

IEEE CANDO EPE 2020

Convergence of Electrical Engineering Disciplines: Lighting and Infocommunication

Péter János VARGA^{a)}, Tibor WÜHRL^{a)} és László BALÁZS^{b)}

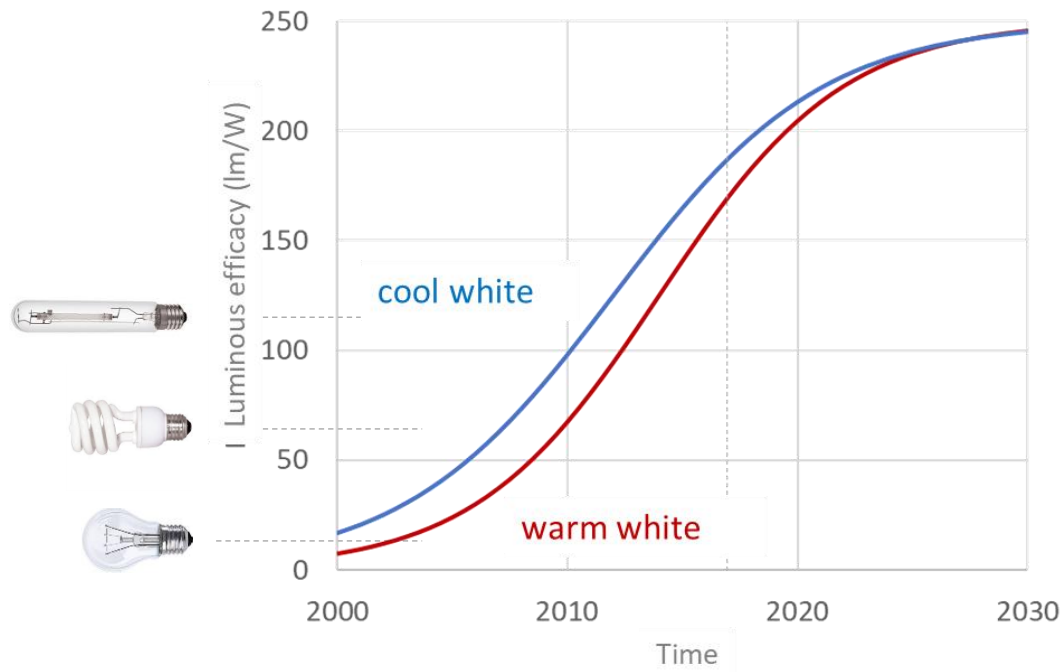
Kálmán Kandó Faculty of Electrical Engineering

^{a)}Institute of Communication Engineering

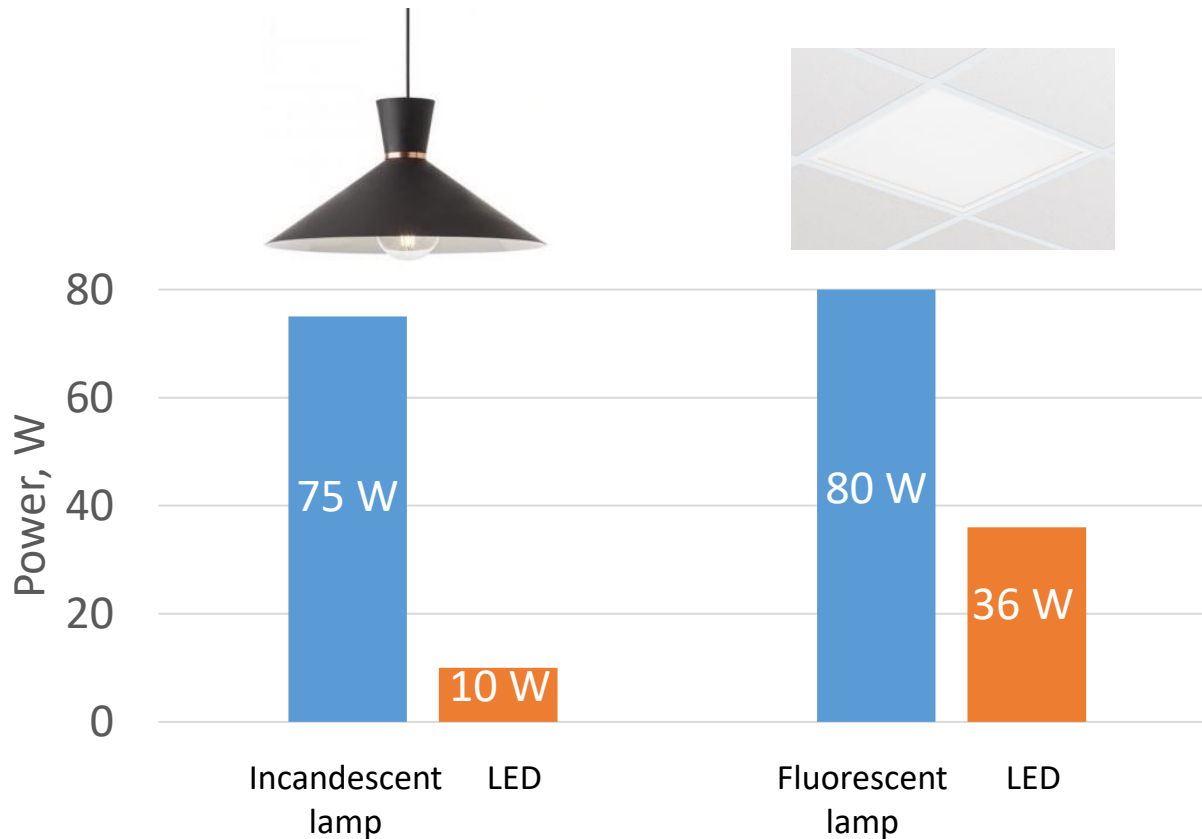
^{b)}Institute of Microelectronics and Technologies

The light output of the LEDs exceeded 200 lm / W

according to USA Department of Energy



Power per light point is decreasing



LEDs are more than high efficacy light sources

Continuously adjustable luminous flux and color



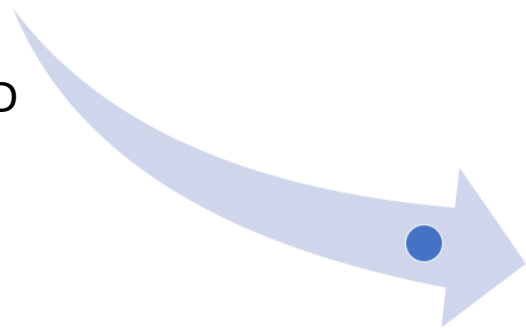
Data transmission: LiFi



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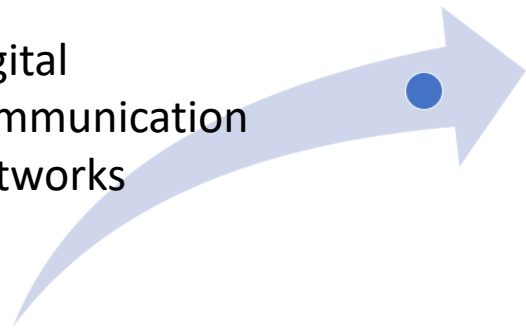
Convergence of technologies

LED



Decreasing power demand

Digital
communication
networks



Increasing
performance

The “tradition” of wired telecommunication networks is power feeding via communication lines

- ▶ Network components (amplifiers, regenerators);
- ▶ Terminals (User Terminals, cameras).



Power feeding via Ethernet

PoE (Power over Ethernet)

Based on:

- TP cables 4 twisted pairs;
- Line codings – No DC in data signal;
- Fantom feeding theory.

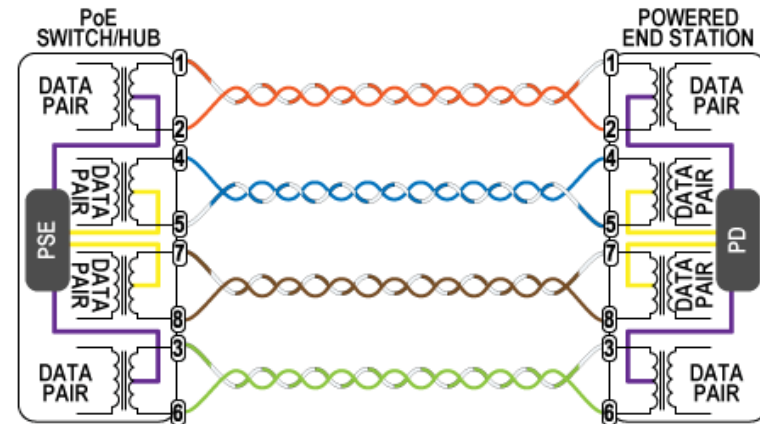
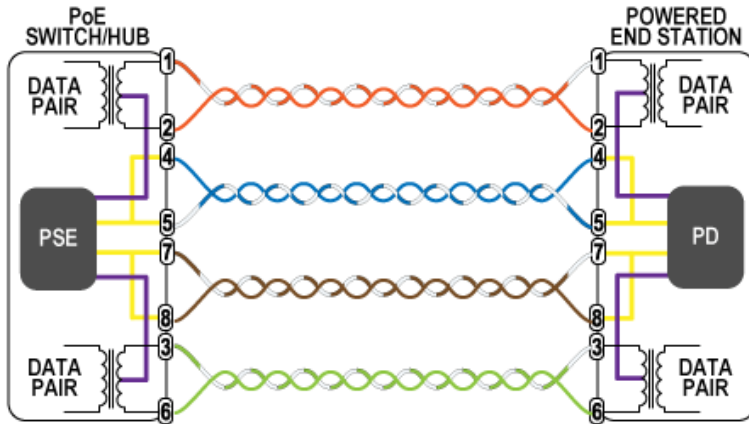
Standards:

- IEEE 802.3 af, at, bt

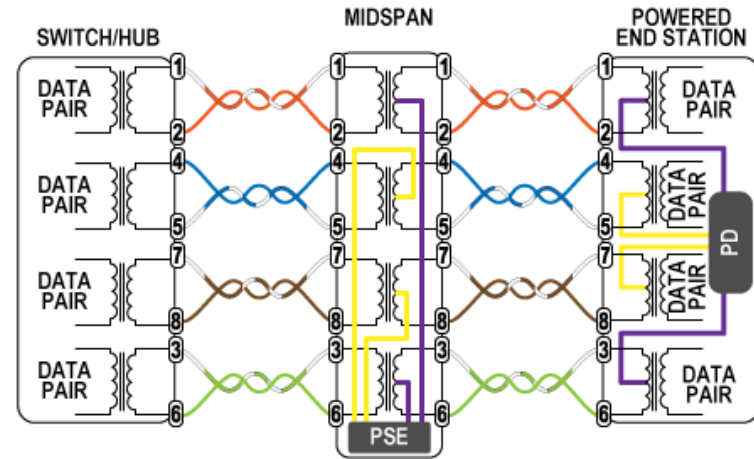
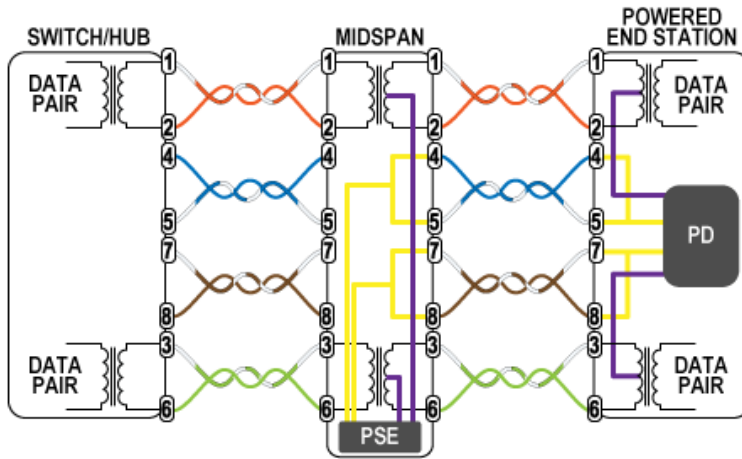
Steady progress

- Fit for new interfaces;
- Transmitted electrical power (12W - > 100W)

PoE solutions (PoE capable Switch components)



PoE solutions (midspan / injector)



Lighting and PoE

Tendencies:

- ▶ PoE solutions provide more and more power to endpoints per interface (nearly 100W);
- ▶ The need for electrical power of LED light sources is decreasing.

Why not power the luminaires on the previously established TP wired communication network?

Why not a communication transmitter as a light source for a building lighting?

Lighting and wireless communication

- ▶ WLAN („Wi-Fi“)
- ▶ Bluetooth
- ▶ ZigBee

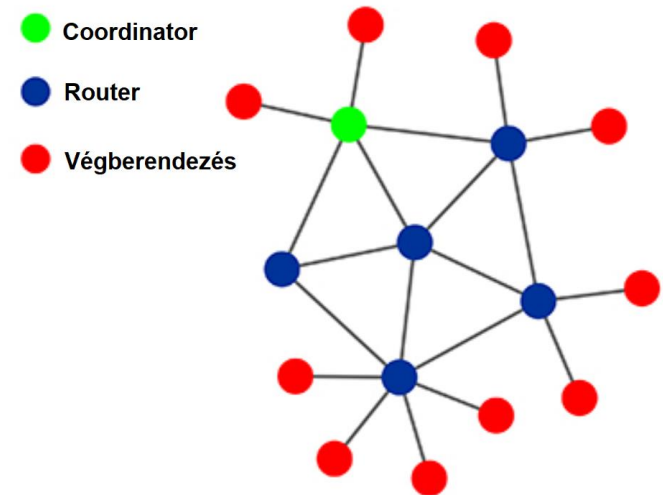


ZigBee solutions

ZigBee is a wireless control solution for intelligent home and home automation based on the 2.4 GHz and 868/915 MHz frequency bands according to IEEE 802.15.4. It allows all household appliances, lighting fixtures, door locks, shutters, thermostats, smoke detectors and so on, control wirelessly.

Network components in the topology:

- ZigBee Coordinator
- ZigBee Router
- ZigBee terminals



ZigBee example

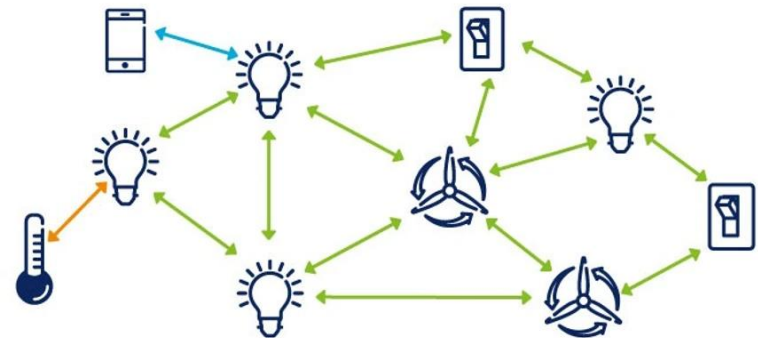


Bluetooth solutions

Bluetooth Smart used in intelligent lighting technology - Bluetooth 4.0 - consumes very little power and operates in the 2.4 GHz ISM band.

Network components:

- ▶ Bluetooth node
- ▶ Sensors and switches
- ▶ Terminals



Bluetooth examples

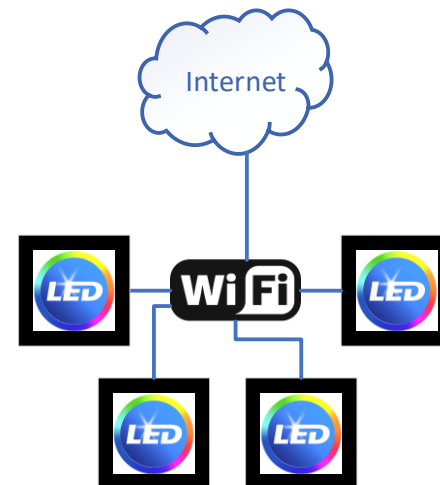


WLAN („Wi-Fi“) solutions

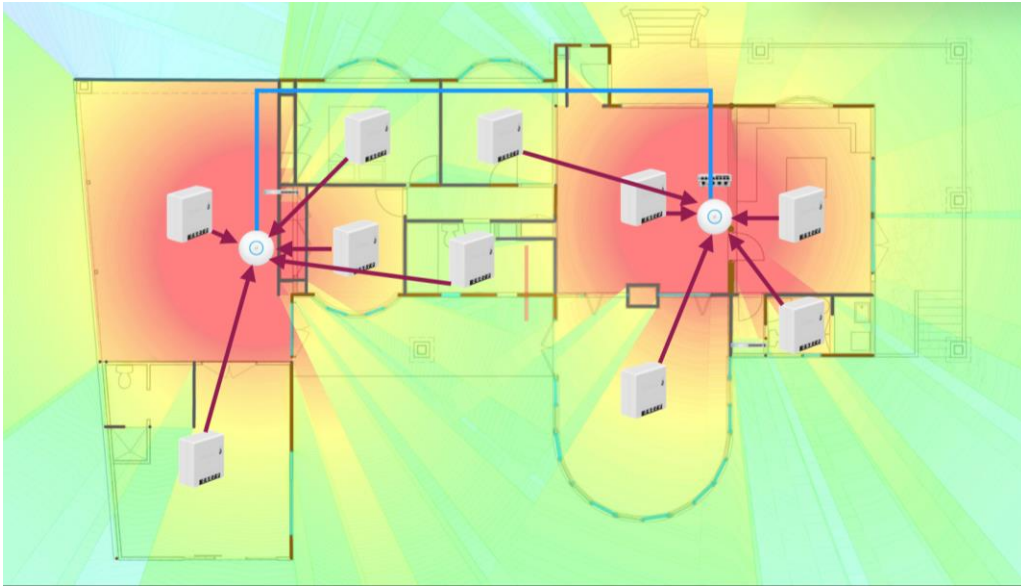
The connection between Wi-Fi and smart lighting is primarily due to the development of wireless communication technology. Wi-Fi is based on the IEEE 802.11 standard and operates in the 2.4 and 5 GHz bands.

Network components:

- ▶ WLAN (Wi-Fi) router
- ▶ Sensors and switches
- ▶ Terminals



Wi-Fi example



Wi-Fi control



Remote ON/Off



Smart Timer



Color Changing

Thank You for Your Attentions!