



ruSMART 2008
Home Automation with ZigBee

5-September-2008

Agenda

1. Smart Space concept
2. Traditional automation systems overview
3. Challenges to the traditional approach
4. Open Platforms and Open Standards
5. Linux and ZigBee

Smart Space Concept



Traditional Automation System Overview

1. Industrial and building automation systems as a first step towards Smart Spaces
2. There are requirements to reliability and maintainability to be met by components of modern automation systems
3. Communication protocols development as a step towards intelligent systems
4. Interoperability between systems from different areas is difficult due to different technology



Home Automation Overview

Application areas:

- HVAC
- Security
- Intercom
- Lightning
- Garage doors
- Metering
- Boiler & Pool

Programming:

- Ladder diagram (LD)
- Sequential Function Charts (SFC)
- Function Block Diagram (FBD)
- Structured Text (ST)
- Instruction List (IL)

Communication:

- **X10** (Noise, attenuation, 256 devices, speed 20 bit/s)
- **BACnet** (Higher level protocol, provides abstractions for control functionality)
- **LonWorks** (Widely accepted, 78/5.6/3.4 kbit/s)
- **KNX** (Widely accepted, speed depends on media)
- **UPnP** (Higher level protocol abstracting control functionality)
- **HomePlug** (Standard for PC networking over powerline)
- **ZigBee** (Open standard for wireless mesh communication)
- **Z-Wave** (Proprietary alternative to ZigBee)

Challenges to the Traditional Approach

1. Development of “multimedia home platforms”
2. Computer networks are everywhere, standards like UPnP offer competitive alternative to traditional home automation networking
3. Interoperability is a key for home automation systems
4. Higher requirements to functionality and quality are difficult to satisfy with a narrow niche approach



Open Platforms and Open Standards

1. Open Standards are the key precondition of growth for modern IT infrastructure
2. Open Platforms are the major enabling factor for integration of computer and automation technologies
3. Linux operating system is a key component of many products due to openness and standards compatibility

Linux Ecosystem



Personal



Network



Industry



Telecom



Mobile



Computers

Home



ZigBee Overview

- Data rate up to 250kbps, 11-26 channels
- Up to 64.000 nodes
- Based on IEEE 802.15.4, three different frequency ranges (868.3MHz, 902-928MHz, 2.4GHz)
- Excellent signal-to-noise ratio
- Extended battery life (years off of a AA cell)
- Strong encryption (AES 128 bit encryption)
- Mesh, Star and Cluster Tree network topologies
- Optimized for time-critical applications
- High reliability of communications
- Very low cost (\$3.10 in 1000+ quantities for MC13193FC transceiver)



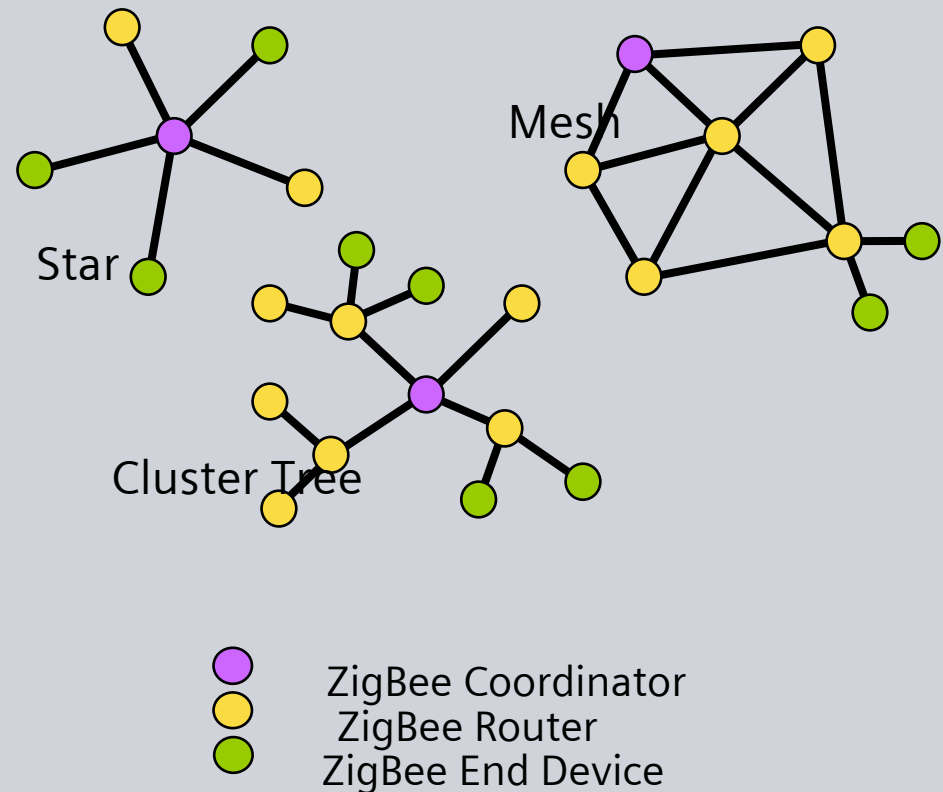
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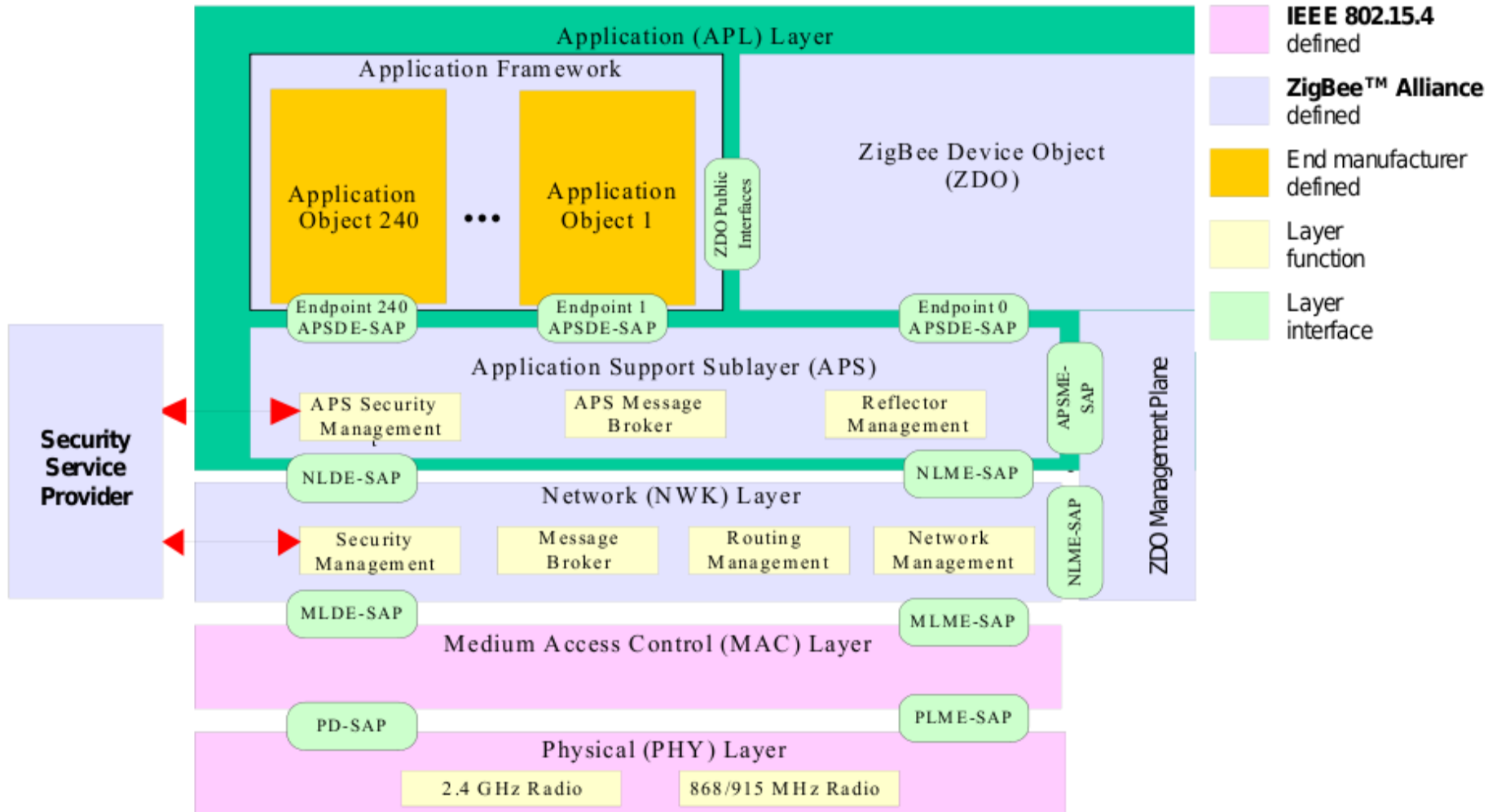
ZigBee Networking

ZigBee standard is built on the top of IEEE 802.15.4 and offers mesh networking capability together with low power consumption.

Key feature of ZigBee network is ability to build paths dynamically depending on node existence and thus increase network reliability.



ZigBee Protocol Stack



Questions and Answers

Thank you!