6th International
LED professional Symposium +Expo
Sept 20-22, 2016 | Bregenz

IoT Architecture for Future Building Management Embedded Lighting Controls

Walter WERNER
Werner Management Services e.U., Dornbirn, Austria
http://www.werner-ms.at

Table of Content

❑ Personalia (who is and what qualifies the speaker)

❑ "IoT" and what does it mean for lighting?
  - ❑ How are the security requirements met?
  - ❑ How are the commissioning and networking requirements met?

❑ "Lighting" and what does it mean for IoT?
  - ❑ How can the lighting timing restrictions ("time to light") be met in IoT?
  - ❑ Will lights operate when the internet connection is down?

❑ OpenAIS and the IoT lighting Controls Architecture
  - ❑ What is OpenAIS?
  - ❑ Main Architectural Aspects of the OpenAIS proposal
    - ⊙ SCA structure, controls stacking and self-similarity
    - ⊙ Apply diversity, Integrate Heritage and Cloud Business
    - ⊙ Add Secure Multicast Group Communication to an existing IoT Framework
    - ⊙ Initial Operation ("out-of-the-box") and commissioning

❑ Espectable effects on the business models
  - ❑ Hardware, Network, Cloud and Commissioning / Maintenance business

Personalia

- ❑ ## Speaker: Dr. Walter WERNER (PhD)
  - ❑ Owner and director of "Werner Management Services e.U.", Dornbirn.
  - ❑ Consultant regarding Innovation Business and Business Innovation, including Controls / IoT and technology research. See also www.werner-ms.at
  - ❑ 25 years plus experience in lighting, lighting controls and room control
  - ❑ Creator and MD of Zumtobel's "LUXMATE Preofessional" System 1988 to 2002.

- ❑ ## OpenAIS (Open Architecture for IP connected SolidStateLighting):
  - ❑ The H2020-EU-co-funded research project "OpenAIS" prepared and published a reference architecture for IoT based lighting controls.
  - ❑ The Consortium consists of ARM, NXP, Johnson Controls,, Philips Lighting, Zumtobel, Tridonic, Dynniq, TU/E and TNO/ESI.
  - ❑ Your Speaker leads the Architecture Work Package of OpenAIS (on behalf of Zumtobel group)
  - ❑ See www.openais.eu/en/results for more information on the available achievements of this project.

IoT and what does it mean for lighting

❑ Security

    ❑ The components (e.g. Sensors and luminaires) of an IoT System are directly exposed to the threats of the Internet.

    ❑ We cannot rely fully on firewalls, as they may fail, but the lighting system may not.

   ❑ Authentication and encryption is applied, but may not delay operative lighting communication

        ⊙ See Mr. Abhinav Somaraju's presentation for "Security in IoT lighting" on Wednesday 12:00 for more Details

❑ Networking and Commissioning:

    ❑ The communication is designed for (any) mix of PHYs: All IPv6 systems are useable, both wired and wireless. The Backbone is a fast link (e.g. Ethernet) the other systems are connected via border routers (6LoWPAN, Thread, BTLE, etc.)

    ❑ Auto-connectable devices (depending somehow on the PHY) will operate in out-of-the-box operation that helps the electrical contractor to proof he has performed his work correctly.

Lighting and what does it mean for IoT

❑ Timing considerations

   ❑ IoT is designed to provide data to the cloud, and to be controled by the cloud. This
      is how it operates, using IPv6, UDP, CoAP and DTLS:
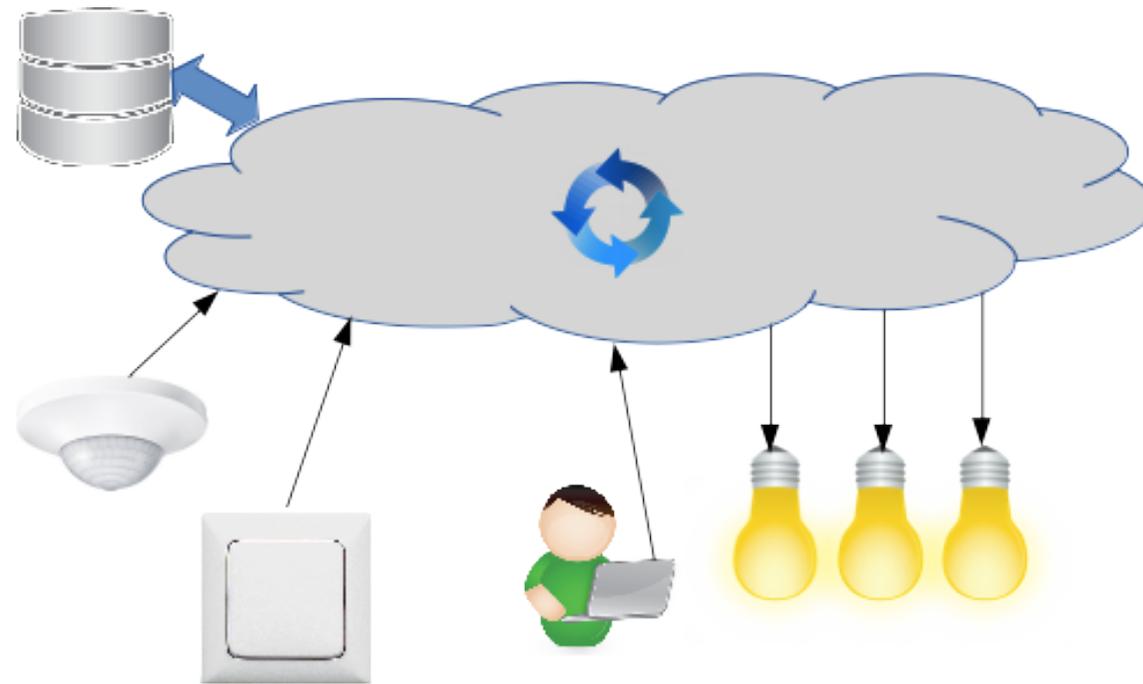
   ❑ OpenAIS uses this setting for commissioning and data integration
   ❑ OpenAIS did choose the LWM2M Specifications, as this is the most available
      framework today.

❑ Timing considerations

    ❑ OpenAIS adds group communication and local controls to IoT. This is how it operates:
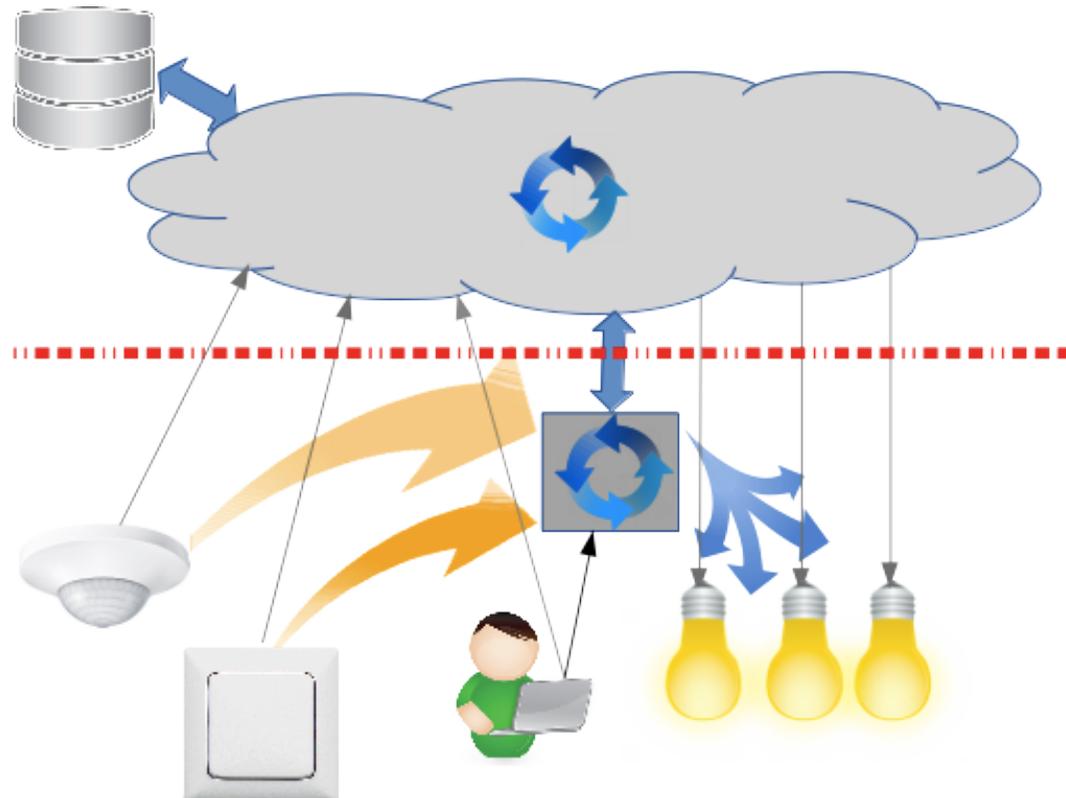
    ❑ Local group communication and local controls is added, using IPv6 Multicast, UDP, CoAP and COSE.

Some IoT Lighting Controls Considerations

❑ Benefits of the S-C-A structure

- ❑ OpenAIS uses a strict Sensor-Control-Actuator Architecture, with a software- only Control Object, that may be placed wherever appropriate.

- ❑ Control Objects perform group control and automation, and can be used like actuators for superior or stacked controls in a kind of self-similarity.

- ❑ Control Objects provide a User Control API.

- ❑ S-C-A structure allows to combine elements from different vendors and different flavours with ease.

- ❑ Heritage systems integrate simply through gateways that provide both sensor data and actuator access to the control objects.

- ❑ BMS systems interface with room control objects that provide summary room status information.

Initial Operation

❑ ## Out-of-the-box

  ❑ After automatic network connection the OpenAIS devices will automatically boot into a preliminary networked operation.

  ❑ The electrical contractor can –without any tool- use this preliminary operation to check if all connections are fine, and if all installed devices operate.

  ❑ Using a simple (and simple to use) blackbox-tool the list of installed devices and their status messages can be downloaded from the network.

  ❑ The out-of-the-box operation delivers light to a site (for the use of the builders)

❑ ## Commissioning

  ❑ Authentication, key distribution, grouping, location documentation etc. is using more complex tools, that easily can be handled by commissioning engineers. All configuration is documented and secured using a granular access regime.

Expectable changes in business models

- ❑ **IoT is open**
  - ❑ IoT allows for coexisting communication protocols on the same transport environment, there is no „either-or"

- ❑ **Open systems allow specialization**
  - ❑ It is no longer one vendor that needs to supply all and everything out of one hand.
  - ❑ Systems can be upgraded at any time by changing or adding control objects
  - ❑ System services may be performed by specialized companies that are not part of the organization that delivers the devices.

- ❑ **Summary:**
  - ❑ The achieved performance that will shift expectations and business models. The lever to lock out others by technical protection will loose its strength.
  - ❑ The 6% market share limit (of lighting controls versus non-controls) is getting porous: Investment into IoT is an investment into Infrastructure, and no longer needs full trust to a single controls vendor.

Lessons Learned

❑ IoT Frameworks need group and multicast extension to cover lighting needs.

❑ Lighting needs to understand and implement the security standards of the internet

❑ Business models will change, and will support those that drive the change.

❑ Easy to use and functionally perfect lighting controls remains very challenging, IoT allows for more granular, flexible and easier multiple vendor contributions to solve the issues.

❑ Refer to www.openAIS.eu/en/results for the full Architecture document. (Now in revision 2, revision 3 to follow early next year.)

❑ Prepare to visit the OpenAIS demonstrator in autumn next year.

THANK YOU FOR YOUR ATTENTION