Hardware architecture and protocols for wireless sensor networks suitable for environmental monitoring

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I. Introduction

Wireless sensor networks (WSN) are widely used in environmental monitoring (Fig1)

Advantages: easy to deploy, auto configurable and many applications areas (eg: environment, military, industry...)

Technologies used: PHY & MAC protocols layer (IEEE 802.15.4, LoRa, Sigfox)
Network layer (Zigbee, LoRaWAN...)

Disadvantages: Ressource constrained (memory, battery..)
Difficult to maintain

II. Problematic & Objectives

Emerging solutions in data collection area prioritize long range transmission in the expense of data rate (eg: 27 kps for LoRa)

How to satisfy applications that need long transmission range and high data rate?

Combine switched beam antennas (Fig2) with WSN low layers (IEEE 802.15.4)
- reach long distance provided by the antenna
- 250 kps data rate

III. Approach

In data collection the trend is to retain star topologies (LoRa: Fig4)

Our approach: Equip the sink in a star topology (Fig3 sink is the node 1) with a switched beam antenna

III. Perspectives

Optimize the neighbor discovery phase
Optimize the beam switching scheme to inquire nodes