OpenAIS: Innovation towards an Open Architecture for Intelligent Solid State Lighting Systems

Christian Moormann, Tridonic GmbH & Co KG
Stefan Verbrugh, Philips Lighting B.V.
Walter Werner, Zumtobel Lighting GmbH/Werner Management Services e.U

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Consortium

- Johnson Controls
- Philips
- Zumtobel
- Imtech
- TRIDONIC
- NXP
- ARM
- TU/e
- ESI

3 years, Jan 2015 - Dec 2017
Philips project Lead

Covering the whole value chain

Supported by the Horizon 2020 funding of the European Union
Project Aim

- Define an All-IP open Lighting system architecture
- Align the European lighting industry to adopt this architecture
- Support maintaining the leading position of the European lighting industry in the IoT era
- Enable eco-system of suppliers of interoperable components
- Create renewed value space for European Industry
OpenAIS target application

- Professional Indoor
- Focus on Offices
  - New builds and refurbishments
  - Small and large installations
- Global, but validation will be in Europe
OpenAIS Vision

Make lighting part of the Internet of Things

The Internet of Light:

- IoT is the future for connected lighting
- IP connectivity to each luminaire (IPv6)
- Exploit standards and HW & SW components from other IoT applications & platforms
  - Achieve economy of scale
  - Standards maintained by much larger industry
- Open architecture enables: Use of multi-vendor equipment
- Scalable architecture allowing software application updates to extend control functionality after installation
- Serves as a valuable infrastructure for other functions in a building

200 – 400 million luminaires/year sold in 2020 → number of lighting nodes can become considerable (estimation 35 – 75 billion total IoT nodes ww)
Challenges in a changing world

• IoT is an emerging concept:
  – OpenAIS is running in parallel to IoT being shaped
  – Numerous protocols and standards, which to be used for lighting?
  – Unified Data Model for lighting and BMS

• Identify new value spaces, related to:
  – Use of office buildings in the 2020’s
  – Technical possibilities of the 2020’s

• Data privacy & protection

• Shape towards a Dominant Design
Technical challenges

- Security of constrained devices
- Align domain model lighting & building automation
- Network: Shared IT or dedicated lighting
- Low standby power
- Interoperability between vendors
- Long system lifetime support (20+ years)
- Extensibility: add functions over lifetime
- Balance system cost vs added value
- Facilitate easy specifying, installing, commissioning and maintenance
Project plan (1)

• Identify system requirements for the 2020’s
• Define the best System Architecture for connected lighting:
  – To meet end user needs of the 2020’s
  – Exploiting the Internet of Things
• Validate in a real setting whether anticipated user needs are met
• Prepare standardization
OpenAIS project plan

WP 1: Scenarios and Requirements
- Interviews
- Requirements
- Update and complete

WP 2: System Architecture
- Architecture
  - State of the art
  - Candidates
  - Final
- Review + extend SW

WP 3: Design and realization (building blocks for integration and for pilot)
- Make HW & SW building blocks
- Building blocks for pilot

WP 4: Integration of components
- Integration

WP 5: Validation by pilot implementation
- Installation at pilot customer
- Assess performance

Timeline:
- 2015
- 2016
- 2017
Process of defining the requirements

Identify Stakeholders 2020’s
- 23 Stakeholder types, e.g.:
  - User (office worker)
  - Building Owners
  - IoT/IP Providers
  - Consultants & Specifiers
  - Installation companies
  - Application writers
  - Lighting companies

Interview stakeholders:
- Vision 2020’s
- Experience with existing systems
Over 700 statements collected, now combining, clustering and selecting

Scenarios Workshop

Scenario’s & use cases 2020’s
- 3 super-scenarios:
  - Easy Life
  - Increase Building Value
  - Building Wide Ecosystem

OpenAIS Requirements

Quality & Integration Requirements

now
Office trends

Nomadic behavior

Responsive and adaptable environments

Digital environments

Intensive collaboration

New work experience

Total Engagement
Interviews (1)

Some examples of key topics mentioned:

- **Buildings Facilitate the activities of its users**
  - The building is welcoming, shows where to go (also if someone comes once or for the first time)
  - Facilitate efficiency of activities

- **Buildings enhance **Comfort and Wellbeing**, e.g.:**
  - Attract and keep scarce talents
  - Create a feeling that the employer cares about the people
  - Natural atmosphere by change color temperature and intensity over the day or in accordance to the weather conditions
  - Control the lighting with smart phone or via PC
Interviews (2)

• Strengthen efficient building management:
  – Use occupancy sensor information to detect which areas are often used and which are rarely used → optimize the building use
  – Reconfiguring the lighting must be easy and not require an expert
  – Detailed energy consumption report per floor or area
  – Cost saving: Trend towards less m² per person → accepted by office workers if the building offers more comfort

• Concerns:
  – Too many parties involved, risk of responsibility shift
  – IP luminaires too expensive
  – Need a different installer for IP devices
  – Need new tooling, especially for fault finding
  – Commissioning is currently too complex
Process of defining the requirements

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Interview stakeholders:
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OpenAIS Requirements
User Requirements – Super Scenarios

• Easy Life
  – Easy specification, buying, installation and commissioning for all stakeholders
  – Easy use and user centric modifications
  – Inclusion of lighting in the Building Information Model (BIM)
  – Extensibility
    • IPv6 to the end node, PHY independent, integration of new sensors and actuators, upgradability
  – Scalability
    • Low cost to add devices, functionality and performance independent of size
User Requirements – Super Scenarios

- Increase Building Value
  - Enhance comfort and wellbeing
  - Increasing the value of the building
  - Making it more attractive for lease or rental
  - Enable flexible use of an office building due to a lighting system that can be adapted quickly over time to the new user requirements.
User Requirements – Super Scenarios

• Building Wide Ecosystem
  – BMS integration and sustainability, e.g. energy saving, cross-compatibility to IT
  – Other building systems and software will also share data and sensors resulting in simpler interoperability. For example meeting room booking/occupancy systems or smart grid demand reduction controls could interoperate better with BMS and lighting.
Following the trends of the creation of the “Internet of Things” (IoT) and the rapid penetration of SSL based lighting, it is very advantageous to connect the luminaires in buildings to the Internet. OpenAIS aims at setting the leading standard for inclusion of lighting for professional applications in to IoT, with a focus on office lighting. This will enable a transition from the currently existing closed and command oriented lighting control systems to an open and service oriented system architecture.

**Openness and service orientation** will create an eco-system of suppliers of interoperable components and a market for apps that exploit the lighting system to add value beyond the lighting function. Added value can e.g. be related to more efficient use of the building, reduction of carbon footprint and increased comfort and wellbeing. In addition, IoT will facilitate smooth and effective interaction of the lighting system with other functions in a building such as e.g. HVAC, security and access control. Extensibility and security of the system architecture are important aspects and will be guaranteed.

The OpenAIS project will define the requirements and use cases for offices in 2020, define the best open system architecture, identify existing ICT components to be used and develop additional components. The system will be validated by a pilot installation in a real office setting.

After the OpenAIS project, the Consortium will pursue standardization of the system architecture, aiming at the creation of the leading standard for Internet connected lighting. The project brings together a strong collaboration of the leading lighting companies Zumtobel, Tridonic, and Philips and
Future Steps

• Proposal for an open reference system architecture will be published in 2016

• Prototype system design and Hard-&Software solution will be created

• Pilot system will be realized and validated

• Standardization will be planned and coordinated
Summary

• OpenAIS aims at the development of the Internet of Light supported by a strong consortium

• The OpenAIS project will develop and validate a system architecture for IP connected lighting towards and open standard

• The Internet of Light can lead to considerably higher added value of buildings and ease of use
Thank you

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Open Architectures for Intelligent Solid State Lighting Systems

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Questions?

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