Konsep Teknologi Informasi

Wireless Sensor Network (WSN)

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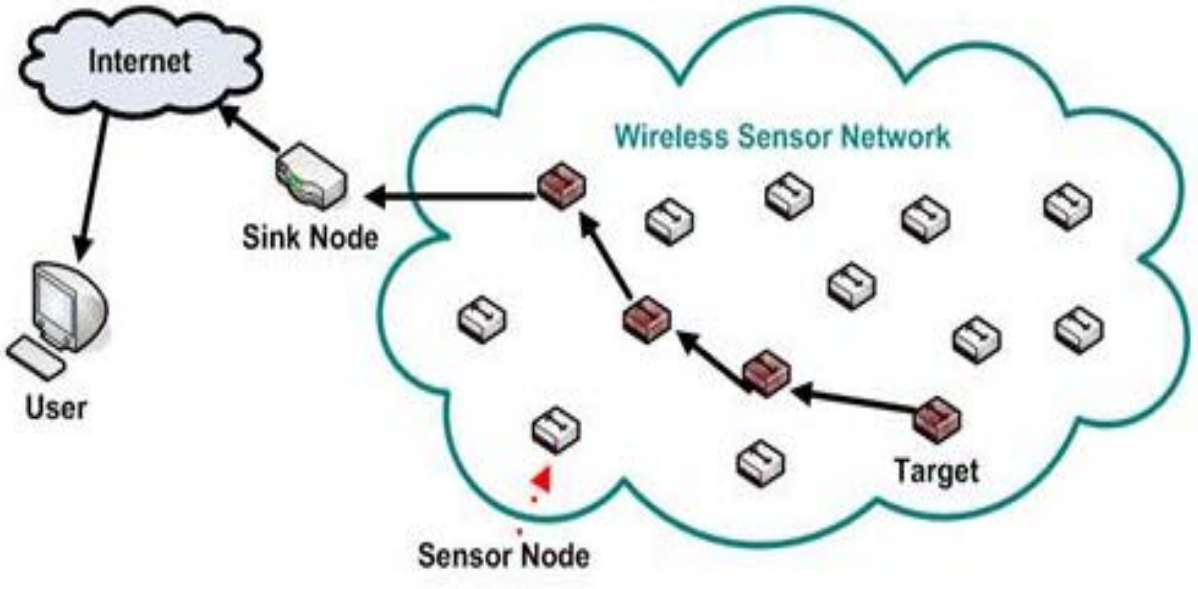
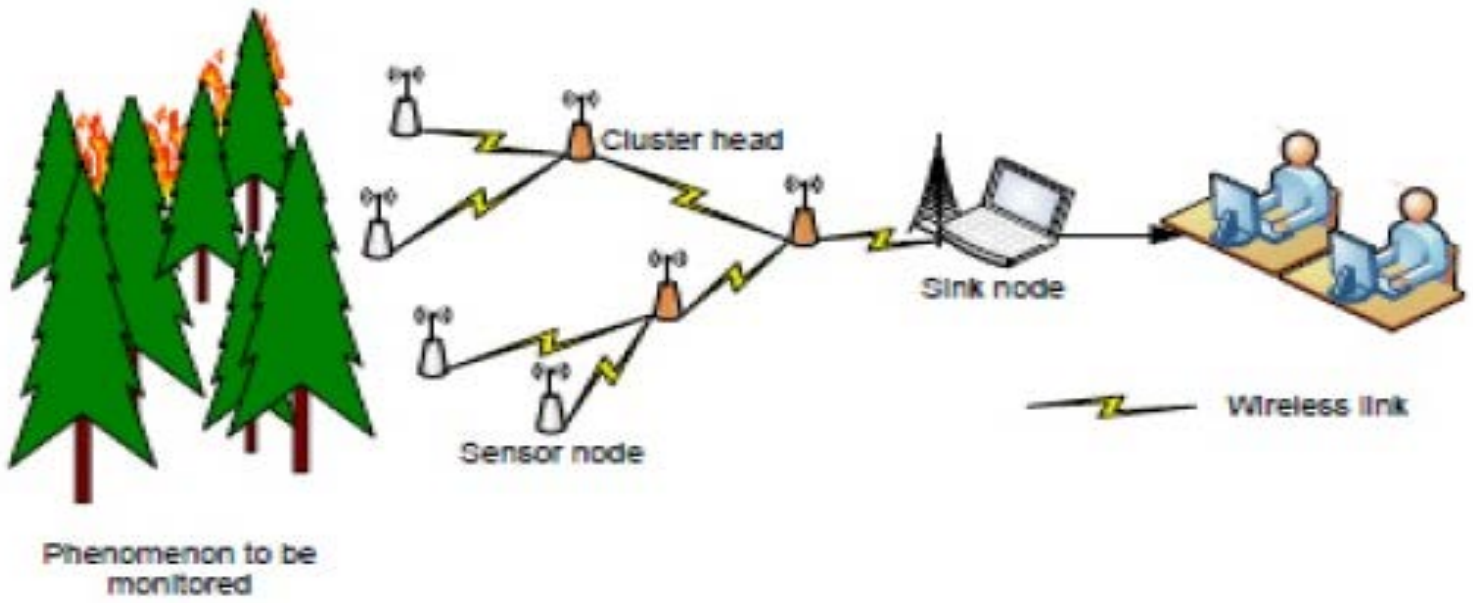
Overview

- **Wireless sensor network (WSN)** is a wireless network consisting of hundreds or even thousands of sensor nodes.

- These sensors to monitor physical or environment condition such as temperature, sound, vibration, motion or pollutant at different area.




Cluster head
Sink node
Wireless link
Sensor node
Phenomenon to be monitored

- In the recent days, wireless sensor network is used in civilian and industrial application such as healthcare monitoring, industrial automation, military application, home automation, habitat monitoring application, and so on.

Wireless Sensor Applications

Smart Cities

Smart Environmen

Smart Water

Smart Metering

Security & Emergencie

Retail

Logístics

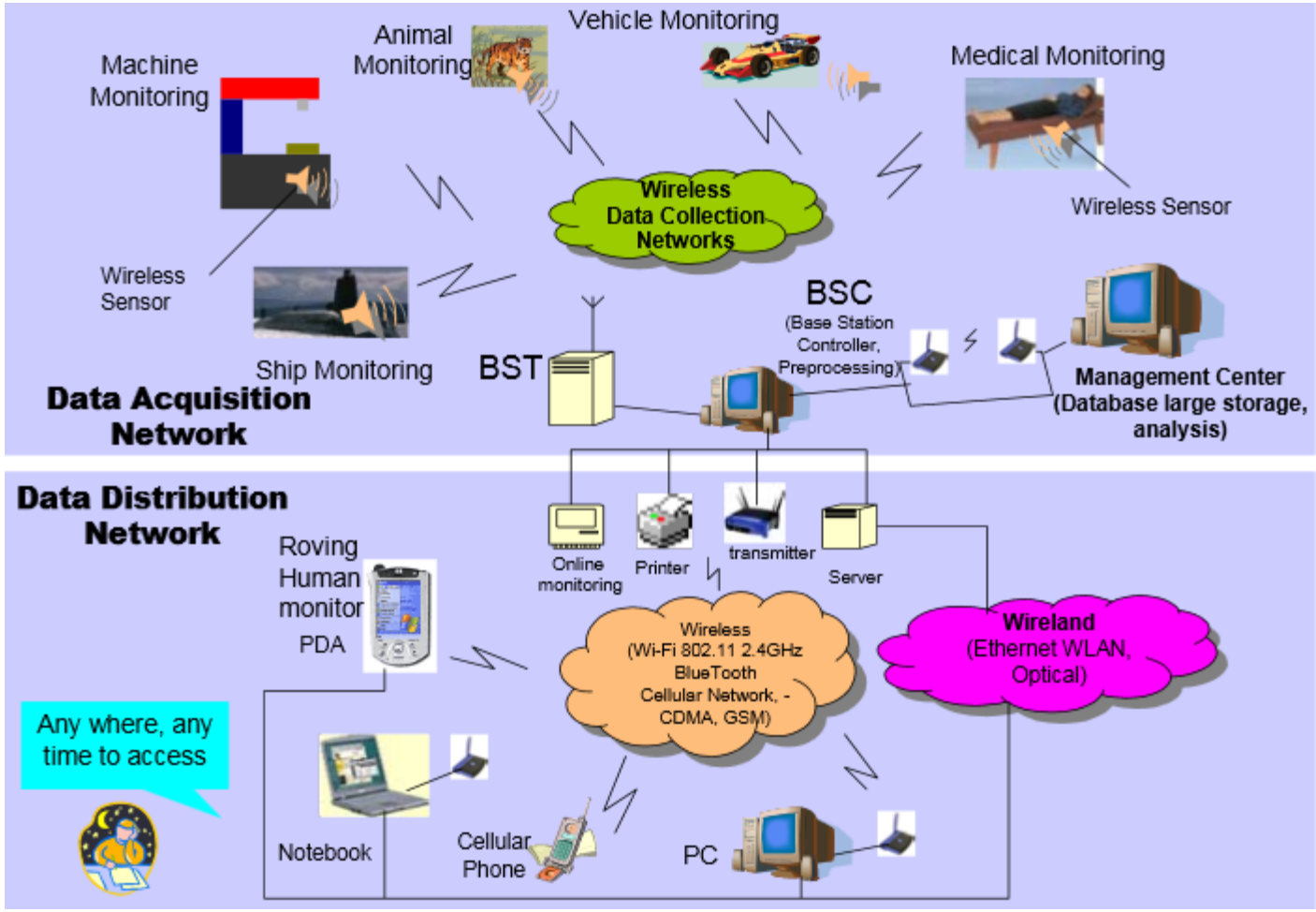
Industrial Control

Smart Agriculture

Smart Animal Farming

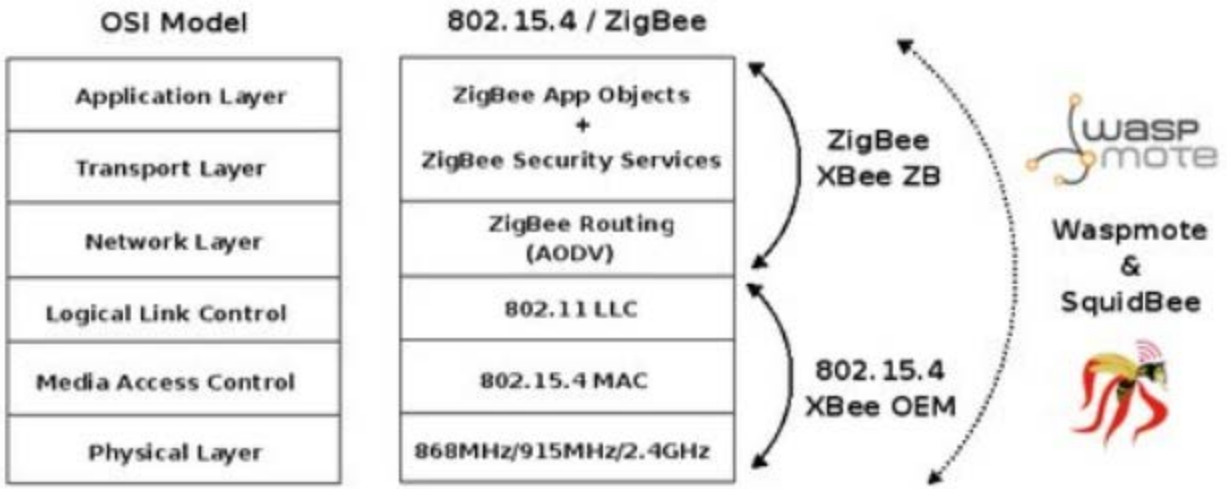
Domotic & Home Automation

eHealth



Source: F.L. Lewis, The University of Texas

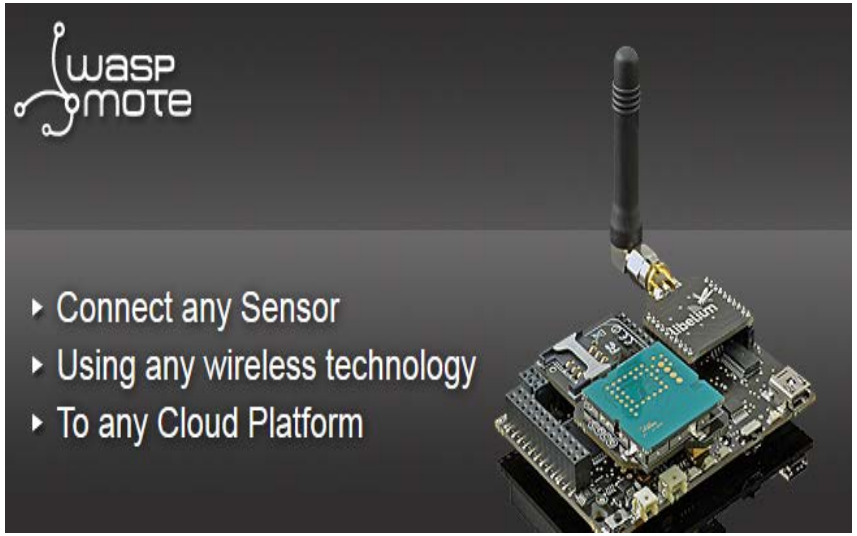
- **The IEEE 802.15.4** low-rate wireless personal area network (LR-WPAN) medium access control (MAC) Standard is protocol for low data rate and low power communication network applications such as **wireless sensor network**.



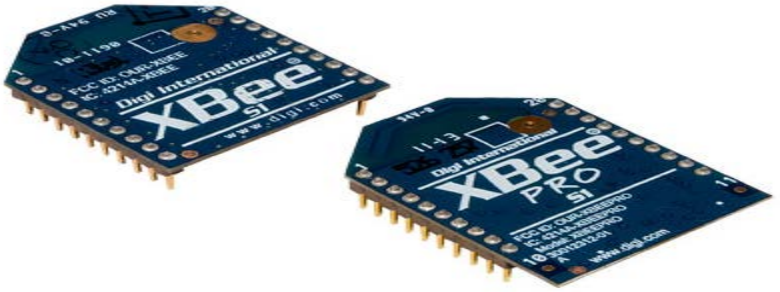
Source: http://www.sensor-networks.org

IEEE 802.15.4

- This standard defines a communication layer at level 2 in the OSI (Open System Interconnection) model.
- Its main purpose is to let the communication between two devices.
- It was created by the Institute of Electrical and Electronics Engineers (IEEE).



Source: http://www.libelium.com/products/waspmote/ and http://www.digi.com



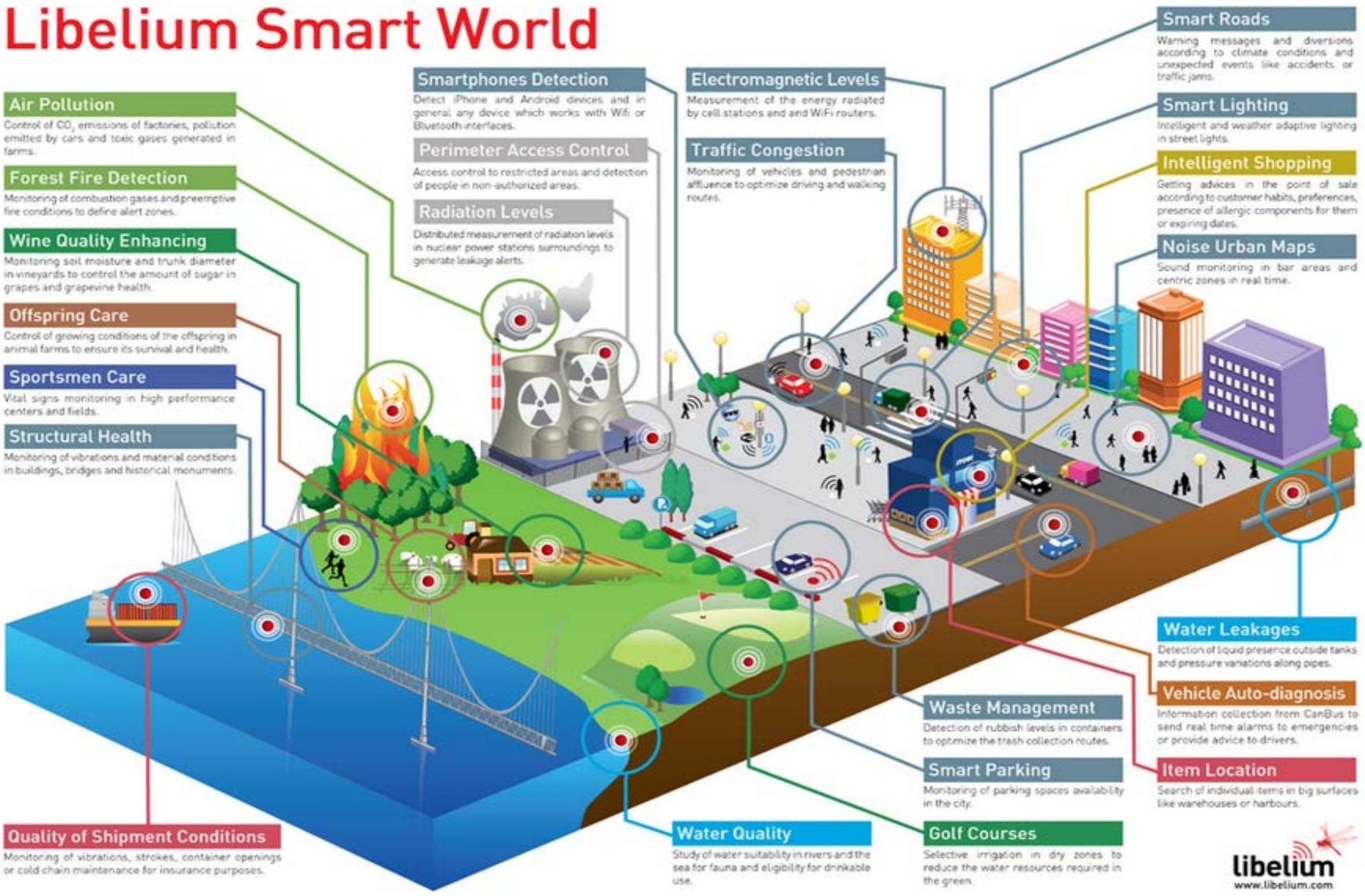
XBee & XBee-PRO 802.15.4 OEM RF Modules

ZigBee

- This standard defines a communication layer at level 3 and uppers in the OSI model.
- Its main purpose is to create a network topology (hierarchy) to let a number of devices communicate among them and to set extra communication features such as authentication, encryption, association and in the upper layer application services.
- It was created by a set of companies which form the ZigBee Alliance.

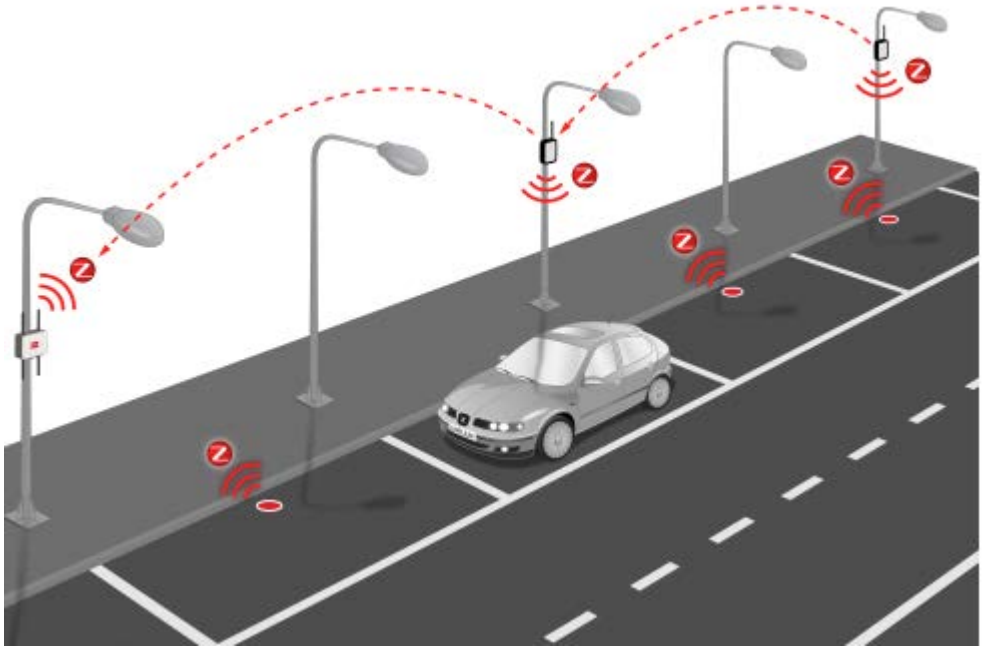
Source: http://www.zigbee.org/

Applications of WSN

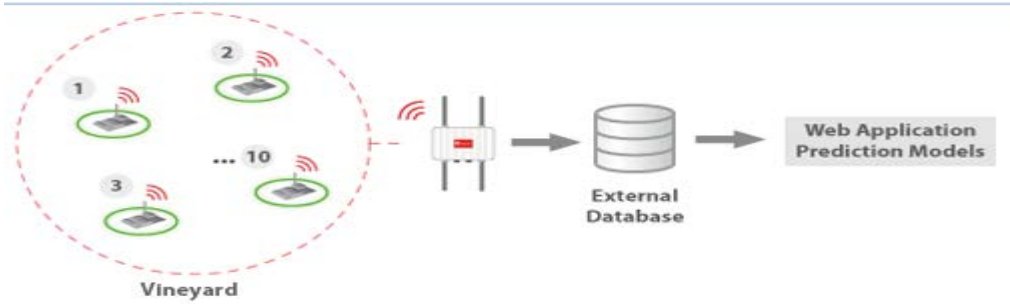


Smart Parking

- The Smart Parking platform will allow system integrators to offer comprehensive parking management solutions to city councils.
- By providing accurate information on available parking spaces, motorists save time and fuel and cities reduce atmospheric pollution and congestion.



Smart Agriculture - to monitor vineyards



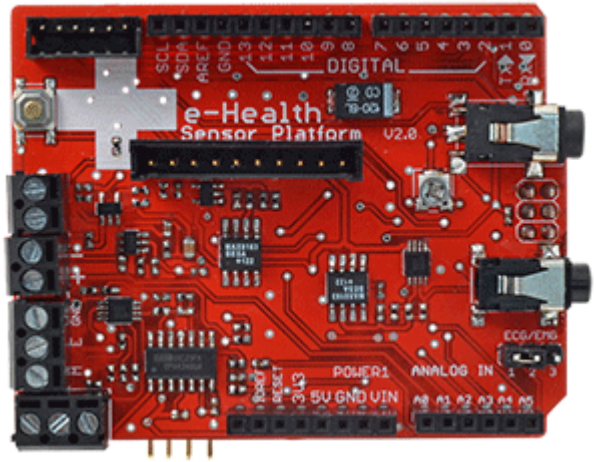
a)

c)

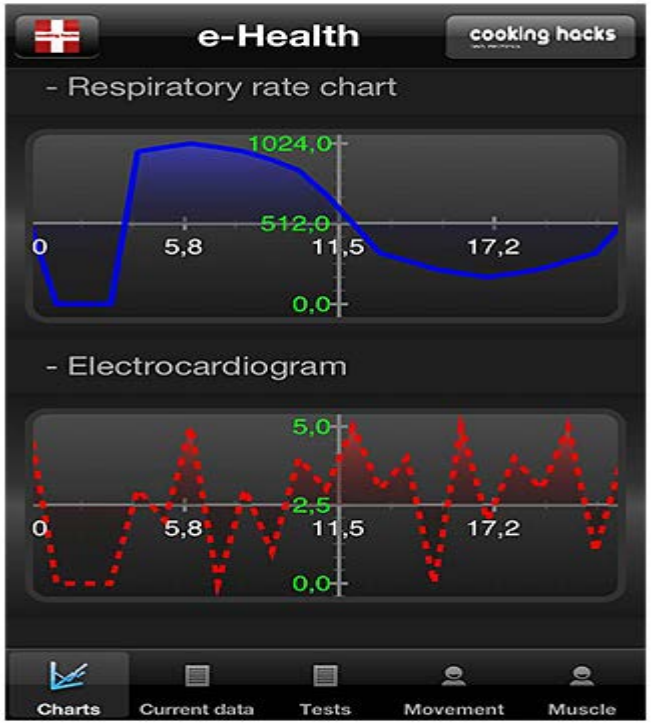
b)

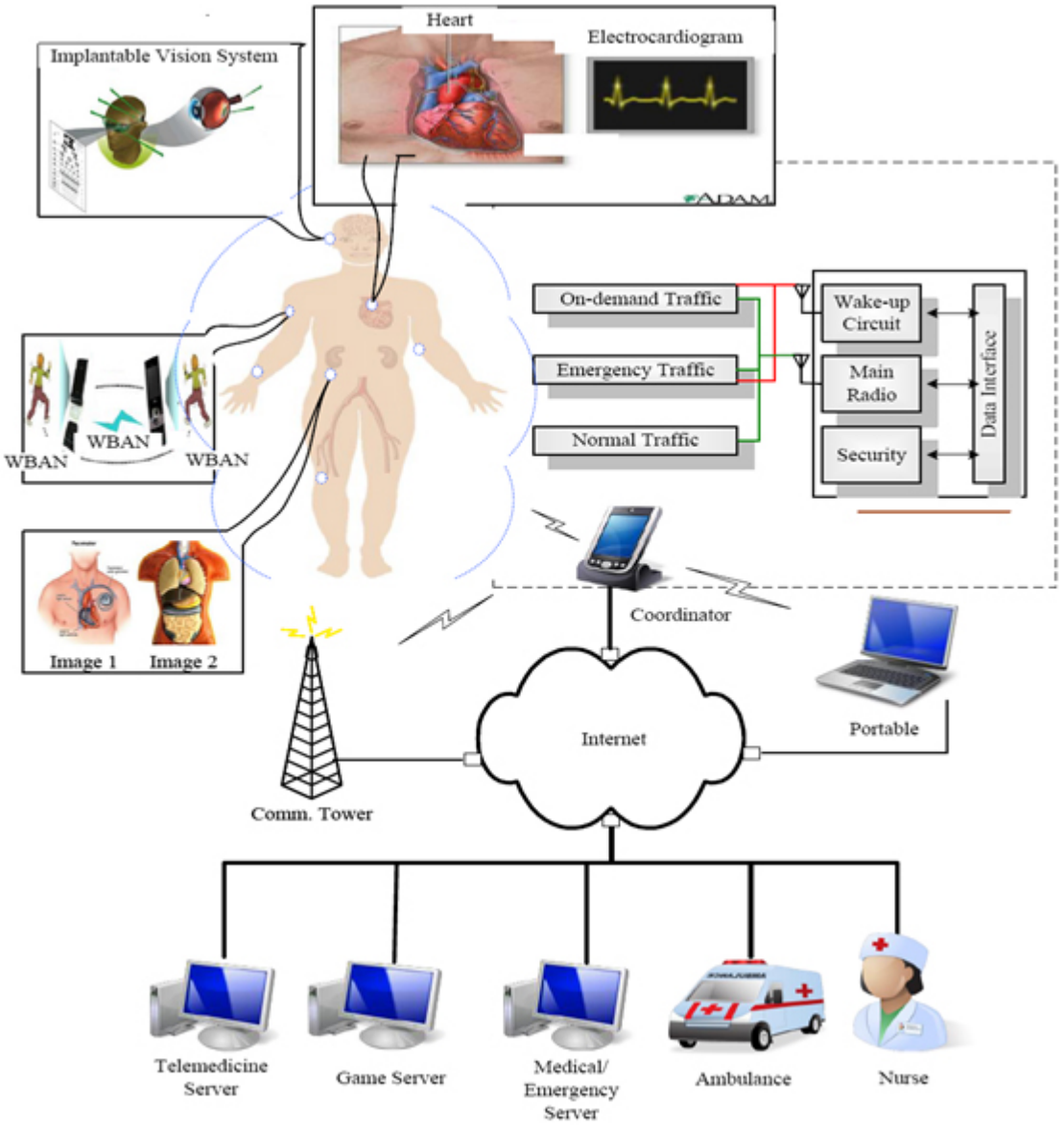
5.- a) Waspmote Agriculture Sensor Board b) Waspmote Proto Sensor Board c) Waspmote RFID module

E-health


DIGITAL
e-Health
Sensor Platform
V2.0
POWER1
ANALOG IN
5V GND VIN


Patient Position Sensor (Accelerometer)
Airflow Sensor (Breathing)
Blood pressure sensor (Sphygmomanometer)
Electrocardiogram Sensor (ECG)
Electromyography Sensor (EMG)
Pulse and Oxygen in Blood Sensor (SPO2)
e-Health Sensor Shield for Arduino and Rasberry Pi
Body Temperature Sensor
Galvanic Skin Response Sensor (GSR - Sweating)


e-Health
cooking hacks
- Respiratory rate chart
1024,0
512,0
0,0
0
5,8
11,5
17,2
- Electrocardiogram
5,0
2,5
0,0
0
5,8
11,5
17,2
Charts
Current data
Tests
Movement
Muscle


Heart
Electrocardiogram
Implantable Vision System
On-demand Traffic
Emergency Traffic
Normal Traffic
Wake-up Circuit
Main Radio
Security
Data Interface
WBAN
WBAN
WBAN
Image 1
Image 2
Coordinator
Portable
Internet
Comm. Tower
Telemedicine Server
Game Server
Medical/ Emergency Server
Ambulance
Nurse

Topology of WSN

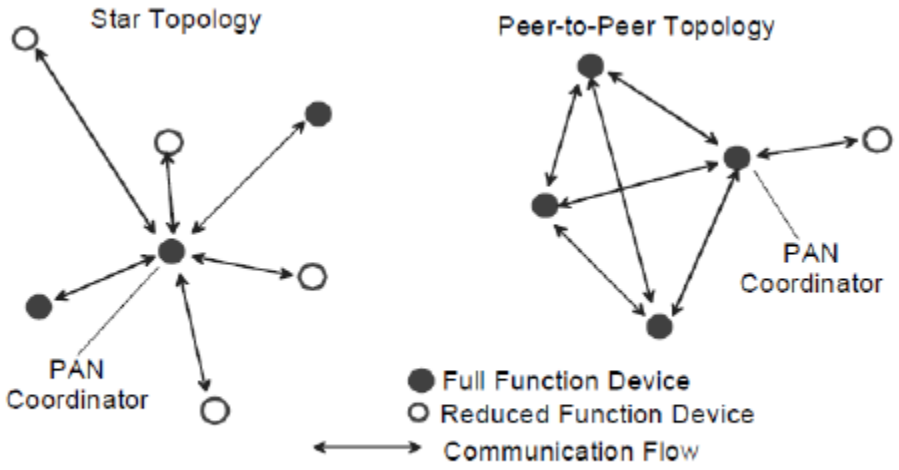


Figure 1—Star and peer-to-peer topology examples

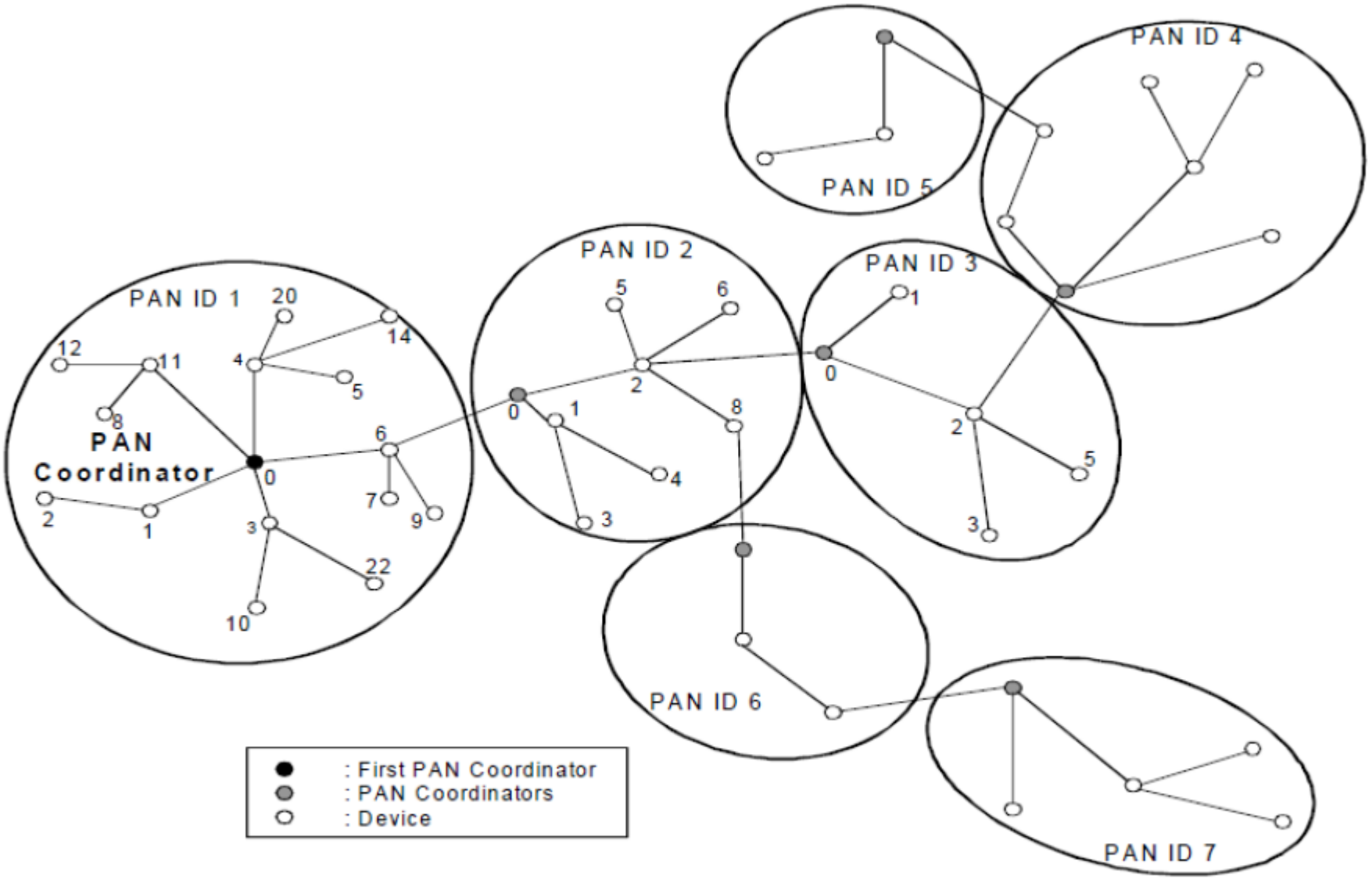


Figure 2—Cluster tree network

Superframe structure

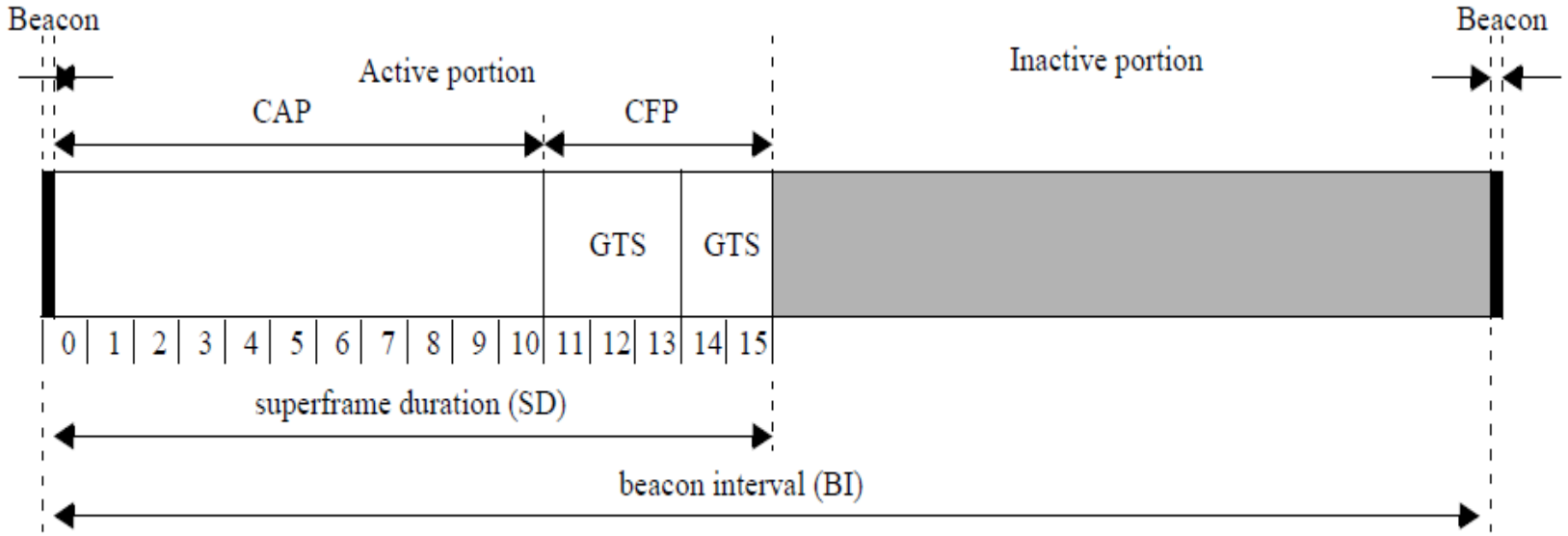
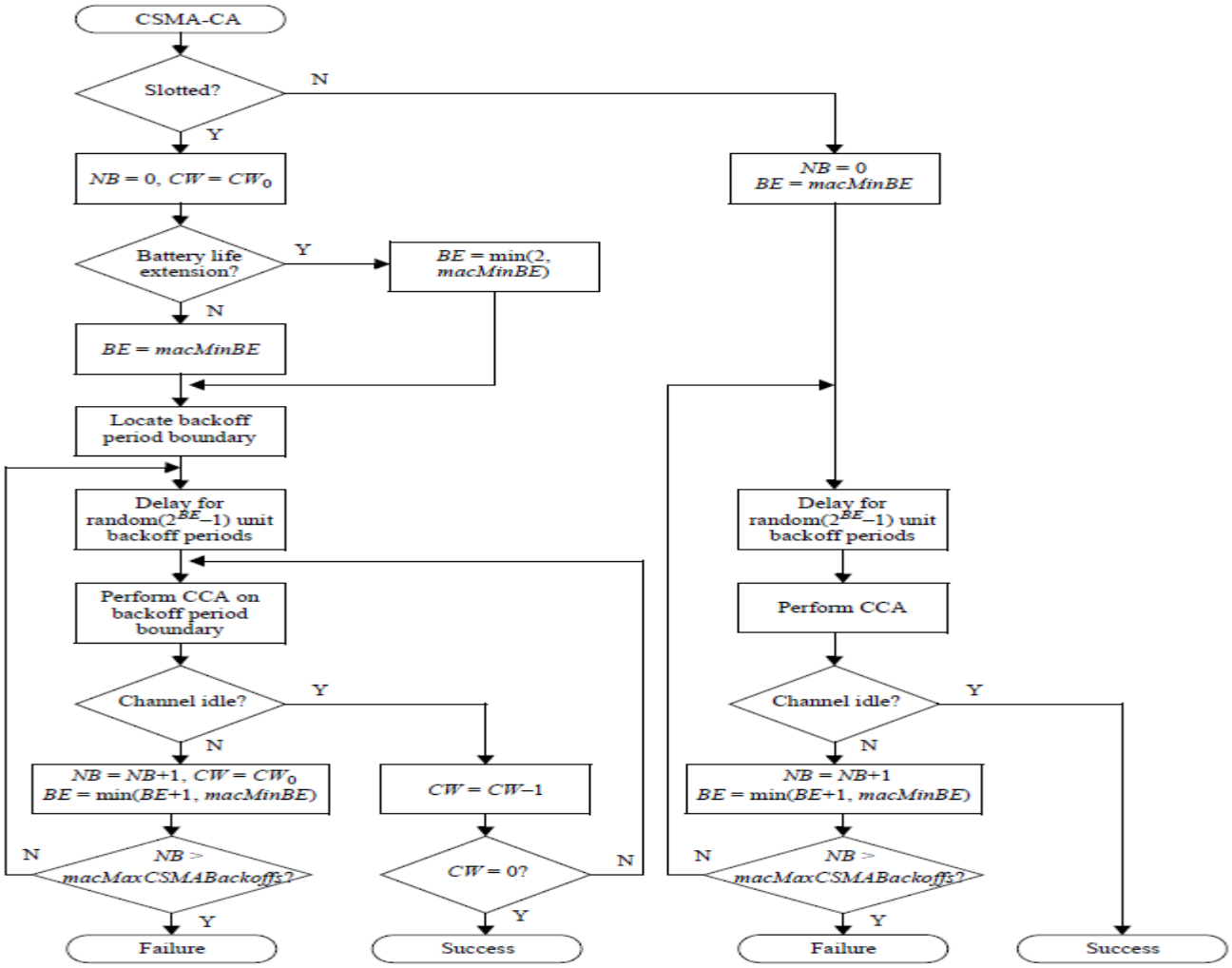


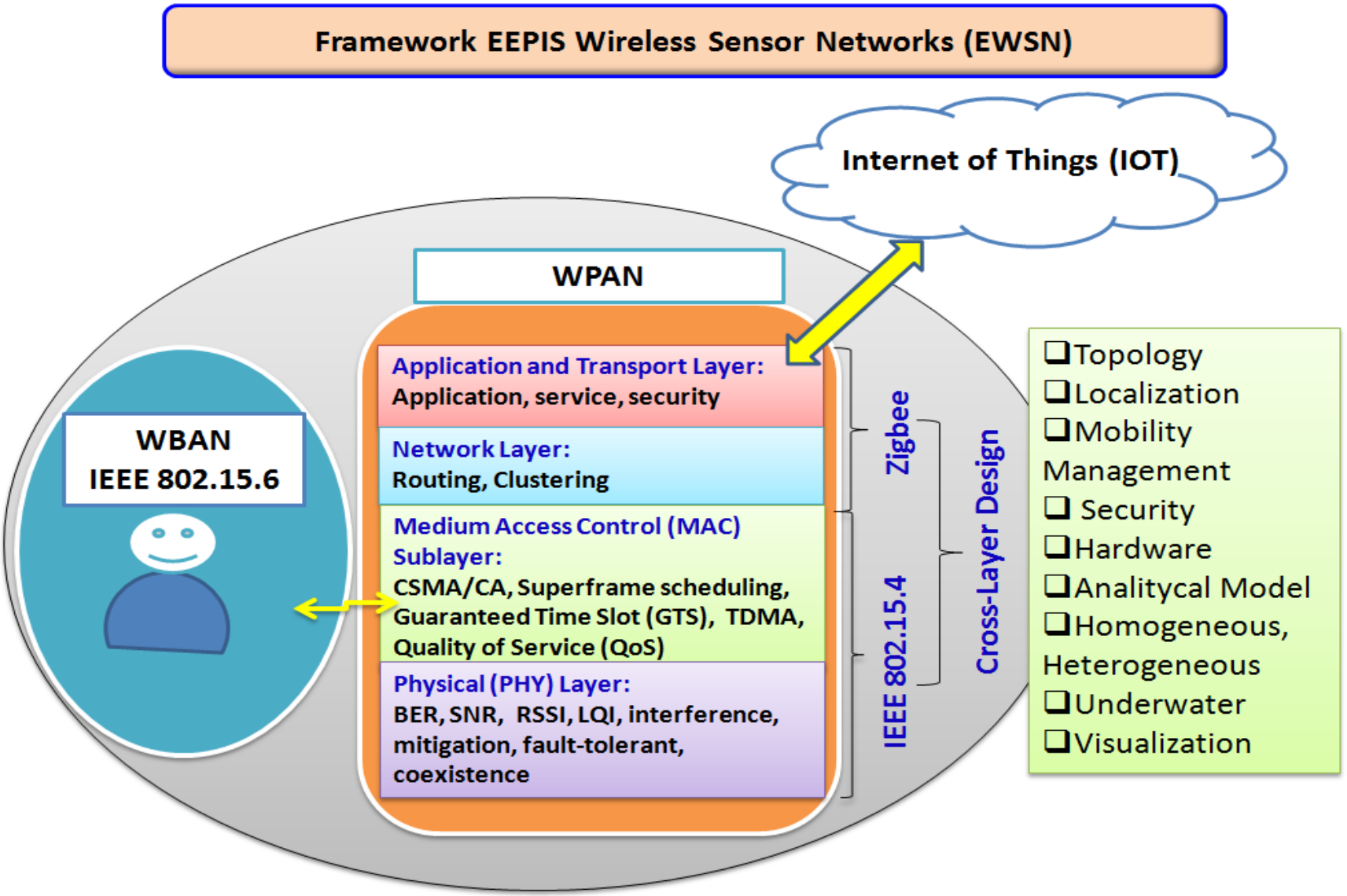
Figure 8—An example of the superframe structure

MAC Layer of WSN

- CSMA/CA Algorithm

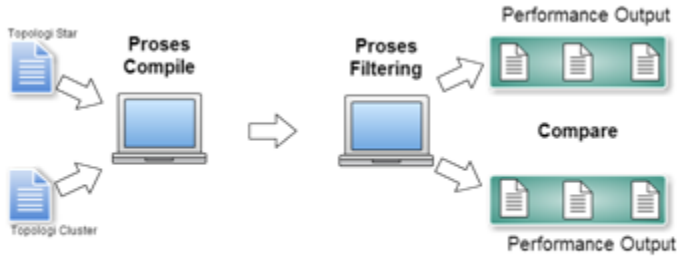


EWSN Research Group

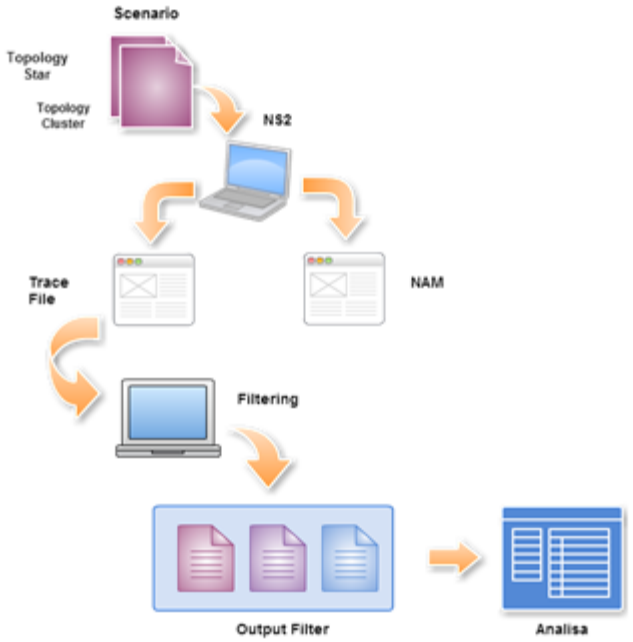


Example: Judul PA

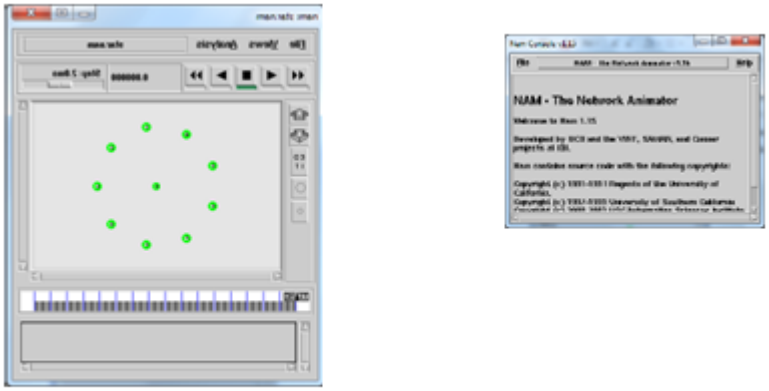
- Performansi Beacon–Enabled IEEE 802.15.4 Wireless Sensor Network: Topologi Star vs Cluster



Gambar 2.1 Desain sistem secara umum

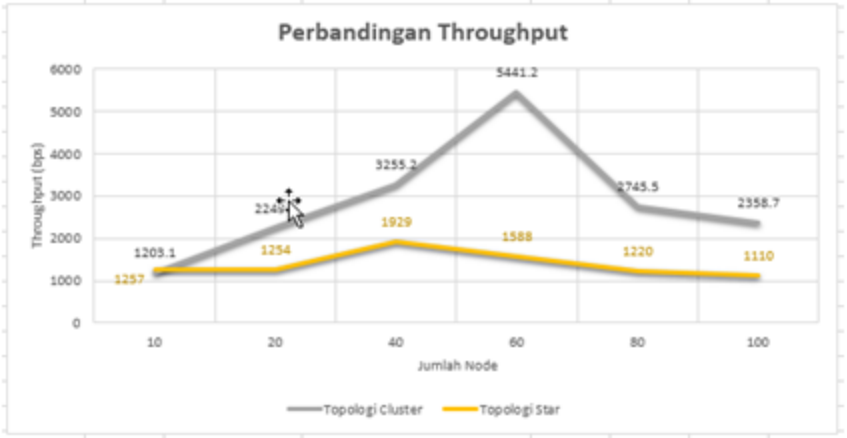


Gambar 2.2 Desain proses skenario pada topologi star dan cluster



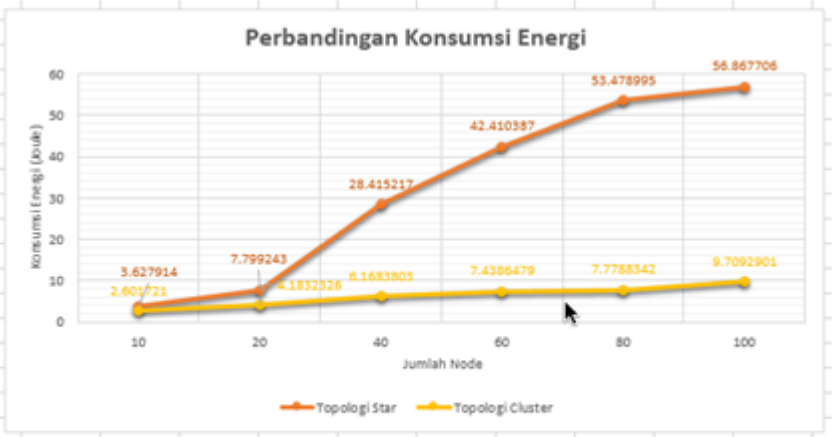
Gambar 2.3 Contoh tampilan NAM

Gambar 2.4 Model simulasi topologi star dan cluster

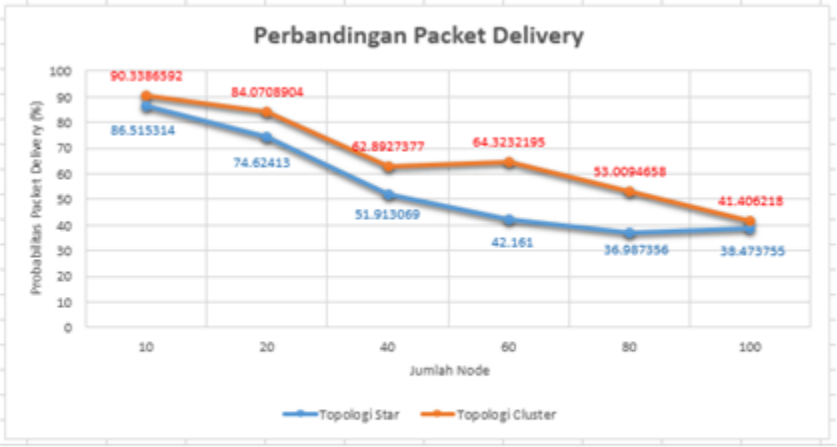


Gambar 3.9 Perbandingan throughput antara topologi star dan cluster

Gambar 3.10 Perbandingan rata-rata delay antara topologi star dan cluster

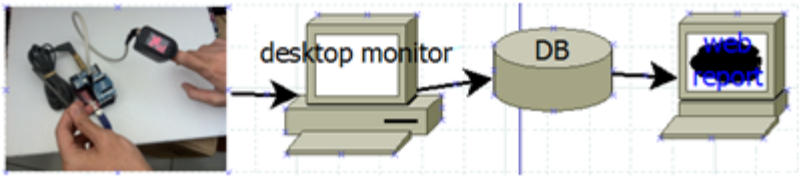


Gambar 3.11 perbandinngan konsumsi energi antara topologi star dan cluster

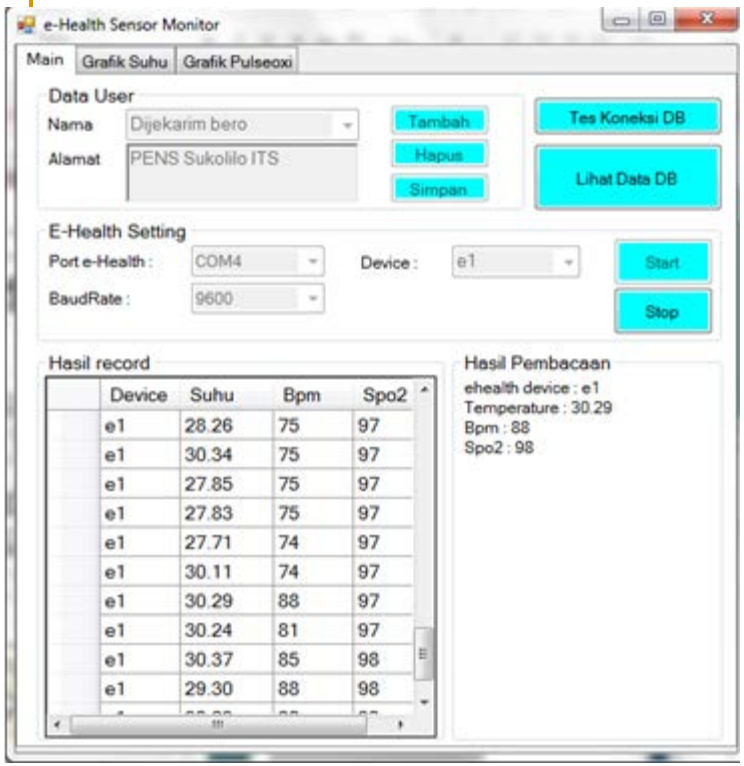


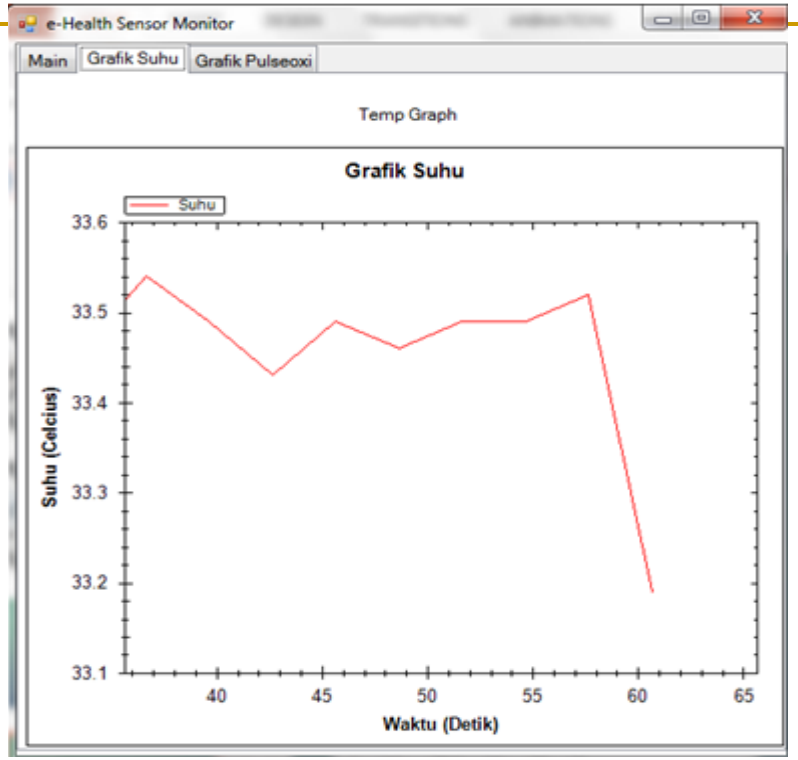
Gambar 3.12 Perbandingan paket sukses antara topologi star dan cluster

2 . IMPLEMENTASI WIRELESS BODY AREA NETWORK (WBAN) MENGGUNAKAN E-HEALTH SENSOR

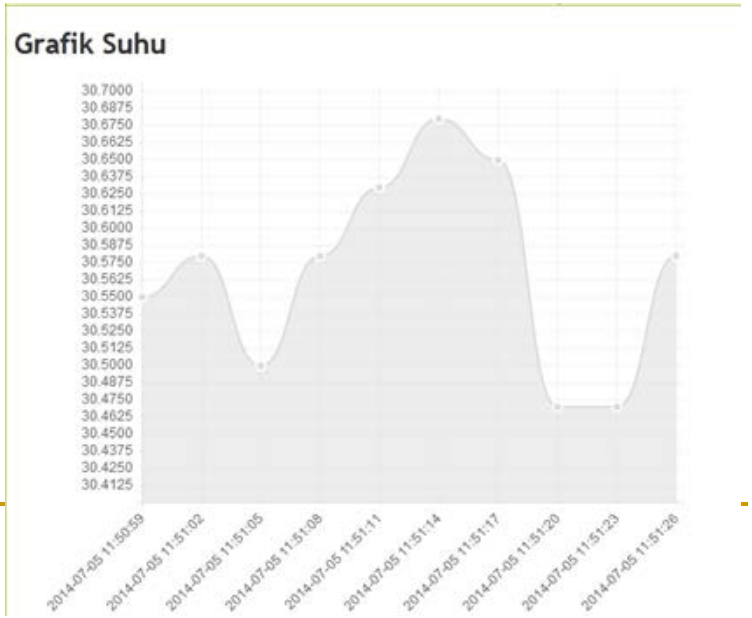


Gambar 3.1. Deskripsi secara umum


e-Health Sensor Monitor
Main
Grafik Suhu
Grafik Pulseoxi
Data User
Nama
Dijekarim bero
Alamat
PENS Sukolilo ITS
Tambah
Hapus
Simpan
Tes Koneksi DB
Lihat Data DB
E-Health Setting
Port e-Health :
COM4
Device :
e1
BaudRate :
9600
Start
Stop
Hasil record
Device
Suhu
Bpm
Spo2
e1 28.26 75 97
e1 30.34 75 97
e1 27.85 75 97
e1 27.83 75 97
e1 27.71 74 97
e1 30.11 74 97
e1 30.29 88 97
e1 30.24 81 97
e1 30.37 85 98
e1 29.30 88 98
Hasil Pembacaan
ehealth device : e1
Temperature : 30.29
Bpm : 88
Spo2 : 98


e-Health Sensor Monitor
Main
Grafik Suhu
Grafik Pulseoxi
Temp Graph
Grafik Suhu
Suhu
Suhu (Celcius)
33.6
33.5
33.4
33.3
33.2
33.1
40
45
50
55
60
65
Waktu (Detik)


E-Health Web Report
Home
View Data Suhu
View Data PulseOximeter
About
Laporan Suhu
tanggal
Suhu
2014-07-05 11:50:59 30.55
2014-07-05 11:51:02 30.58
2014-07-05 11:51:05 30.5
2014-07-05 11:51:08 30.58
2014-07-05 11:51:11 30.63
2014-07-05 11:51:14 30.68
2014-07-05 11:51:17 30.65
2014-07-05 11:51:20 30.47
2014-07-05 11:51:23 30.47
2014-07-05 11:51:26 30.58


Grafik Suhu
30.7000
30.6875
30.6750
30.6625
30.6500
30.6375
30.6250
30.6125
30.6000
30.5875
30.5750
30.5625
30.5500
30.5375
30.5250
30.5125
30.5000
30.4875
30.4750
30.4625
30.4500
30.4375
30.4250
30.4125
2014-07-05 11:50:59
2014-07-05 11:51:02
2014-07-05 11:51:05
2014-07-05 11:51:08
2014-07-05 11:51:11
2014-07-05 11:51:14
2014-07-05 11:51:17
2014-07-05 11:51:20
2014-07-05 11:51:23
2014-07-05 11:51:26