



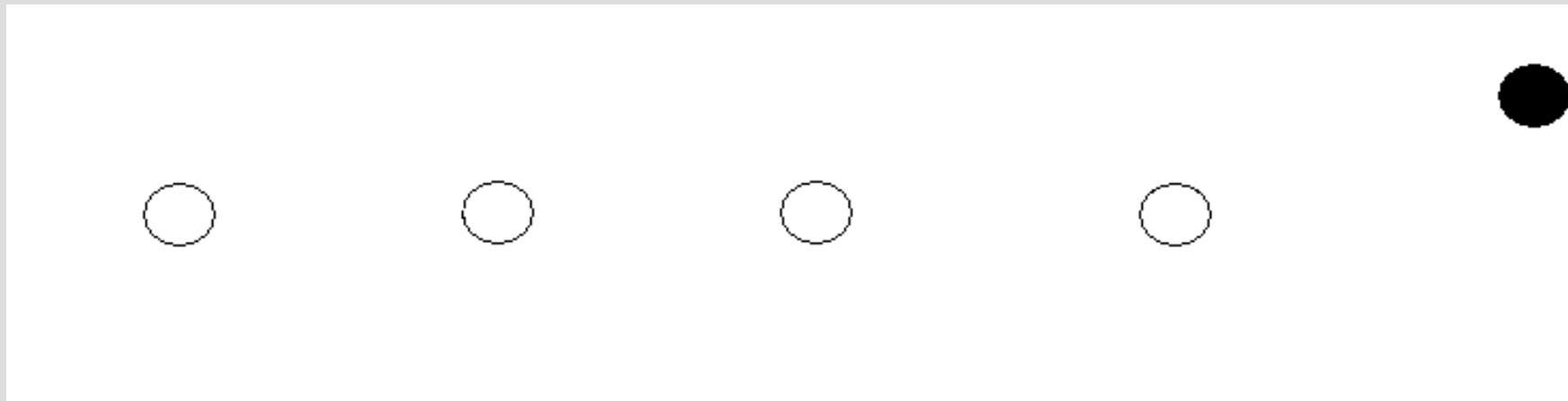
Title

Development of a ZigBee-based wireless sensor network node for automatic data acquisition and transfer.

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Overview

←..... Host network node



↖ ↗
Sensor network node

Introduction

Designed Modules

- Sensor network node
 - Gathering Data
 - Single Measurements
 - Interval measurements
 - Power-down when idle
- Host network node
 - Receiving Data

ZigBee

Characteristics

- Based on IEEE 812.15.4 protocol (WiFi)
- Unlicensed use possible
- Frequency 868MHz, 915MHz and 2.4 Ghz
- Data rate 250 kbps in 2.4GHz band

ZigBee

Network host

- **Coordinator** in ZigBee standard
 - forms a network (PAN = Personal Area Network)
 - is unique in a PAN
 - maintains a network
 - voltage source is infinite

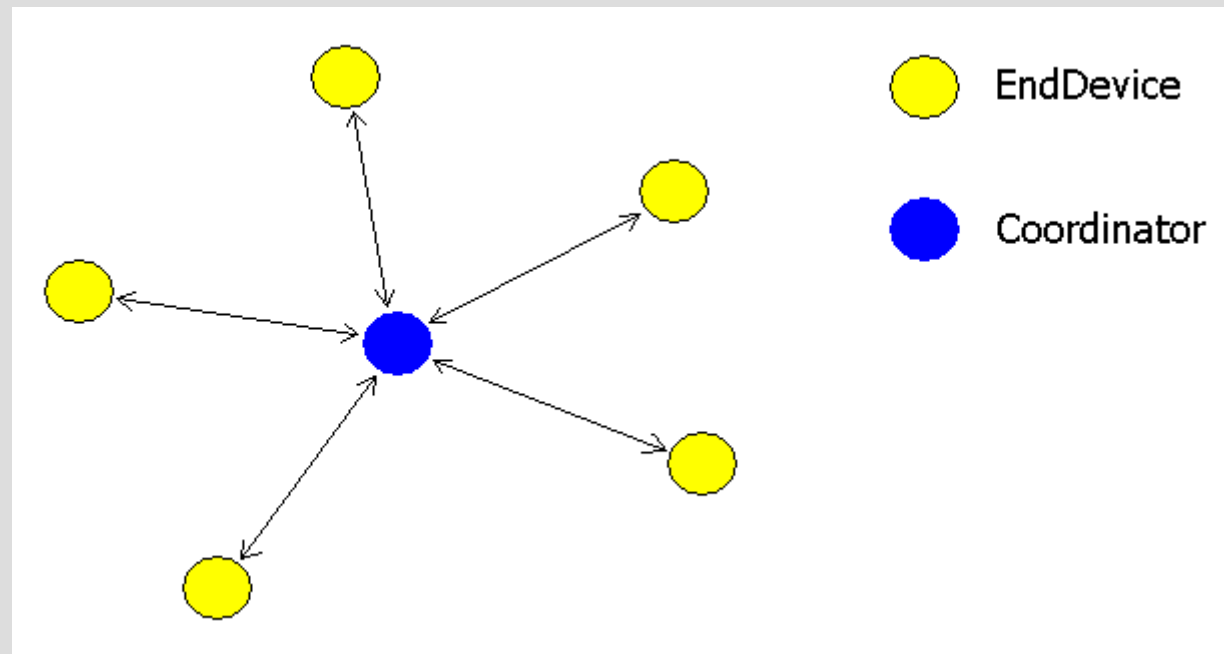
ZigBee

Network client

- **EndDevice** in ZigBee standard
 - sensors directly interfaced
 - can be controlled by a Coordinator
 - voltage source is limited (e.g. a battery)

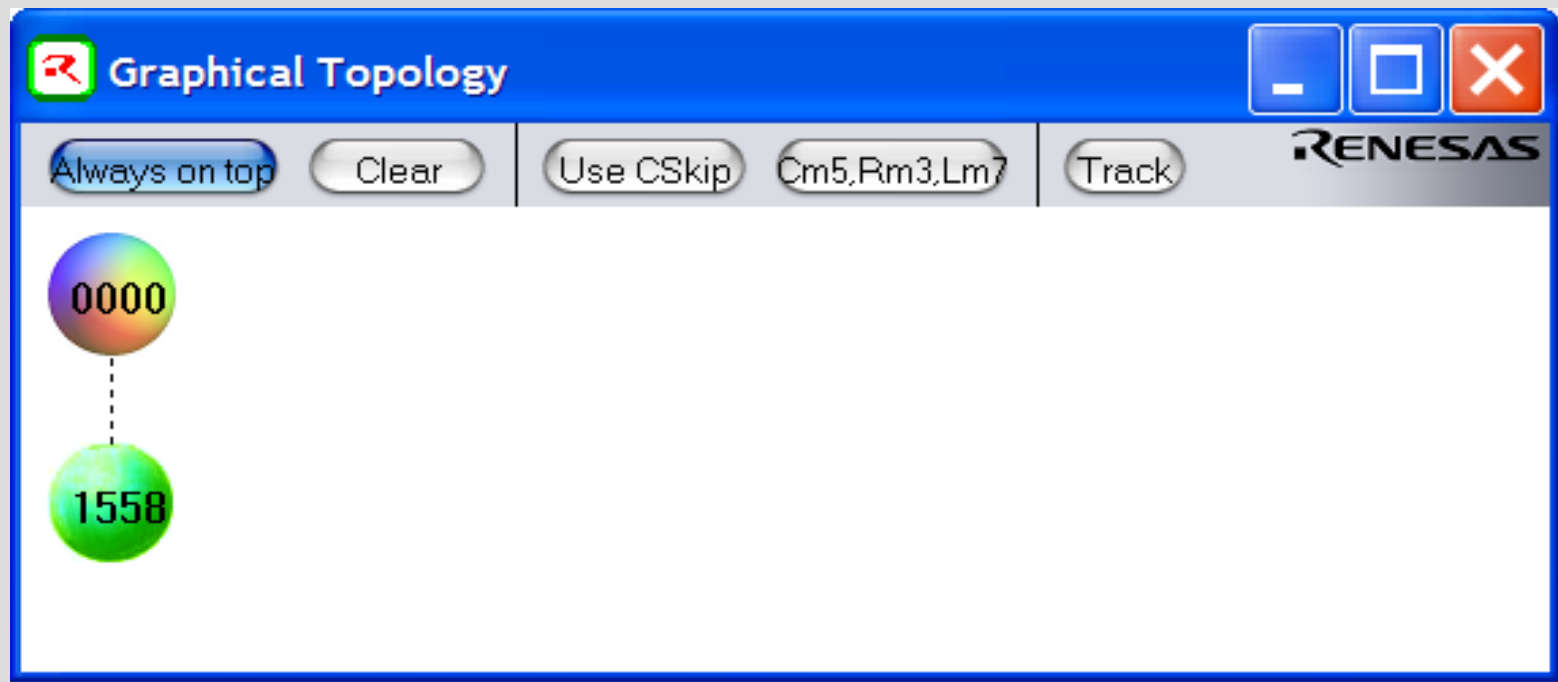
ZigBee

ZigBee Star Topology



ZigBee

ZigBee Star Topology



ZigBee board

Renesas RZB-ZMD16C-ZDK

Features

- MCU with 20MHz main clock
- 2.4GHz ZigBee RF-Chip
- LC-Display

Attached Hardware

- AD-Converter
- Real time clock



ZigBee board

Renesas RZB-ZMD16C-ZDK



Sensor

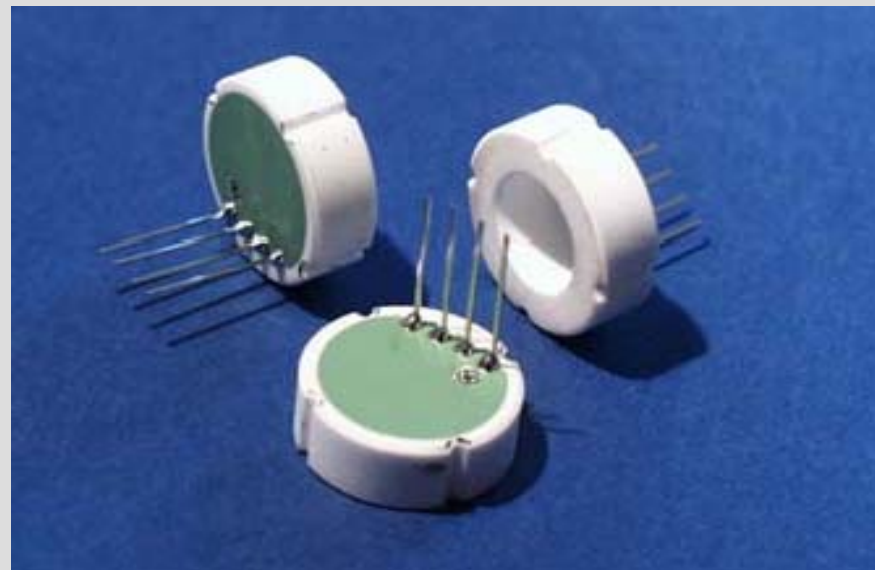
Pressure sensor

Pressure range 0...5 Bar (about 72 psi)

Piezo-resistive ceramic sensor

Relative-pressure sensor

High linearity



Sensor

Pressure sensor

Pressure sensor and PCB board

Output Voltage 0.5...4.5 Volts

3-wire connection





Sensor

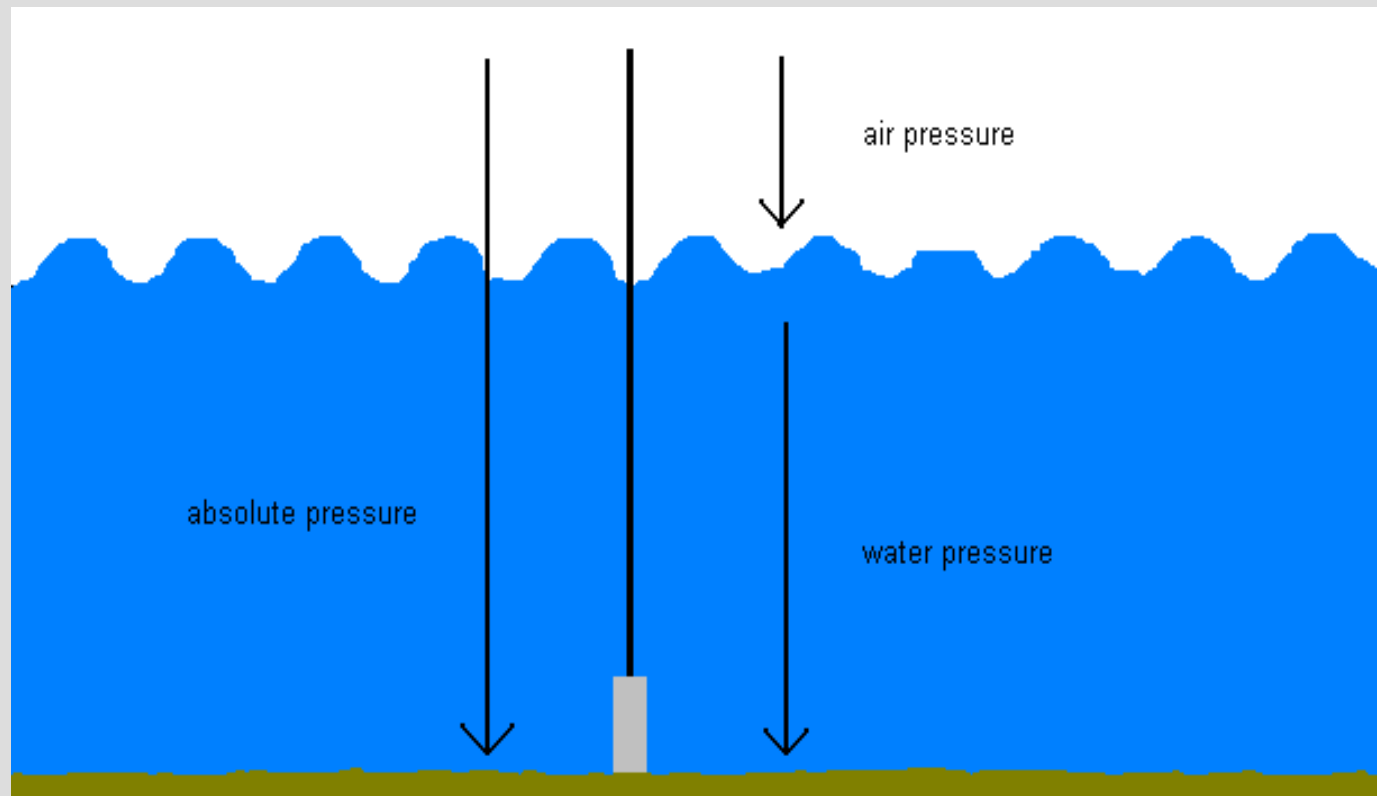
Sensor casing



Sensor

Calculating the water level

$$h = \frac{P_g - P_0}{\rho \cdot g} = \frac{P_d}{\rho \cdot g}$$



Designated target

Sensor node

- Design of a PCB
 - Minimized Power consumption ($\ll 1\text{mA}$)
 - As little Hardware as needed
 - Small sized

Designated target

Pressure sensor

- Cheap Design
- Temperature compensated
- Pressure-resistant casing and seals