Exploring New Lighting Opportunities with ZigBee Light Link™ Webinar

May 16, 2012

Before we begin…

- All attendees are on mute
- Submit questions at any time using the Chat function on your GoTo Webinar panel
- Questions will be answered at the end of the presentations
- An email with links to the slides and the recorded version of the webinar will be sent everyone later today

Agenda & Speakers

- **Introduction and Background**
  - Ryan Maley, Vice President of Strategy, ZigBee Alliance
- **Technological Features/Benefits**
  - Jos Bruins, Technical Working Group Chair, Philips
  - Phil Jamieson, Specialist Engineer, Philips
- **Practical Uses**
  - Francesca Zanette, Product Manager, OSRAM SYLVANIA
- **Lighting and the Internet**
  - Mike Coop, Technology Evangelist, GreenWave Reality
- **Question & Answers**

Introducing ZigBee Light Link

Ryan Maley
Vice President of Strategy – ZigBee Alliance

ZigBee Light Link

Light

Lighting Network

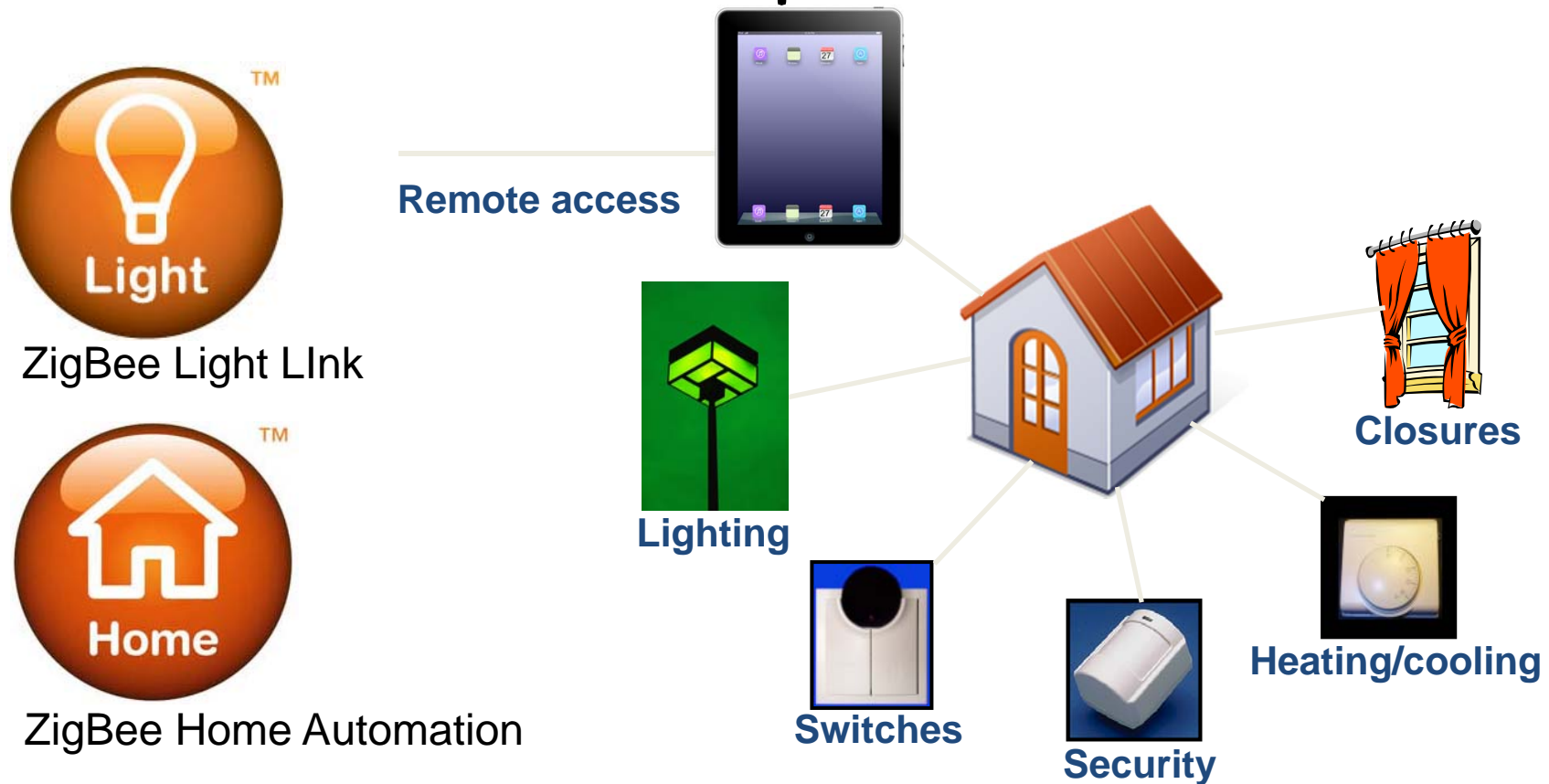ZigBee
Control your world

ZigBee Light Link & ZigBee Home Automation
A powerful combination--

Meeting the needs of customers ranging from the DIY homeowner to professional installers.

ZigBee Light LInk

ZigBee Home Automation

Remote access

Lighting

Switches

Security

Heating/cooling

Closures

ZigBee Light Link & ZigBee Home Automation A powerful combination--

Meeting the needs of customers ranging from the DIY homeowner to professional installers.

ZigBee Light Link

- Targeted to consumers and the DIY market
- Coordinator-less : No extra devices required
- Easy to install via Touchlink configuration

ZigBee Home Automation

- Supports advanced, professional installations
- Integration with other connected home features including shades, thermostats, security, etc.

ZigBee Family of Standards

Introduction ZigBee Light Link

Jos Bruins
Working Group Chair – Philips

ZigBee Light Link

- **Our scope and playing field**

  - **DIY Consumer products for the home**
  - **Quick-fix installer products for the home and the small building market**

  - **Does not address high-end home automation or complete building automation**
  - **ZigBee Light Link is made to work with the broader family of ZigBee standards**

How Philips Made Its Choice

Our industry is in transition. We need to redefine our technology strategy to manage through new - and fundamentally different market dynamics.

Wireless connectivity was a key requirement.

Technology options

WiFi ?

ZigBee ?

BT ?   DECT ?

PROPRIETARY ?

DESIGN SOMETHING NEW ?

OTHER ?

Bottom-line review factors

- Open standard which we can co-design

- Low power consumption

- Global solution

- Simple and Reliable

- Ecosystem / Many active companies

- Mass market / Scale economy potential

Three Driving Forces and Intent

1. The new trend in lighting is to LED

- Partly driven by the banning of incandescent bulb
- Besides the major reduction in energy consumption and form factor benefits, users can now also "play" with light from the comfort of their couch.
- With one universal remote, people want to:
  - control multiple products and brands
  - switch, dim, change color, make group color settings, etc.
- These new technology opportunities should enrich the consumer experience, in a very simple manner.

Three Driving Forces and Intent

2. Lighting products can now benefit from opportunities in the digital world.

- Via several bridging possibilities, products can be controlled from smart phones, tablets, computers, etc.
- Control now possible while at home or when away from home anywhere in the world
- A secondary digital benefit is additional control
  - Functionality can be downloaded, e.g.
    - Timer app with wake-up functionality
    - People-home simulation app when away.

Three Driving Forces and Intent

3. Prospective mass adopters only consider what is implemented by the leaders of the industry

- These implementations widely available in retail are <u>the</u> standard.
- ZigBee Light Link will become the A-brand implementation and an industry reference in 2012.

We Evaluated ZigBee standards

Current standards did not fully address all off-the-shelf / DIY marketing and technical requirements:

- Consumer tests have shown that installing a network was perceived as complex (role of a coordinator)
- Simpler mechanisms were necessary for this market space to avoid product returns
- Resellers start to demand interoperable standards
- LED technology unlocks the potential of many new lighting applications, which requires different control mechanisms
- We face user behaviour and specific consumer perceptions on lighting, developed over the past 100 years. Changing this and keeping things simple is very challenging
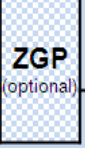- We primarily focus on building lighting success

ZigBee Light Link within the Family

ZGP	ZigBee Green Power	ZSE	ZigBee Smart Energy
ZRC	ZigBee Remote Control	ZHA	ZigBee Home Automation
ZID	ZigBee Interface Devices	ZLL	ZigBee Ligjt Link
Z3S	ZigBee 3D Synch	ZBA	ZigBee Building Automation
ZIP	ZigBee Internet Protocol	ZTS	ZigBee Telecom Services
MAC	Media Access Control	ZRS	ZigBee Retail Services
PHY	Physical Layer	ZHC	ZigBee Health Care

	RF4CE			PRO								IP	
Application Profile	ZRC	ZID	Z3S	ZLL (Light)	ZHA / ZBA / ZGP (optional)		ZTS	ZRS	ZHC	ZSE 1.X		ZSE 2.0	
Network	ZigBee RF4CE			ZigBee PRO								ZigBee IP (IETF based)	Alternate IP Transport
MAC	IEEE 802.15.4 – MAC												Alternate MAC
PHY	IEEE 802.15.4 – sub-GHz (specified per region)			IEEE 802.15.4 – 2.4 GHz (worldwide)									Alternate PHY

Technical Introduction to ZigBee Light Link

Phil Jamieson
Technical Editor – Philips

ZigBee Light Link Architecture
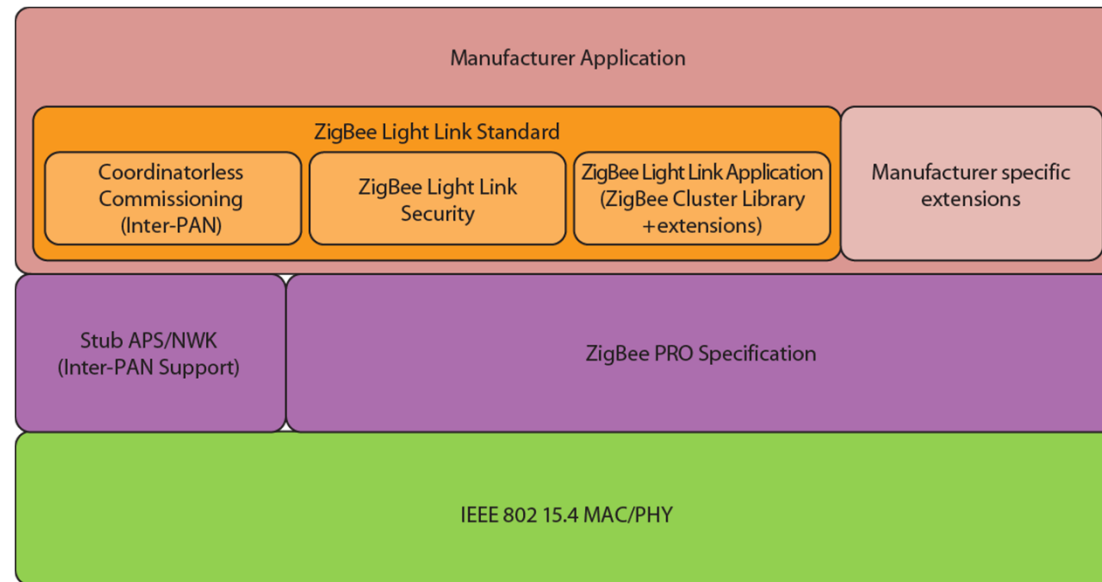
- Manufacturer application connects the ZigBee Light Link Standard to the actual hardware of the manufacturer. In addition, manufacturer-specific extensions can be added as appropriate.

- The standard provides not just the application language (based on the ZigBee Cluster Library) but also the coordinatorless commissioning (Touchlink) mechanism and associated security.

- A stub component is used with the ZigBee PRO stack to provide inter-PAN support to the ZigBee Light Link Standard.

Device Descriptions

Lighting Devices

- On/off light
- On/off plug-in unit
- Dimmable light
- Dimmable plug-in unit
- Color light
- Extended color light
- Color temperature light

Controller Devices

- Color controller
- Color scene controller
- Non-color controller
- Non-color scene controller
- Control bridge
- On/off sensor

Cluster Summary

Cluster ID	Cluster Name	Origin	Attributes	Commands	Scene Table*
0x0000	Basic	ZCL	Additional	-	-
0x0003	Identify	ZCL	-	Additional	-
0x0004	Groups	ZCL	-	-	-
0x0005	Scenes	ZCL	-	Additional	Additional
0x0006	On/off	ZCL	Additional	Additional	-
0x0008	Level control	ZCL	Enhanced	-	-
0x0300	Color control	ZCL	Additional	Additional	Additional
0x1000	ZLL commissioning	ZLL	-	New	-

* When the scenes cluster is supported

Cluster Enhancements

- **Basic**
  - Software build identifier attribute
- **Identify**
  - Trigger effect mechanism (light notifications such as blink, breathe, etc.)
- **Scenes**
  - Support for 1/10th second transition time
  - Copy scene mechanism
- **On/off**
  - Global scene control mechanism (allows the user to return to the last settings that existed before the lamps were turned off)
  - Off with effect mechanism (more pleasing lamp off effects)
  - On with timed off mechanism (sensor re-kick)
- **Color control**
  - Support for 16-bit hue values
  - Better support for color temperature (move and step color temperature)
  - Color loop mechanism (cycle the color spectrum over time)

Touchlink Rationale

- For off-the-shelf/DIY products, simplicity is key
- A mechanism was developed for a commissioning mechanism which is simple for the consumer and does not have a need for a coordinator; this mechanism is known as Touchlink
- Touchlink utilizes inter-PAN communication for commissioning messages
- Touchlink commands contained in the ZigBee Light Link commissioning cluster
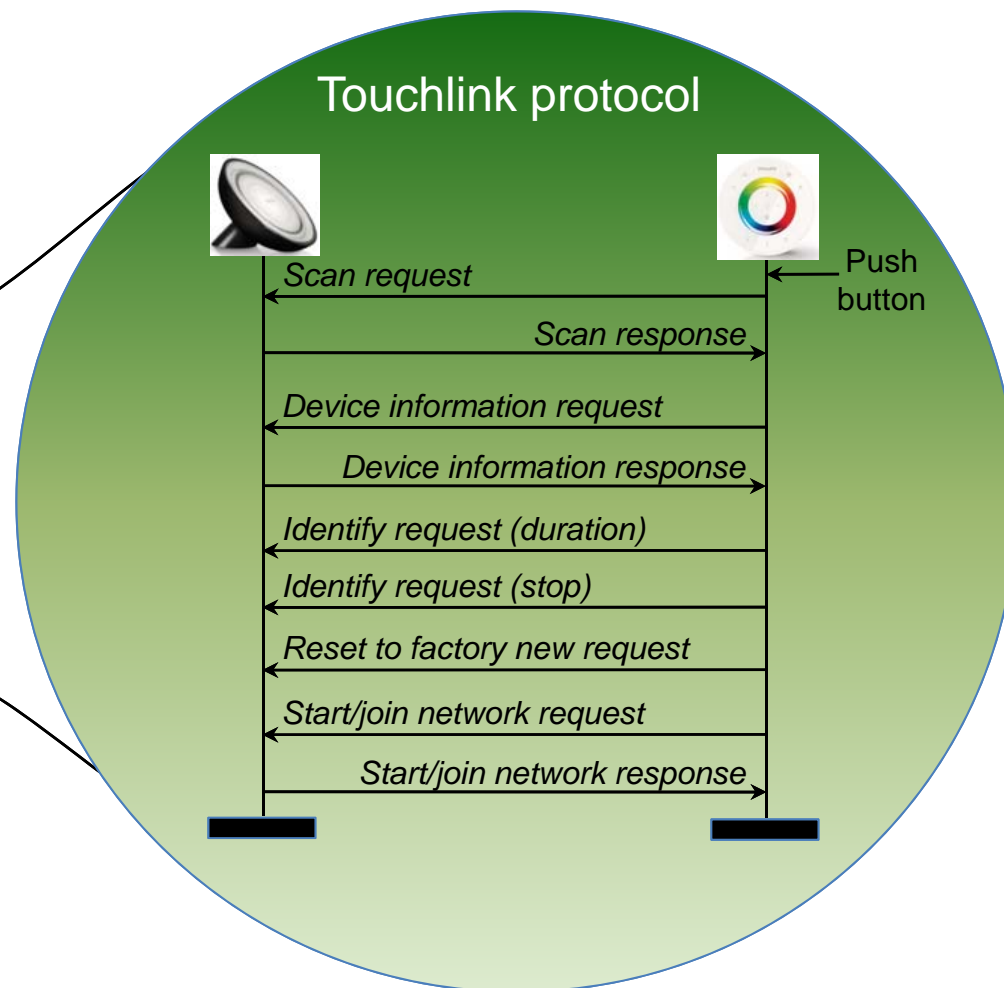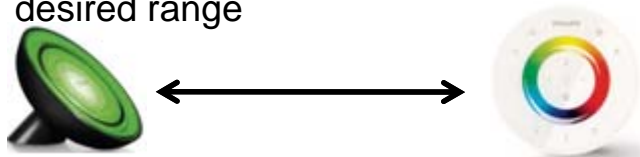- Once commissioned, devices operate on the ZigBee PRO network as normal

Touchlink:
Consumer & Protocol Actions

1) Consumer starts with a lamp and a controller

2) With the controller held close to the lamp, consumer pushes a button on the controller to begin Touchlink
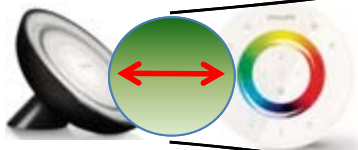
3) The consumer can now control the lamp with the controller at the desired range

Touchlink protocol

Scan request ← Push button

Scan response →

Device information request ←

Device information response →

Identify request (duration) ←

Identify request (stop) ←

Reset to factory new request ←

Start/join network request ←

Start/join network response →

Security Overview

- Since ZigBee Light Link does not have a coordinator and hence a trust centre, classical ZigBee security mechanisms cannot be used

- ZigBee Light Link utilizes network level security and so both sides must exchange a network key

- The Touchlink initiator is responsible for generating the key and passes it to the target during commissioning

- To ensure the key is not sent in the clear, it is first encrypted with a ZigBee Light Link master key

- The ZigBee Light Link master key is assigned once a device has successfully completed ZigBee certification

Security Mechanism
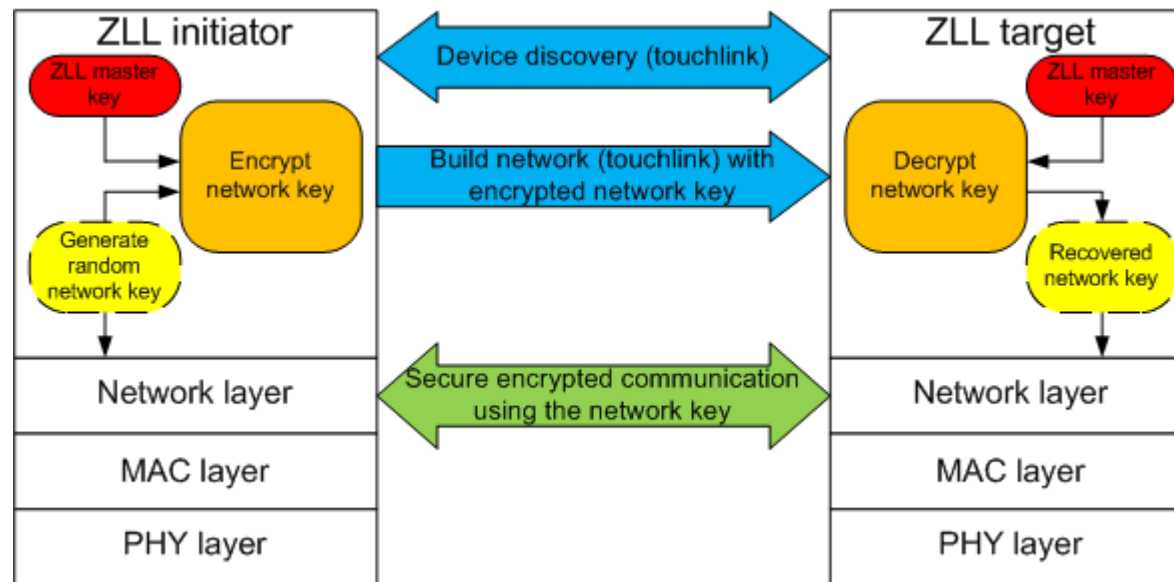
- Devices discover each other via Touchlink commissioning
- Initiator generates a random key (if a key does not yet exist) and encrypts it using the ZigBee Light Link master key, passing it to its network layer
- Initiator requests target either to start a network or join its network, delivering the encrypted key at the same time
- Target decrypts the key using the ZigBee Light Link master key and passes it to its network layer
- Normal communication can now be secured with the network key

Summary

- **ZigBee Light Link addresses off-the-shelf, DIY installed products**
- **Commissioning is accomplished simply and quickly via a consumer button press**
- **ZigBee Light Link does not require a coordinator**
- **A selection of common lighting devices is currently supported**
- **ZigBee Cluster Library clusters are enhanced and extended for this market sector**
- **The network utilizes network level security**

ZigBee Light Link Use Cases

Francesca Zanette
Product Manager – OSRAM Sylvania

Three Consumer Target Groups

Users can typically be clustered into three groups:

1. FUNCTIONAL

"I just need light, that's it."

Decision to buy is price-driven

2. DECORATIVE

"Proper lighting makes things look better."

Decision to buy is design-driven

3. EMOTIONAL

"The right lighting helps me feel better."

Decision to buy is driven by value-for-money

ZigBee Light Link Use Cases

1. COMFORT

- Remotely controlled luminaries (fixtures)
- Dimming
- Activate control actions through timers

2. ENERGY SAVING
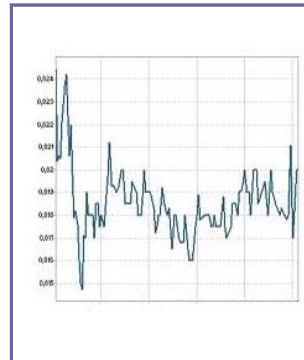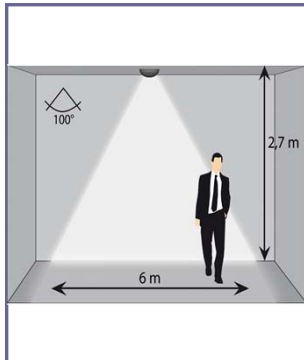
- Occupancy Sensors
- Daylight harvesting
- Energy consumption monitoring

3. MOOD LIGHTING
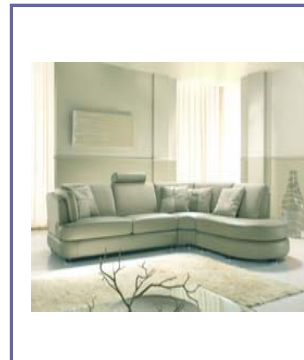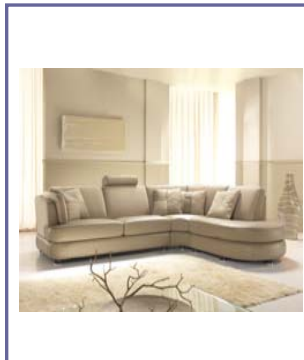
- Scene creations
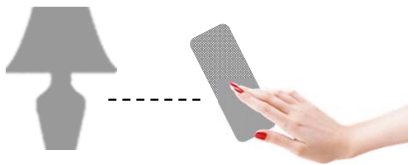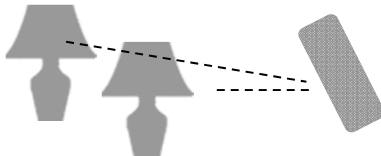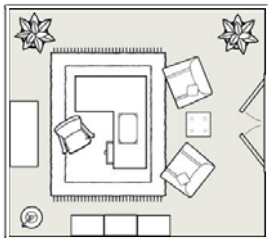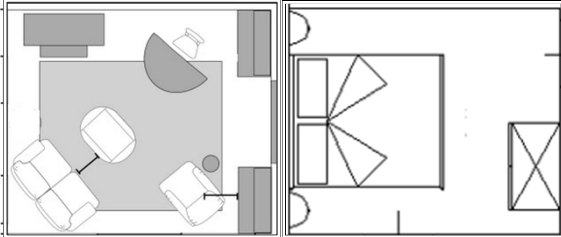- Color control
- Dynamic lighting effects

ZigBee Light Link Use Cases

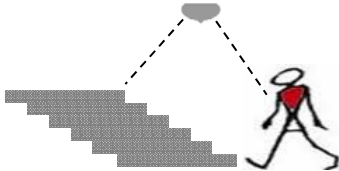| Use Case		Function	Benefit
Initial set-up		Touchlink	System is easily up and running
Group of lamps		On/off, dimming	Upgrade w/o rewiring
Single-room		Scenes, color control, dimming	New lighting experience
Multiple-room		Multiple groups and scenes	Control lighting from multiple locations

SIMPLER → MORE COMPLEX

ZigBee Light Link Use Cases

Use Case		Function	Benefit
Sensor		On/off, daylight	Energy saving
Indoor/Outdoor		On/off, scenes	Control outside lights from inside, security benefit
Whole-house		Mesh network	An expandable system is more affordable
Remote Access		ZigBee/WiFi	Monitor and control, andvanced user interface

SIMPLER

MORE COMPLEX

Why OSRAM Sylvania chose ZigBee Light Link

Focus on light

Broad range of adopters

Retrofit of existing installations

Ease of use

Flexibility

Globally recognized frequency range

Interoperability

Light

Reliable mesh-network

Ecosystem

ZigBee Certified devices

Many chip-vendors

Increased product innovation

Energy efficient

Easy installations

Economy of scale

No coordinator needed
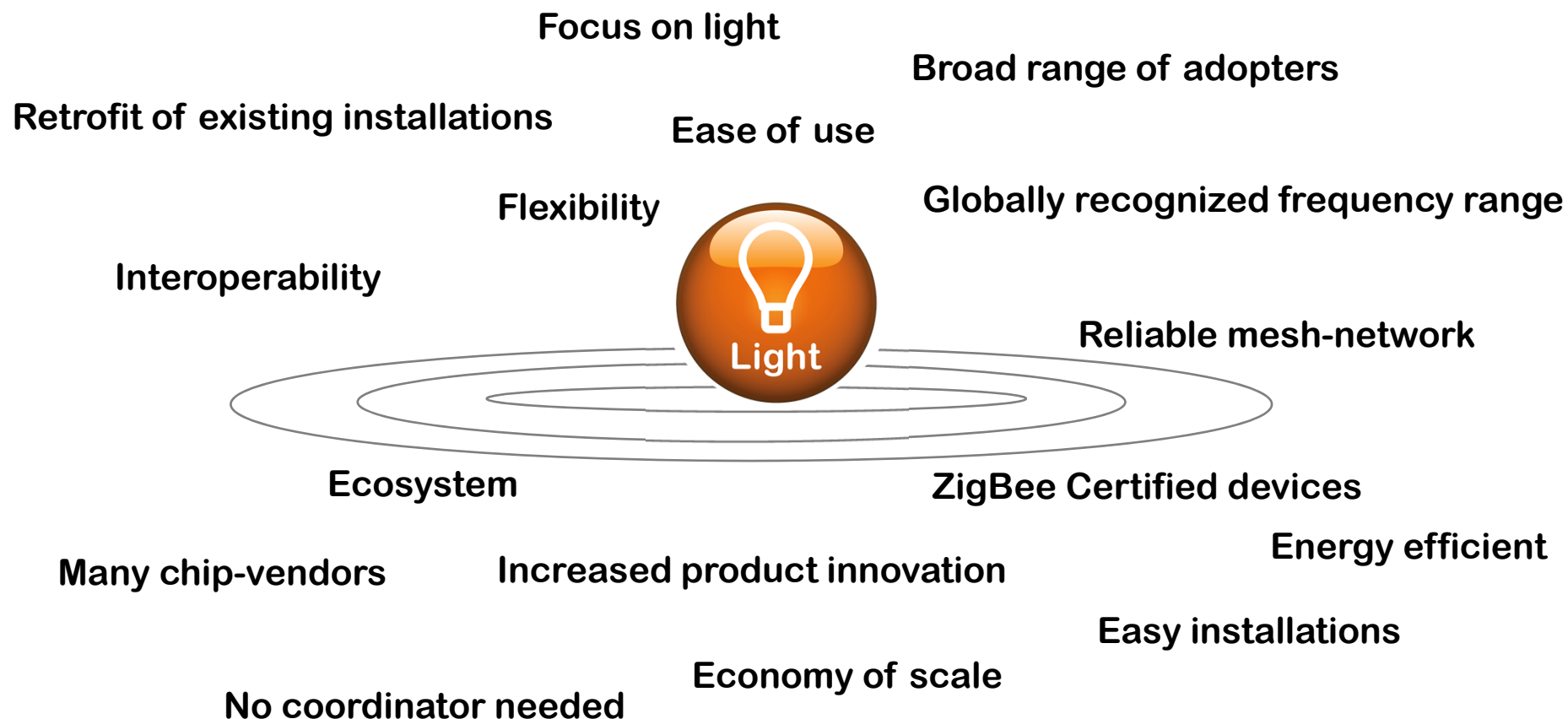
ZigBee Light Link:
Benefits For Customers

INTEROPERABILITY

83% of the interviewees thinks that interoperability with other manufacturers is an added value

CERTIFIED DEVICES

68% of the interviewees recognized interoperability through the ZigBee Certified logo

EASE OF USE

70% of the interviewees thinks that performing the Touchlink operation is very simple.

Results from an OSRAM survey

Lighting Benefits Using IP and the Internet

Mike Coop
Technology Evangelist – GreenWave Reality

ZigBee Light Link Meets the Internet

Remote access

Lighting

Switches

Security

Heating/cooling

Closures

ZigBee Light Link Meets the Internet

- **ZigBee Light Link enables powerful lighting networks with ranges of hundreds of meters**
- **Combining ZigBee Light Link with an Internet gateway enables literally unlimited range**
- **Remote access extends benefits to anywhere you have Internet connectivity, on just about any device—smart phones, tablets, and personal computers**
- **Remote access enables managed service providers to further extend home automation offerings by integrating smart lighting, simply and securely**
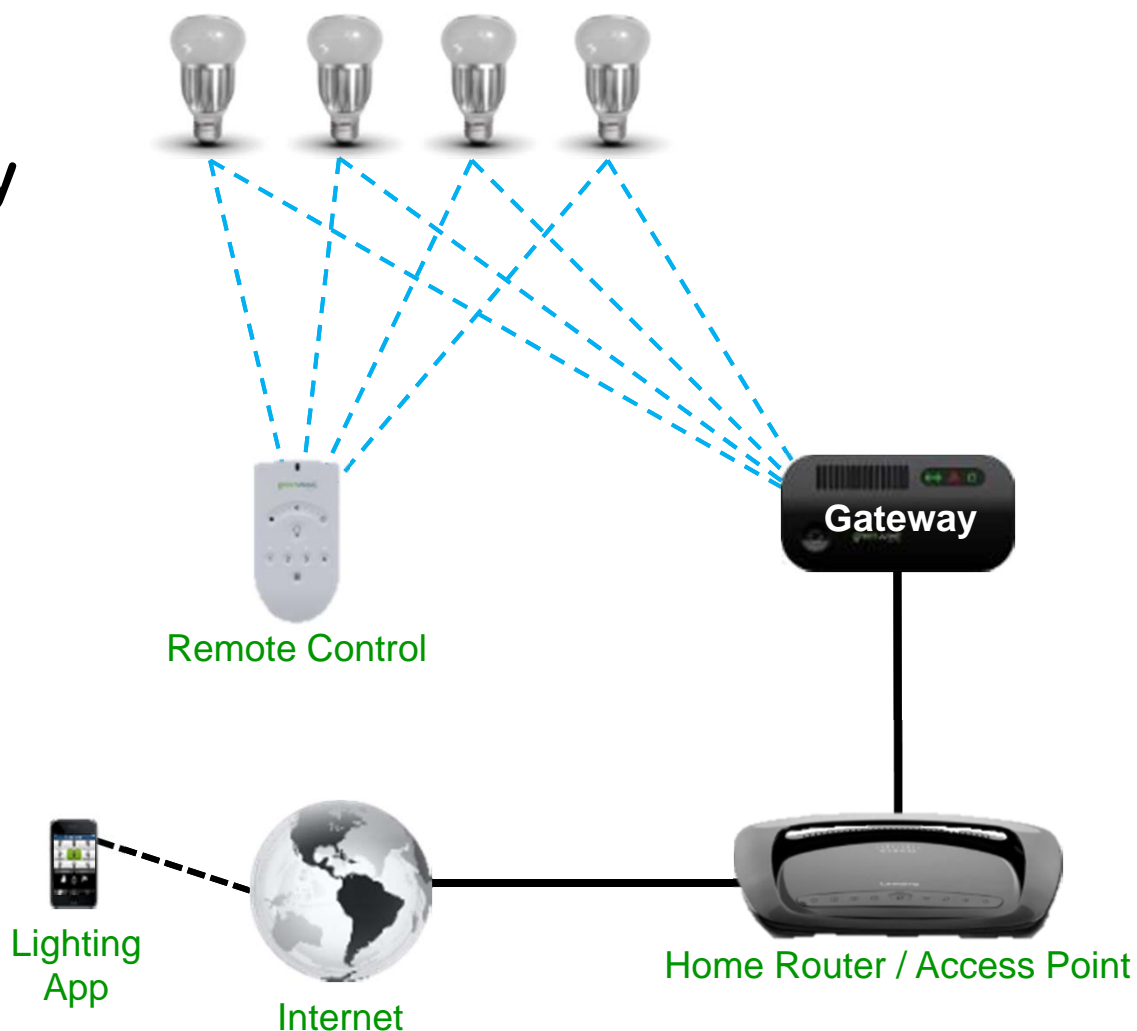
ZigBee Light Link Local Access

Remote Control

Lighting/Energy
Management Interface
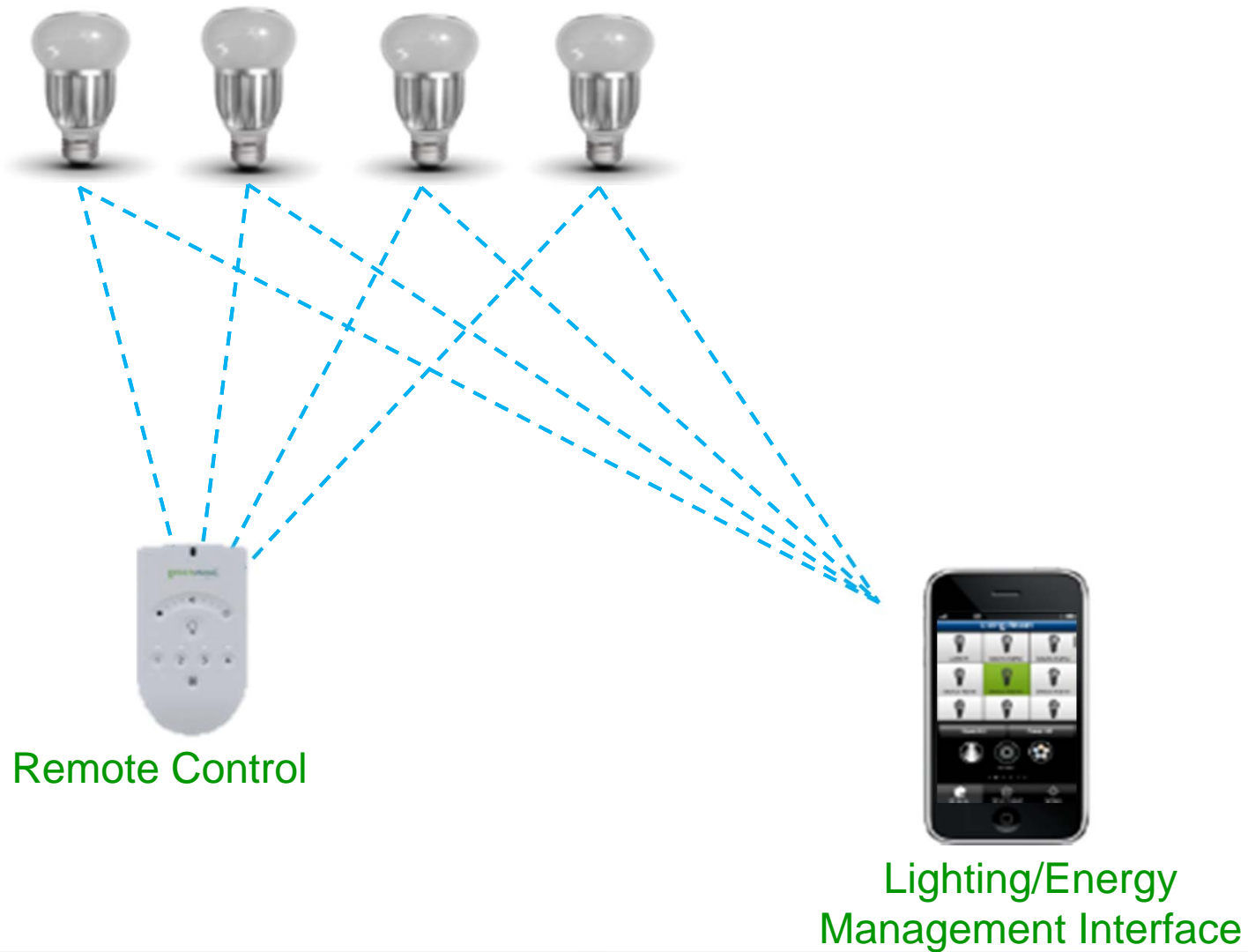
ZigBee Light Link Remote Access

● **Connect a ZigBee Light Link gateway to a router to enable simple and secure control by consumers or managed service providers**

Remote Control

Gateway

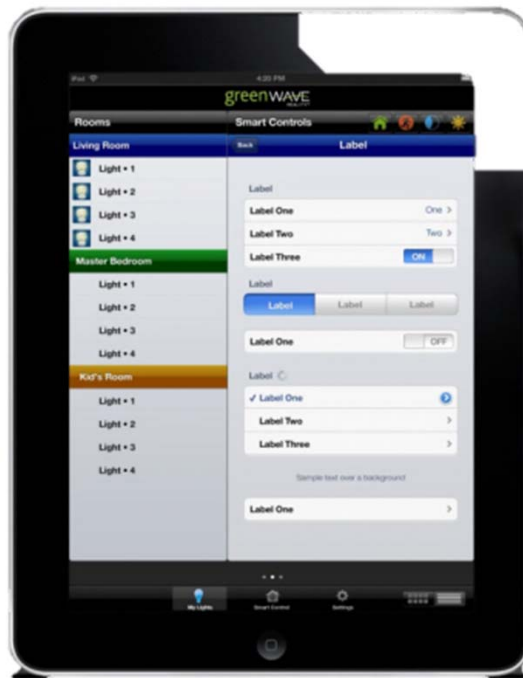Lighting App

Internet

Home Router / Access Point

Forgot to Turn Off the Lights?

Once You've Set Up Light Link Scenes

Control via the Internet is Simple!

Enabling Lighting Command and Control Across the Internet

- **Create lighting scenes**
- **Combine ZigBee Light Link standard bulbs, a gateway, and an Internet link to integrate lighting into the Internet of Things**
- **Enjoy lighting control anytime, anywhere it's convenient—while making your home greener and smarter!**

Question & Answers

Submit Your Questions using Chat

Thank you!