



# **SNS COLLEGE OF TECHNOLOGY**

**Coimbatore-35**  
**An Autonomous Institution**



Accredited by NBA – AICTE and Accredited by NAAC – UGC with 'A++' Grade  
Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

## **DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING**

### **19ECT312 – EMBEDDED SYSTEM DESIGN**

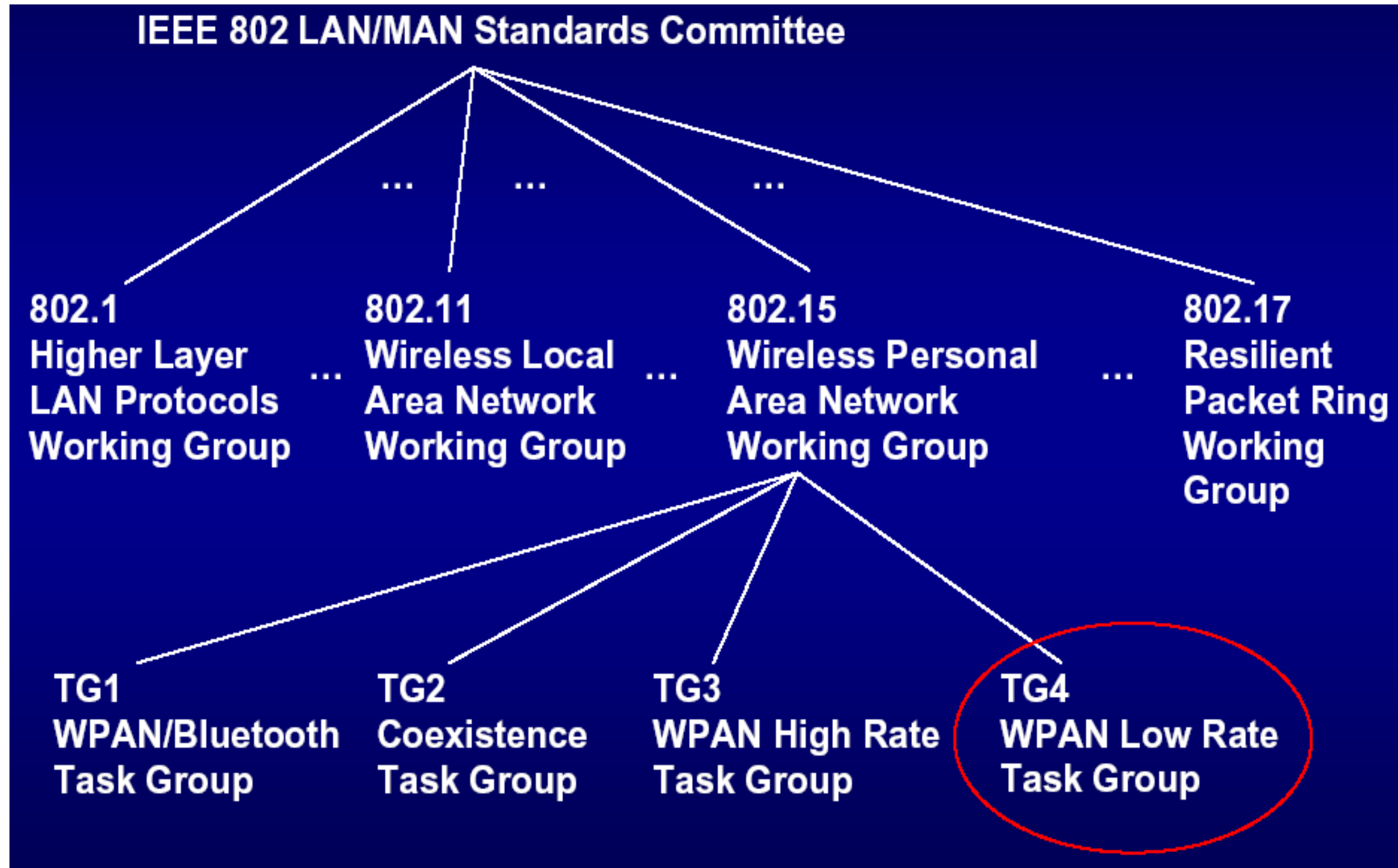
III YEAR/ VI SEMESTER  
1

#### **UNIT 2 :DEVICES AND EMERGING BUS STANDARDS**

#### **TOPIC 2.8 ZIGBEE**



# ZIGBEE 802.15.4





# ZIGBEE NETWORK

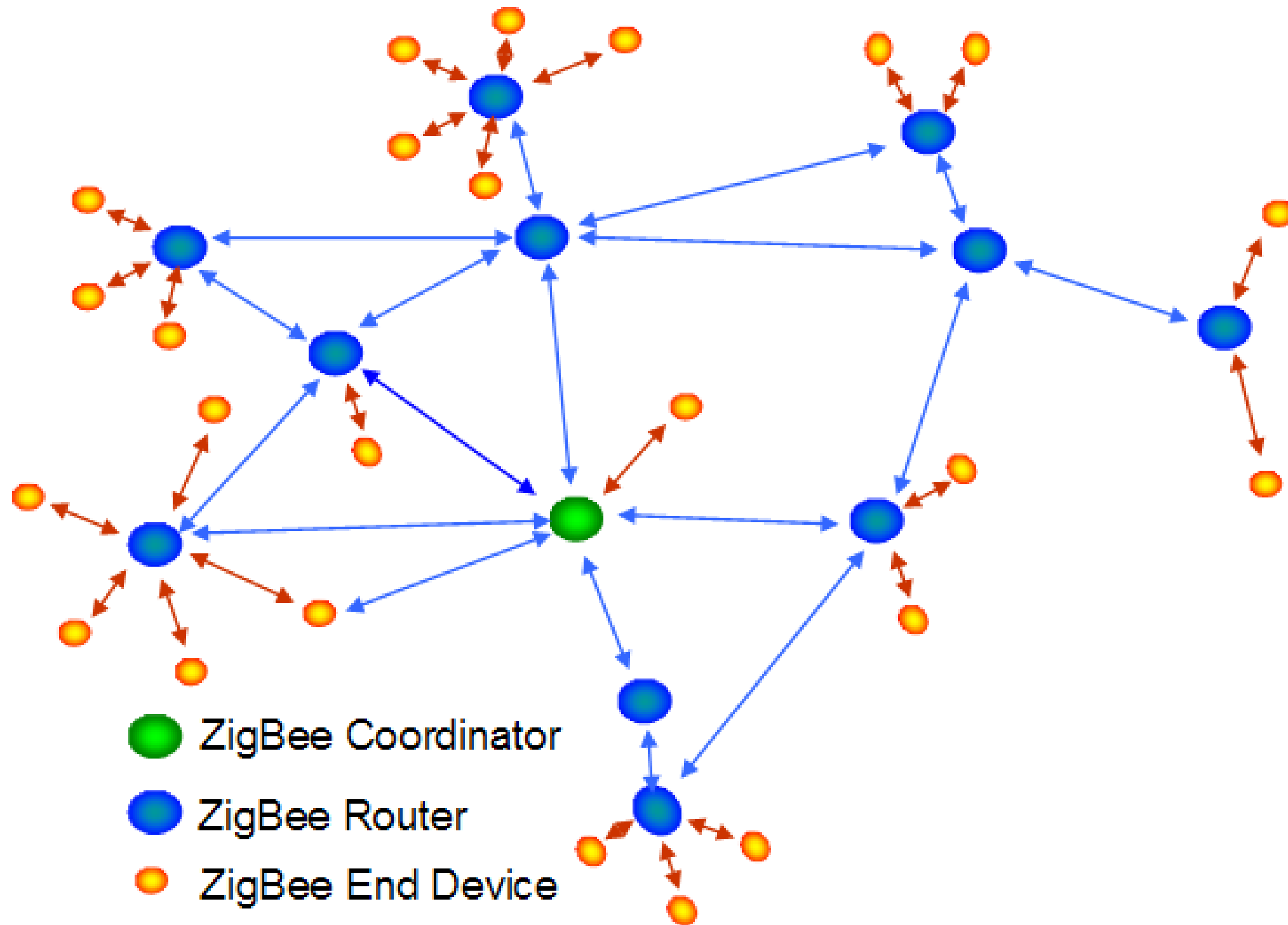


- IEEE 802.15.4 - Standard released in May 2003 for LR-WPAN
- Zigbee - set of high level communication protocols based upon the specification produced by 802.15.4
- The ZigBee Alliance is an association of companies working together to enable reliable, cost-effective, low-power, wirelessly networked, monitoring and control products based on an open global standard.





# ZIGBEE IS MESH NETWORKING

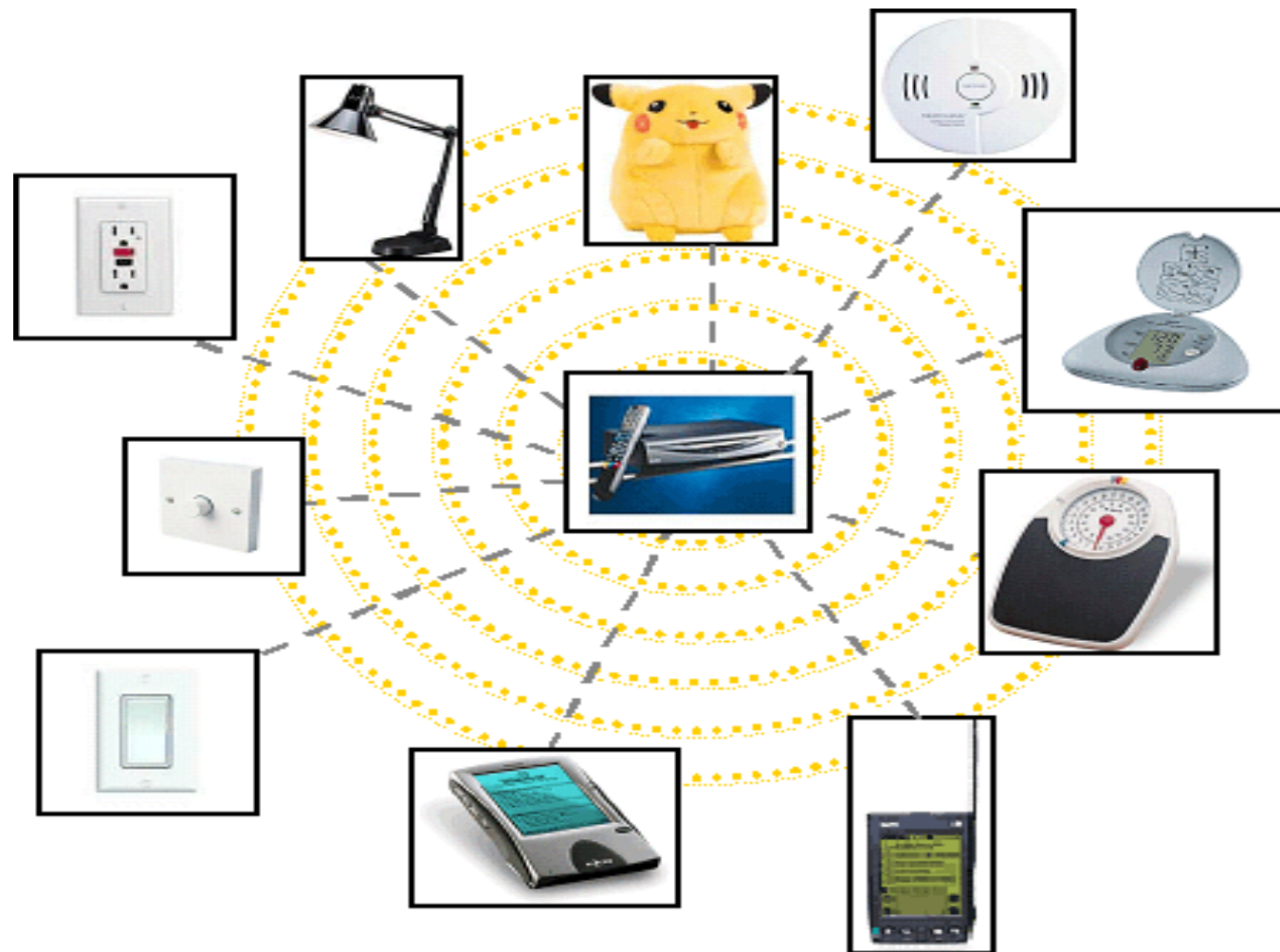




# IEEE 802.15.4

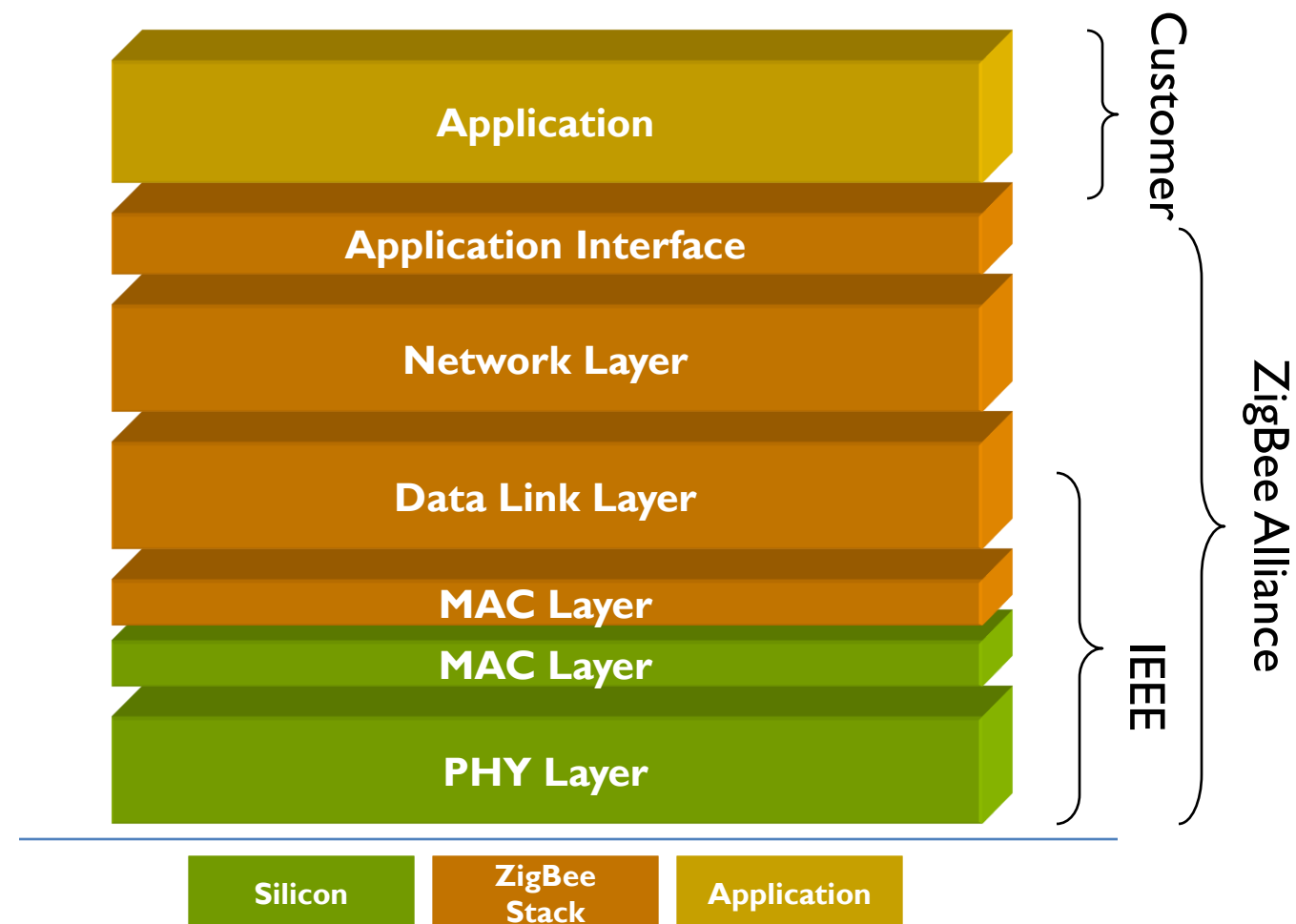


ZigBee™  
Alliance





# ZIGBEE ALLIANCE - IEEE - CUSTOMER RELATIONSHIP





## **PHYSICAL LAYER FUNCTIONALITIES:**

- **Activation and deactivation of the radio transceiver**
- **Energy detection within the current channel**
- **Link quality indication for received packets**
- **Clear channel assessment for CSMA-CA**
- **Channel frequency selection**
- **Data transmission and reception**

## **ZIGBEE SPECIFIES TWO PHYSICAL MEDIA:**

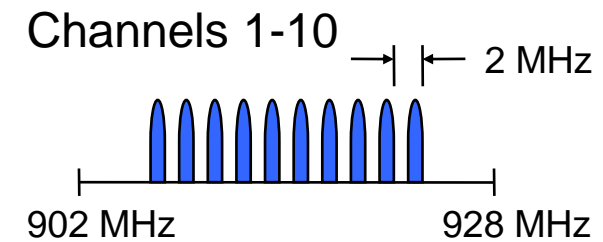
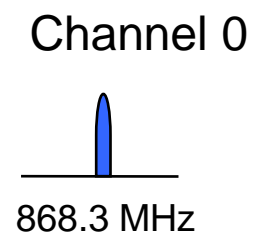
- **868 MHz/915 MHz direct sequence spread spectrum (DSSS) PHY (11 channels)**
  - **1 channel (20Kb/s) in European 868MHz band**
  - **10 channels (40Kb/s) in 915 (902-928)MHz ISM band**
- **2450 MHz direct sequence spread spectrum (DSSS) PHY (16 channels)**
  - **16 channels (250Kb/s) in 2.4GHz band**



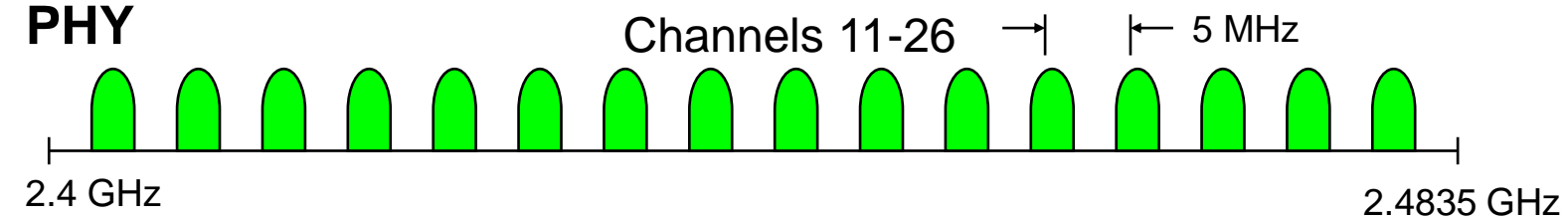
# IEEE 802.15.4 PHYSICAL LAYER

- Operates in unlicensed ISM bands:

**868MHz/  
915MHz  
PHY**



**2.4 GHz  
PHY**



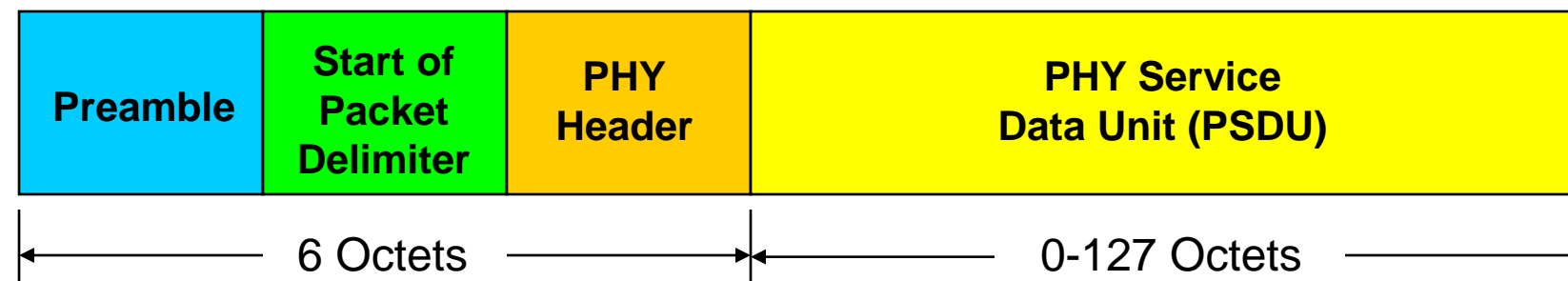




# IEEE 802.15.4 PHY OVERVIEW PACKET STRUCTURE

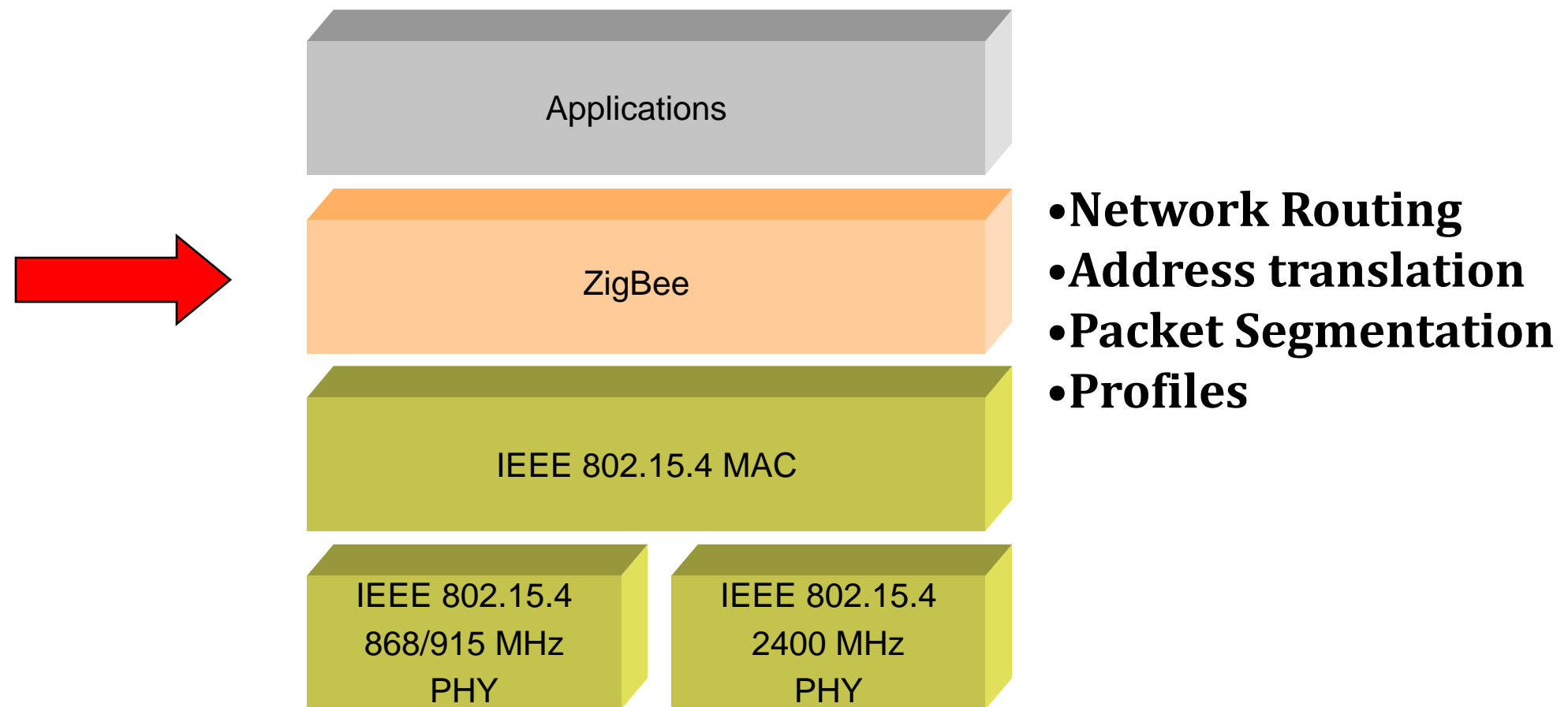
## PHY Packet Fields

- Preamble (32 bits) – synchronization
- Start of Packet Delimiter (8 bits)
- PHY Header (8 bits) – PSDU length
- PSDU (0 to 1016 bits) – Data field





# 802.15.4 ARCHITECTURE





# SOME INTERESTING APPLICATIONS OF ZIGBEE



- Using the power of the mesh to automate a manual process
  - *Rental Car Return Automation\**
- Long life battery powered sensing
  - *Wireless Termite Detection\**

*\*From Software Technologies Group*



# 802.15.4/ZIGBEE PRODUCTS



Control4 Home Automation System  
<http://www.control4.com/products/components/complete.htm>



Eaton Home HeartBeat monitoring system  
[www.homeheartbeat.com](http://www.homeheartbeat.com)



Chip Sets

- Ember, <http://www.ember.com/index.html>
- ChipCon, <http://www.chipcon.com>
- Freescale, <http://www.freescale.com>



Software, Development Kits

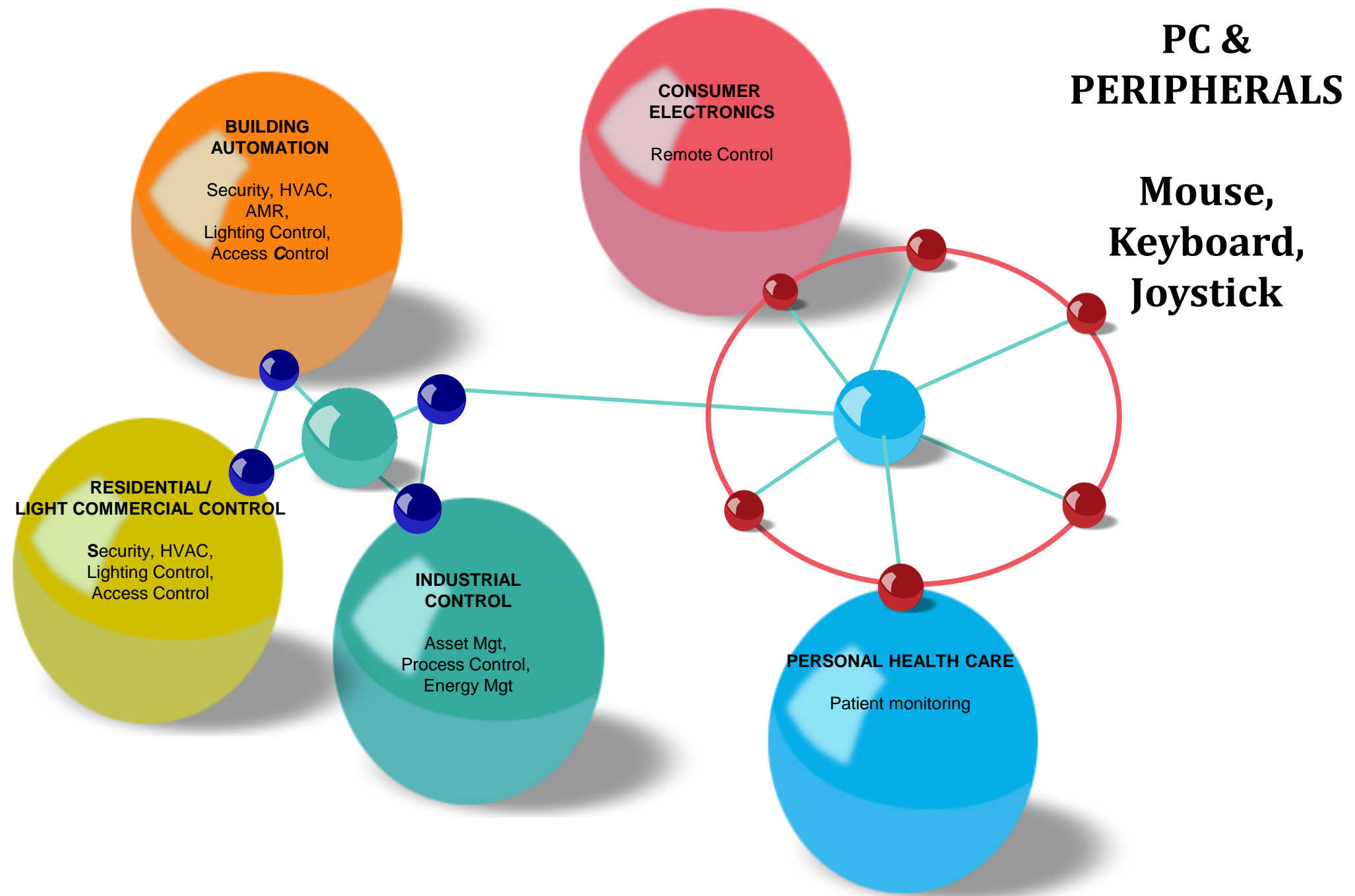
- AirBee, <http://www.airbeewireless.com/products.php>
- Software Technologies Group, <http://www.stg.com/wireless/>



Crossbow Technology - Wireless Sensor Networks  
[www.xbow.com](http://www.xbow.com)



# ZIGBEE WIRELESS MARKETS AND APPLICATIONS





**Thank you**