IoT standardization needs and multiple connectivity

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Why Does the Internet Work at All?

- Have you ever seen an internet compatibility logo?
  - If not, how do we know if a device will be able to work with the internet?
  - → we just take it for granted that it will work, and we are confident it does.
- Have you ever heared about the internet compatibility enforcing authority?
  - If not, this is due to the fact that it doesn't exist at all.

- So why is internet working at all?
  - Because it is a system that needs no "system compatibility", it is based on pair compatibility, with each pair possibly using other standards than other pairs.
  - All attempts to provide "incompatible" solutions finally had to back down on the pressure of annoyed users (see: MS version of HTML and java-script and alike)

Who Standardizes the Internet?

- W3C (WWW consortium): application layer standards
  - HTML, JS, CSS, XML etc. are proposals made by W3C, largely followed by the industry.
  - W3C is creating technical experts proposals, and has no authority.
  - Some Companies add (more or less open) proposals (e.g. SOAP by MS, LWM2M by OMA etc.)
- IETF (Internet Engineering Task Force): middleware standards
  - HTTP, DTLS, CoAP, HTTPS, 6LoWPAN etc. are proposals made by IETF, that are largely followed by the industry. These are usually called “RFC”.
  - IETF is creating technical experts proposals, and has no authority.
- IEEE (Institute of Electrical and Electronic Engineers): the physical networking standards.
  - LAN, WIFI, WPAN etc. are standards proposed by the IEEE, (e.g. IEEE_802.15.4) that are largely followed by the industry.
  - IEEE is creating technical experts proposals, and has no authority.
  - Some companies add additional proposals in this area, that often come with private middleware and application layer also. (BT, Zigbee, etc.)

Why is internet so successful?

- The internet is the most successful communication technology
  - It is a full set of communication technologies.
  - It outdid most of the specialized and optimized technologies (like: Telephone, Fax, BTx (minitel) etc), only some remain (like USB, Lighting Controls and Public TV and Radio), but this will change.
  - Main reason: Pair compatibility **is more innovation friendly** than any of the other technologies, so on the long run the day approaches when the switch to IP is less effort than the upgrade to a more advanced version of the classic offer.
- Internet technologies allows concurrent access to a node
  - A classic converter will offer either a DALI or a KNX interface, it may offer both interfaces with „autodetect select on startup“ (awfully complex), but will never be able to use both systems at the same time.
  - An internet based converter may easily use multiple application protocols in parallel (like your PC uses SMTP, POP and HTML in parallel).
- Internet technology provides seamless innovation support.
  - Using the pair compatibility allows to keep old equipment connected and use new functionality with newly deployed devices. Controllers can adapt to the reduced functional spectrum of old nodes with ease.

Why does adopting to IP take so long?

- Internet technologies use a lot more resources than classical systems did
  - This makes it „expensive“ for the final product.
  - But system maintenance cost get higher with the lifetime of any system, and one day decreasing hardware cost and increasing old system maintenance cost get equal, and the decision for a replacement of the classic system by internet technology is close.
- Some lighting controls aspects may need additional engineering activity at IEEE, IETF or at the application level.
  - Lighting controls needs low latency group communication. This has been made available with IPv6 multicast. (RFC 2357, 3513 etc.)
  - Reasonable low latency security for multicast is not yet available, but already in discussion at IETF. (Main need for low latency (time-to-light) is only in lighting)
  - There are multiple SDOs interested in the application layer protocol: It is not clear who will finally set the prevailing application layer standard. (Lighting industry focus is missing)
- Lighting industry focusses on heritage (DALI, Zigbee etc.) and proprietary solutions.
  - Not really surprising, as IP provides less protection for known business models.

IoT in Lighting is now working, it is time to act!

- Remaining obstacles have been resolved and remocved
  - IoT for Lighting is becoming available now.
  - Providing low latency group communication,
  - Acceptable time to light and synchronicity in action
  - Spanning RF, wired and PoE connectivity
  - Priority handling for concurrent (overlapping) control access to nodes and groups
- The EU has co- financed this attempt under its Horizon 2020 program in the OpenAIS project.
  - It started off as a research project, the technological challenges have been resolved, and now the demonstrator is under final construction.
  - It provides flexible automation, low latency and good synchronicity reaction to manual and sensor driven action, and full coupling into BMS and cloud systems.
  - See www.openais.eu for more details.

And how about a Real Installation?

- The OpenAIS project will show that professional IoT based lighting controls works in a real environment
  - Controls system networking some 400 light points and some 400 sensors
  - Connected through RF (thread) and wired (PoE and LAN)
  - A real customer, (public administration)
  - flexible automation, low latency and good synchronicity reaction to manual and sensor driven action,
  - Full coupling into BMS and cloud systems.

- The OpenAIS project partners are proud to present these results in early 2018 at ”de Witte Dame” in the center of Eindhoven.
  - Joining forces to create the future:
  - Johnson Controls, ARM, NXP, Tridonic, Philips, Zumtobel, TU/E, TNO and Dynniq.

How will this finally look like?

The demonstrator is a full floor in this building:
http://dewittedame.nl/

Lessons Learned

- IoT (= internet based) Lighting Controls is becoming available
- IoT Internet based lighting controls will replace classical lighting controls in the near future. (No “DALI 3”)
- Internet based lighting controls will need a completely new approach to standardization
- Internet based lighting controls will be able to support and use multiple controls languages concurrently.
- Lighting Industry should take action to retain the initiative and formulate a professional lighting application layer standard.