

# Contribution to the technical and QoS algorithms in wireless sensor networks

Student: Carlos Egas Acosta,<sup>2</sup> Thesis directors: Felipe Gil Castiñeira,<sup>1</sup> Enrique Costa Montenegro<sup>1</sup>  
<sup>1</sup>Department of Telematics Engineering, University of Vigo <sup>2</sup>Area Computers, Pontificia Universidad Católica del Ecuador

## 1. Motivation of the work

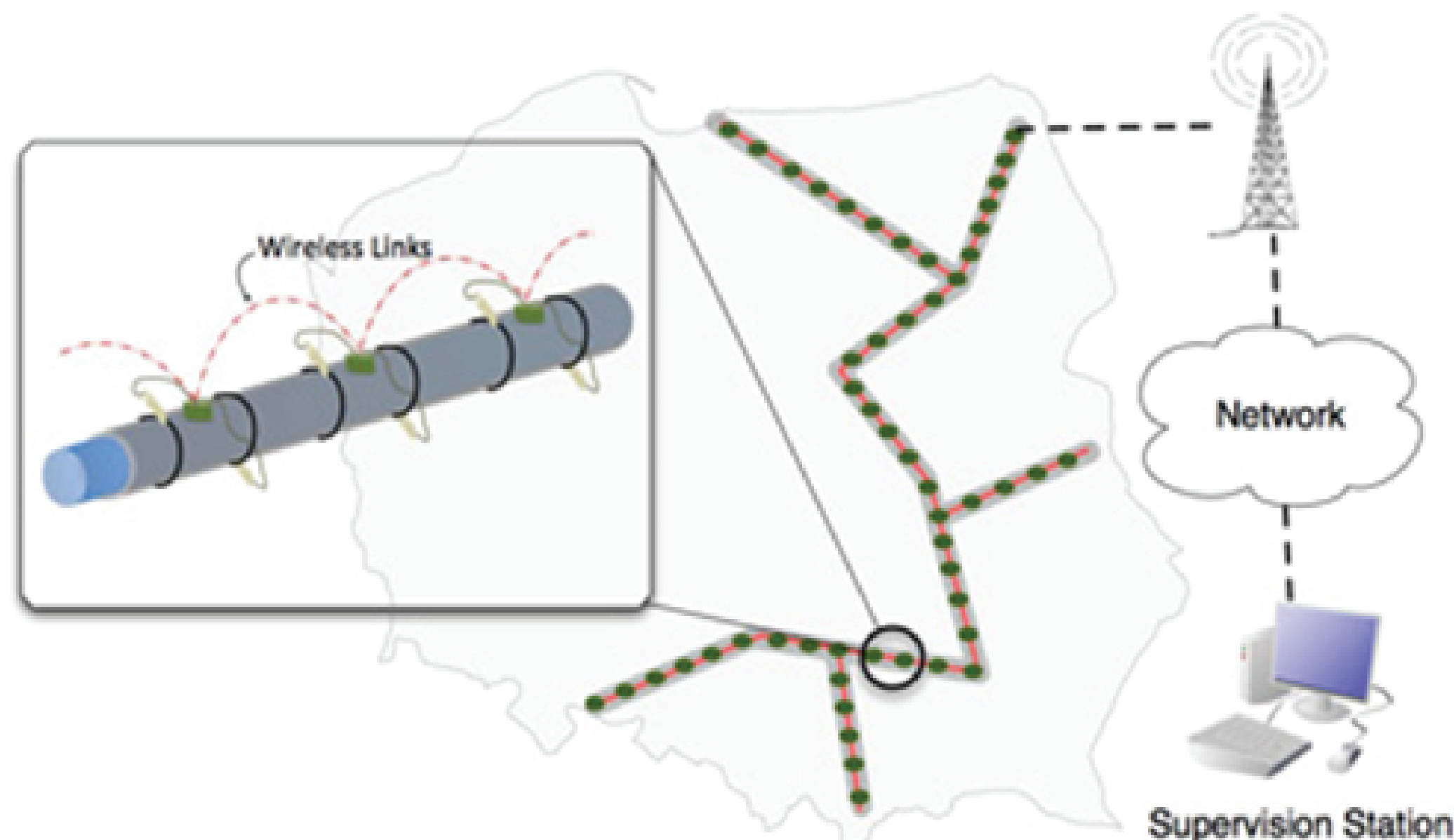
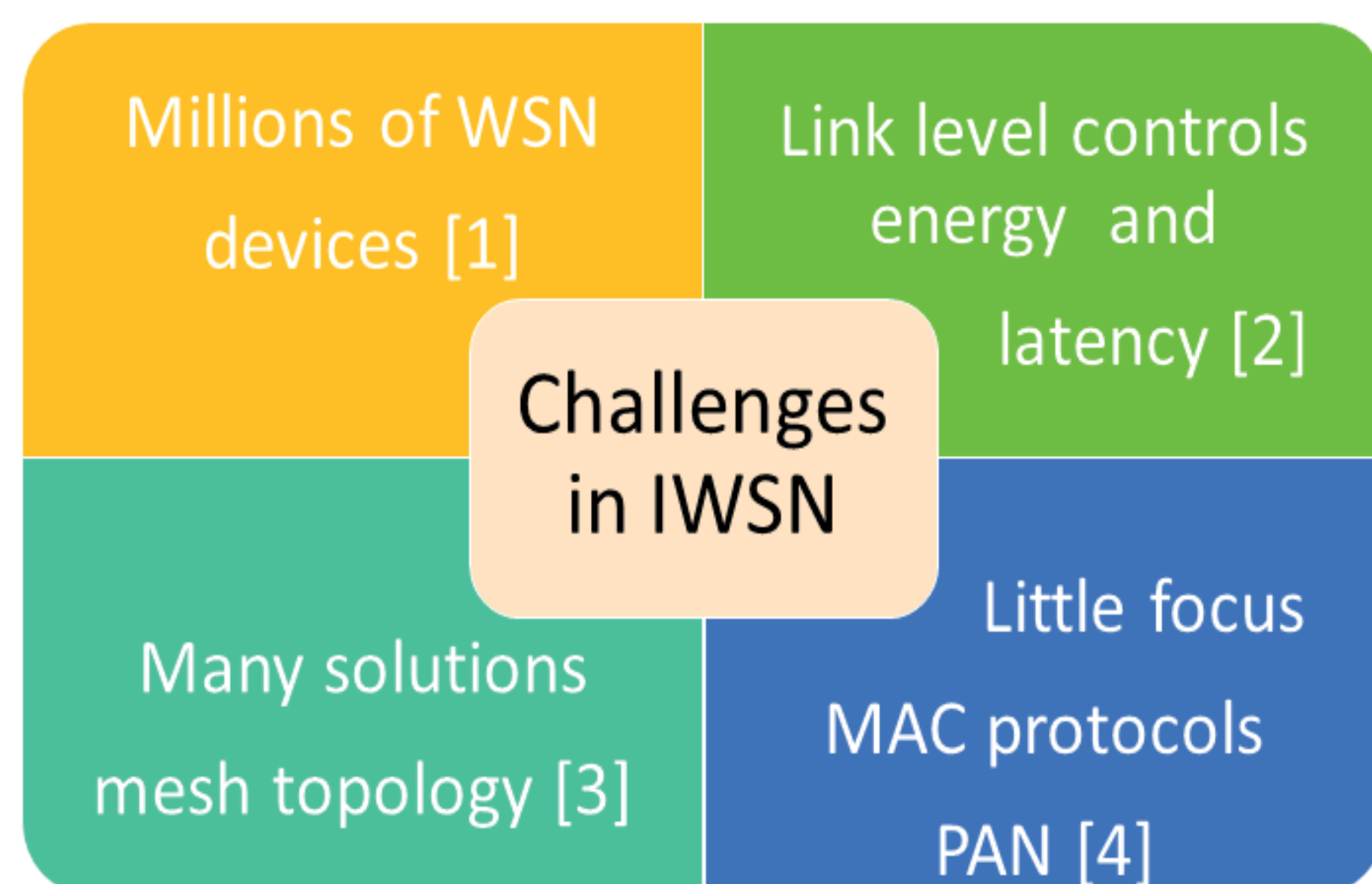


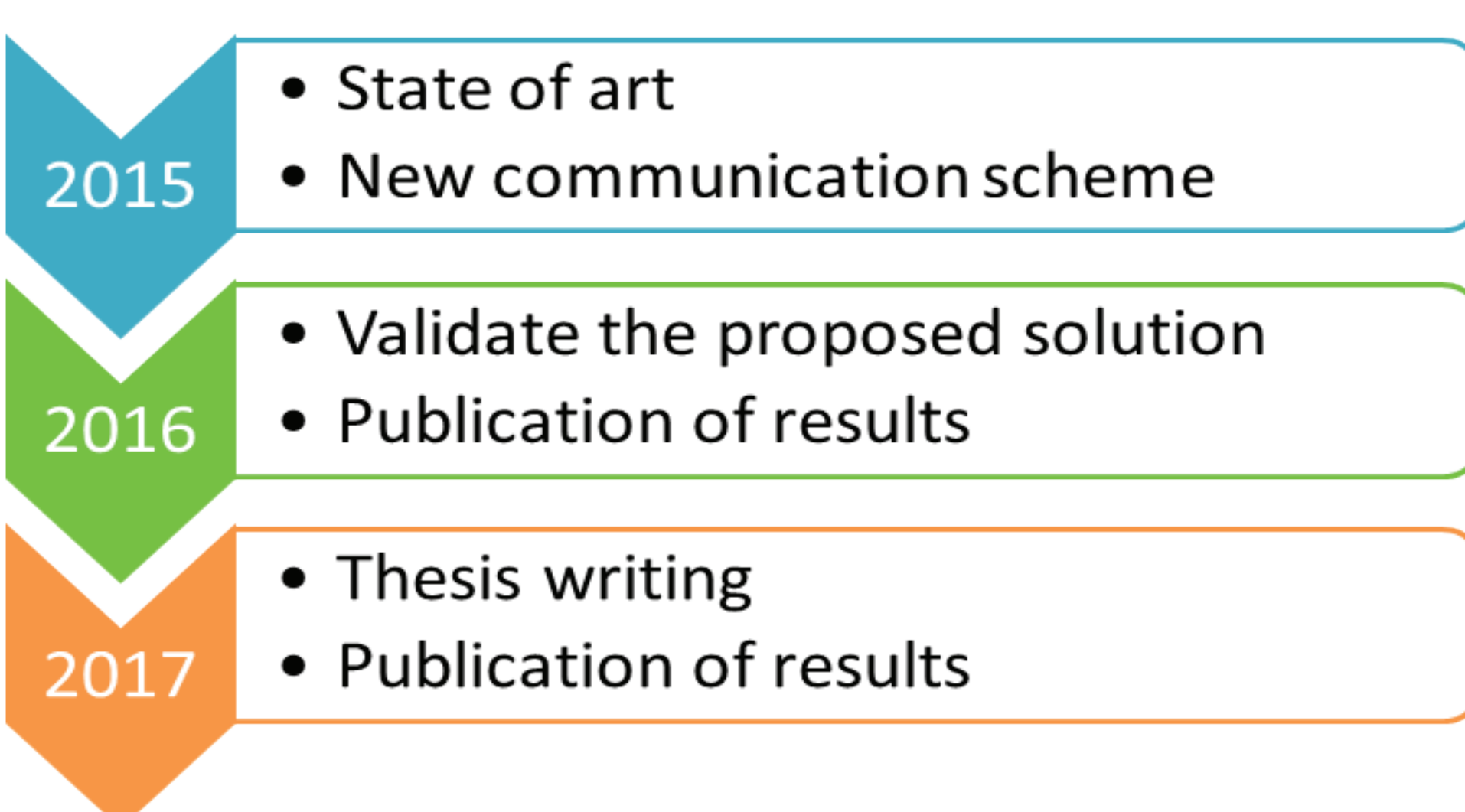
Fig. 1 Pipeline monitoring system



## 2. Thesis Objectives

- Introduce the pasive acknowledgement technique
- Take advantage of linear topology and TDMA
- Propose a new communication scheme
- Introduce new LLDN superframe
- Optimize the radio frequency transmisions

## 3. Research Plan



## 4. Results:

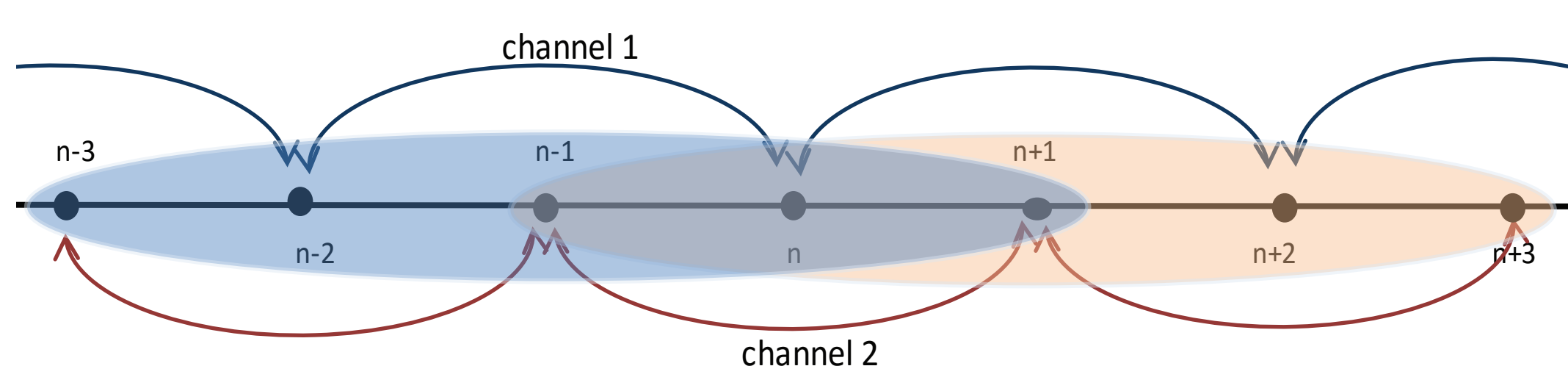


Fig. Coverage node IEEE 802.15.4

- Each node has conectivity with four nodes
- Range is about 60 meters without obstacles
- $v_{n+3}$  and  $v_{n-3}$  nodes can transmit simultaneously, not interfere with each other
- Implementation of two virtual channels

## 4.1 Automatic allocation of identifiers in linear wireless sensor networks using link-level processes (Draft paper)

- Fixed location and received power level allow locate the node in the lineart infraestructura
- Knowing the position of the nodes are assigned identifiers way secuencial
- The link layer provides information



Fig. ATMEGA RCB256RFR2 node

Fig. Test Network

## 4.2 LLDN frame synchronization for monitoring linear structures (Draft paper)

- Each node synchronizes your neighbors by sending beacons
- The synchronization of the nodes is sequential
- LLDN frames have 8 time slots
- Each node transmits the sixth time interval

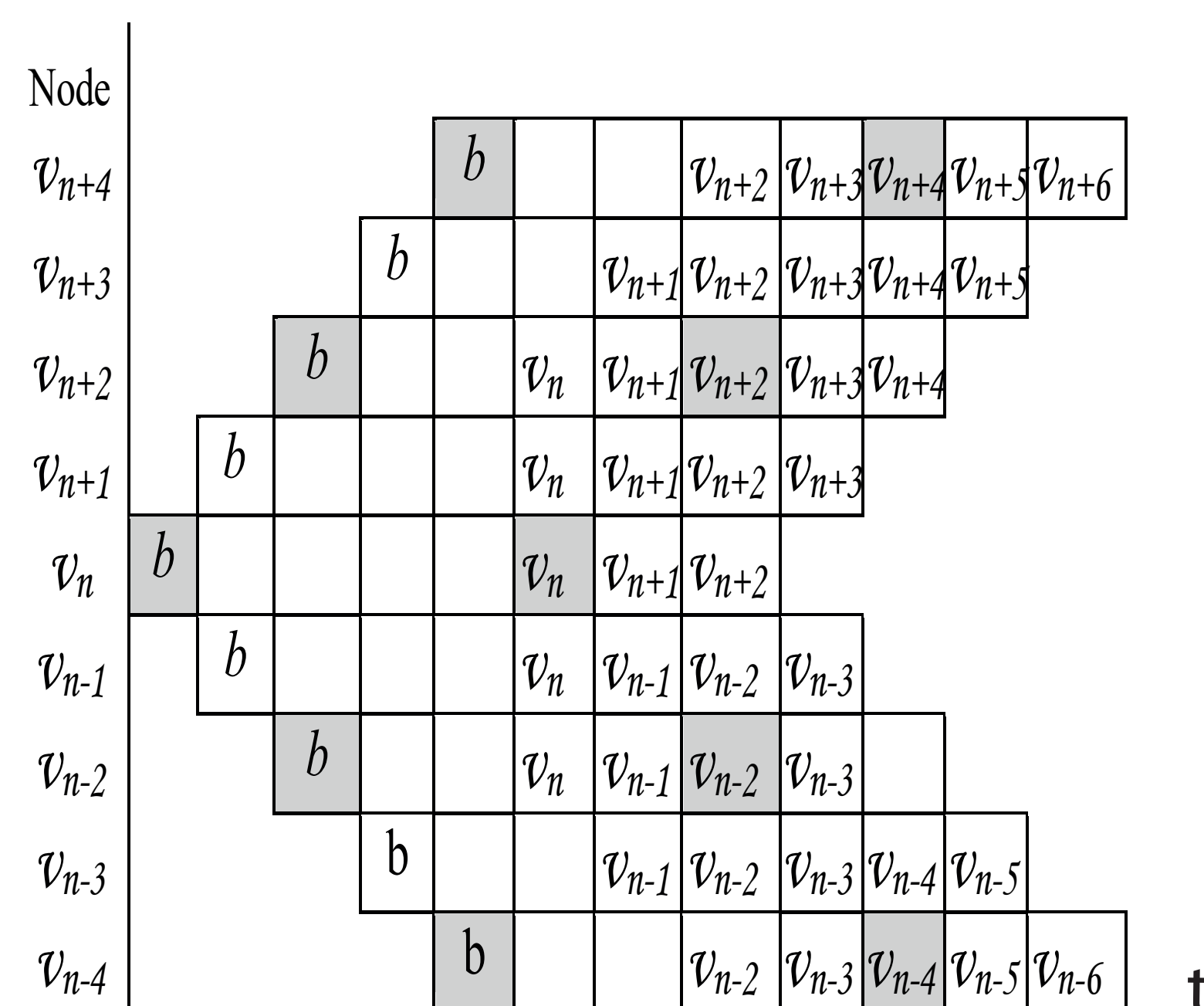


Fig. Starting synchronization of nodes

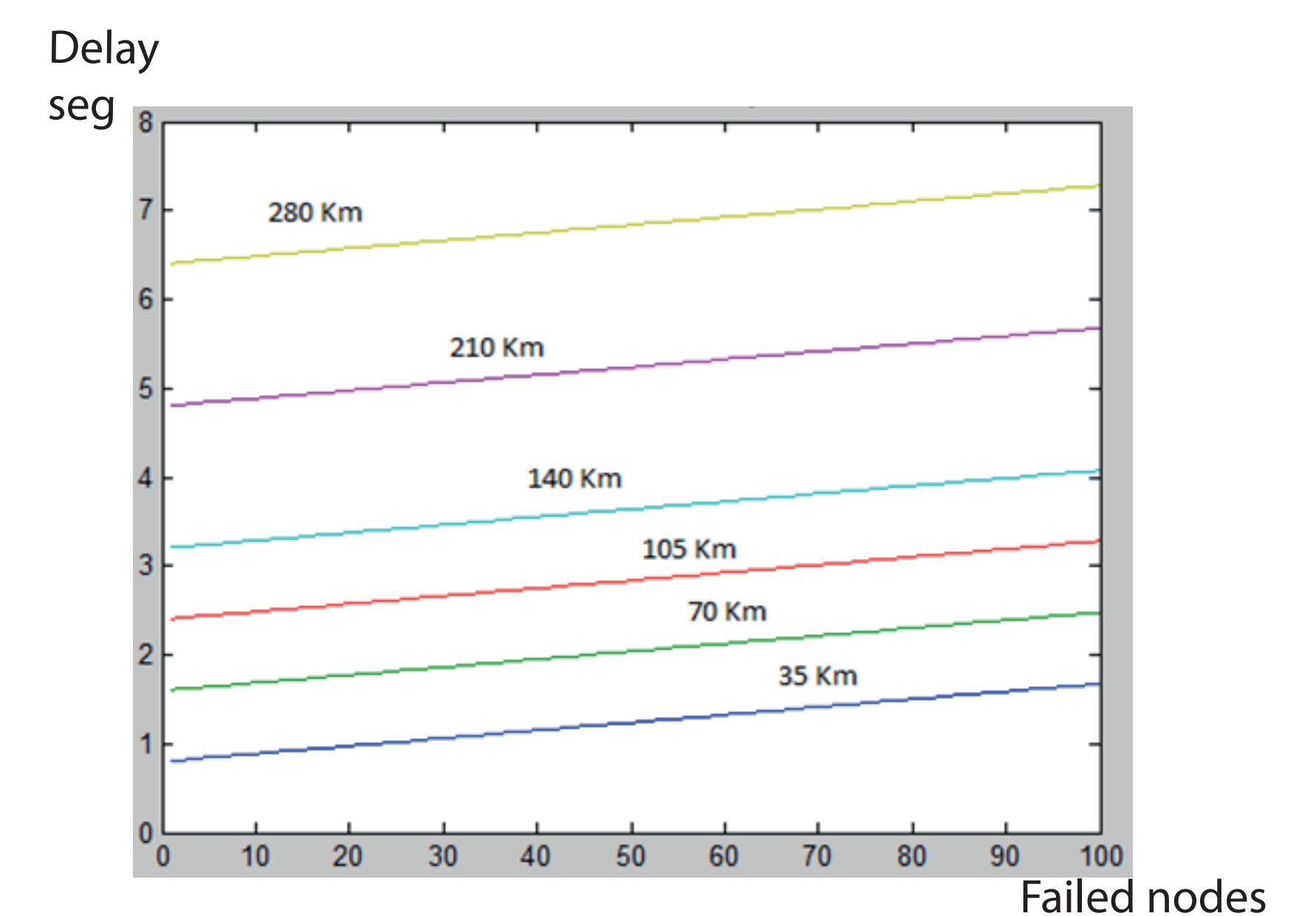


Fig. Delays due to network synchronization with p failed nodes

## 4.3 Use of passive ack to provide LLDN network reliability

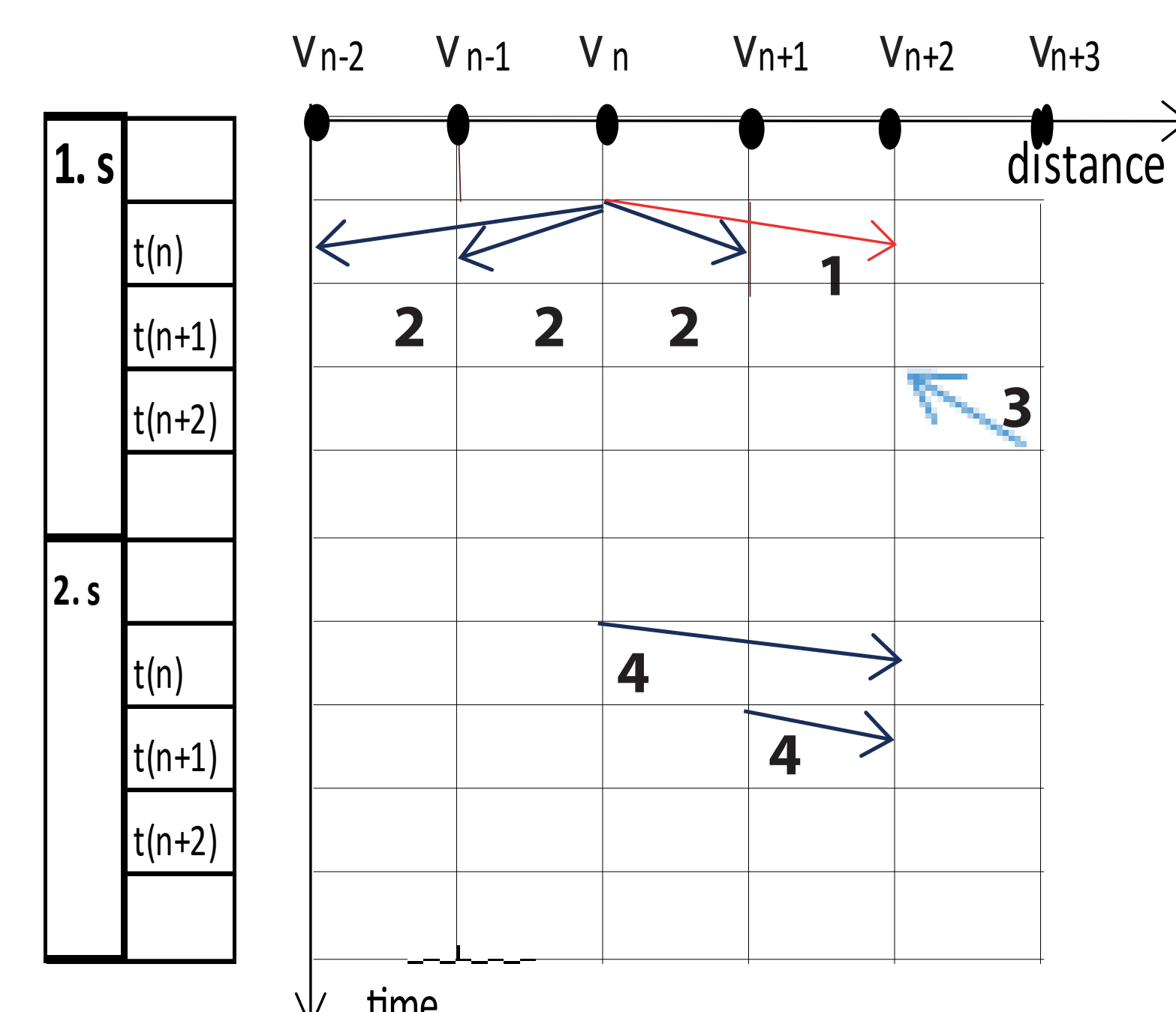


Fig. Passive ACK

1.  $v_n$  node transmits to  $v_{n+2}$
2. The signal reaches node  $v_{n-2}$ ,  $v_{n-1}$  and  $v_{n+1}$
3. If node  $v_{n+2}$  does not retransmit the data in its timeslot, wrong data or failed link
4.  $v_n$ ,  $v_{n+1}$  nodes sends again the data without receiving ACK frame

## 5. Next Year Planning

- ▲ Publishing of a paper on use of passive ACK to provide network reliability
- ▲ Continue our research in improve the reliability of networks LLDN
- ▲ Publish a paper in IEEE LATINCOM 2016 conference
- ▲ Attend conferences on IoT

## 6. Bibliografya

- [1] Digital Oilfield Wireless Sensor Networks A Market Dynamics Report, Mareca Hatler, Darryl Gurganious Published: Q4 2014
- [2] An Industrial Perspective on Wireless Sensor Networks — A Survey of Requirements, Protocols, and Challenges A. Kumar S., Vsthus, L. Kristensen. IEEE Communications surveys & tutorials, Vol. 16, No. 3, Third quarter 2014 pag. 1391 -1412
- [3] Wireless Sensor Networks for Long Distance Pipeline Monitoring, A. Azubogu, V. Idigo, Engineering and Technology Vol:7, 2013 ,pag 78- 82
- [4] Mac layer protocols for linear wireless sensor networks: a survey. Radosveta Sokullu, Eren Demir Recent Advances In Telecommunications, Informatics And Educational Technologies, 2014, 247-256