

# Enabling SNMP for IEEE 802.15.4 A Practical Architecture

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# SCHEME OF TALK

- INTRODUCTION
- SYSTEM'S ARCHITECTURE
- IEEE 802.15.4 MIB
- EXPERIMENTAL RESULTS
- CONCLUSIONS
- FUTURE WORK

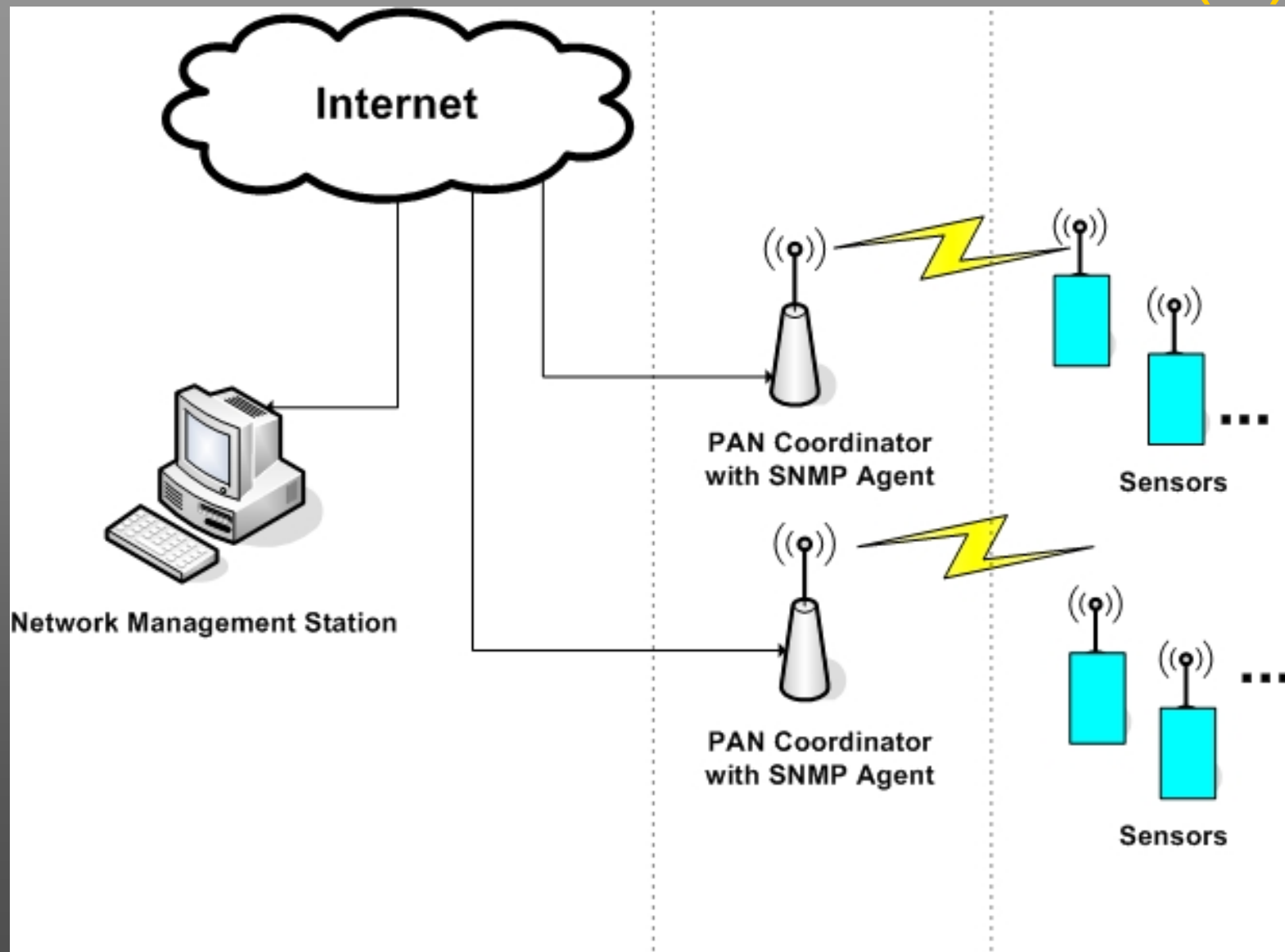
# INTRODUCTION

- IEEE 802.15.4 was developed to address low-cost, low-complexity and low-power design
- Low data rate wireless connectivity
- Fixed, portable, and moving devices with very limited battery capacity
- SNMP framework - management of equipment implementing TCP/IP stack
- It seems that adding SNMP to devices implementing IEEE 802.15.4 is not quite suited

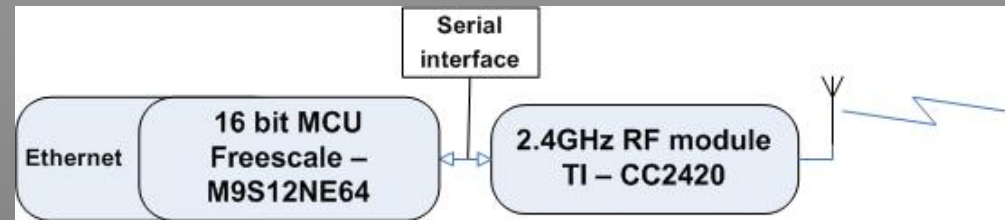
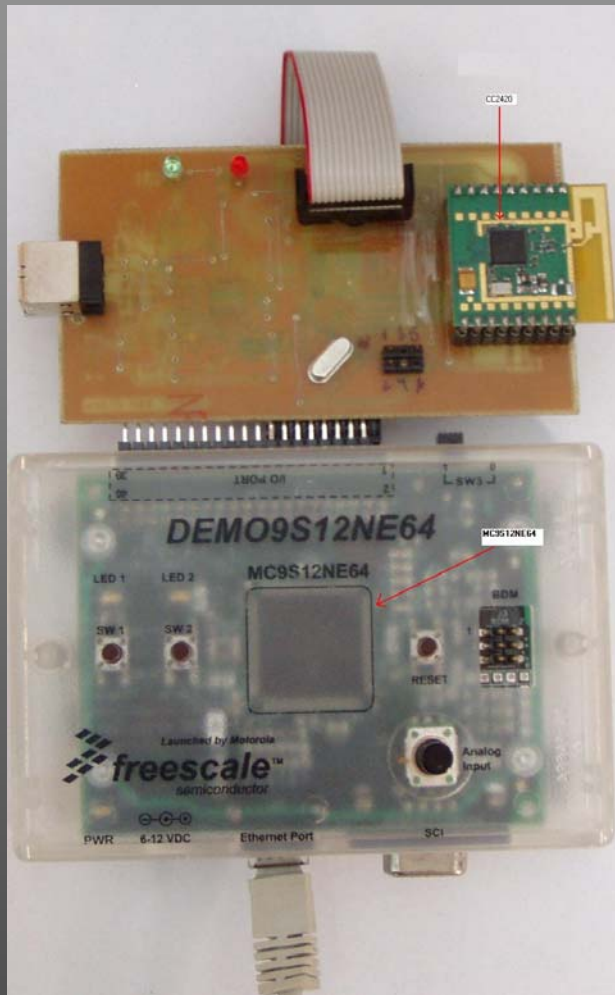
# SYSTEM'S ARCHITECTURE(1)

- SNMP Framework
  - NMS (Network Management Station)
  - Managed nodes - agents
  - Management information
  - MIB (Management Information Base)
- IEEE 802.15.4 Framework
  - RFD (Reduced-Function Device)
  - FFD (Full-Function Device)
  - one FFD -> PAN coordinator

# SYSTEM'S ARCHITECTURE(2)

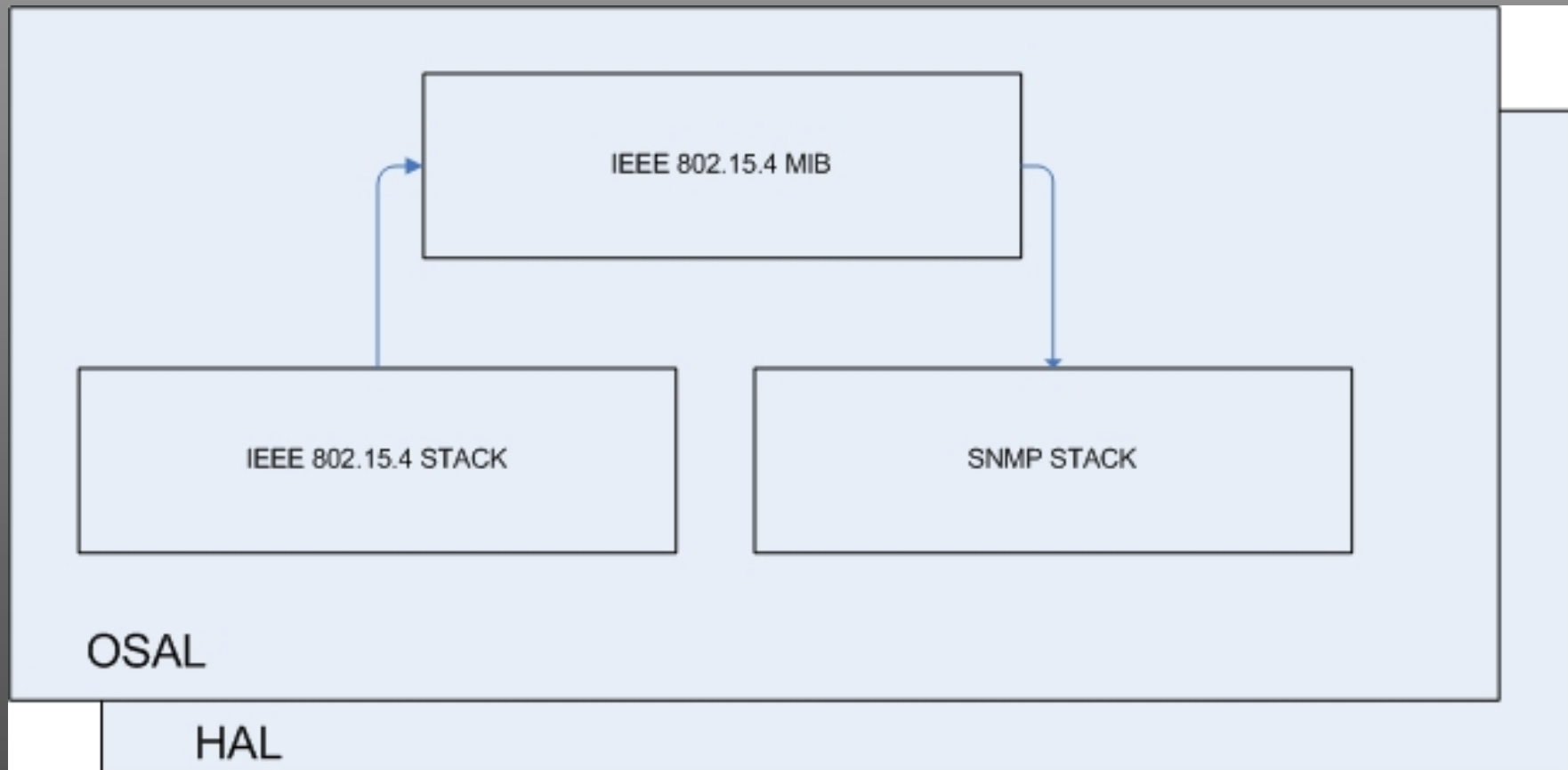


# SYSTEM'S ARCHITECTURE(3)

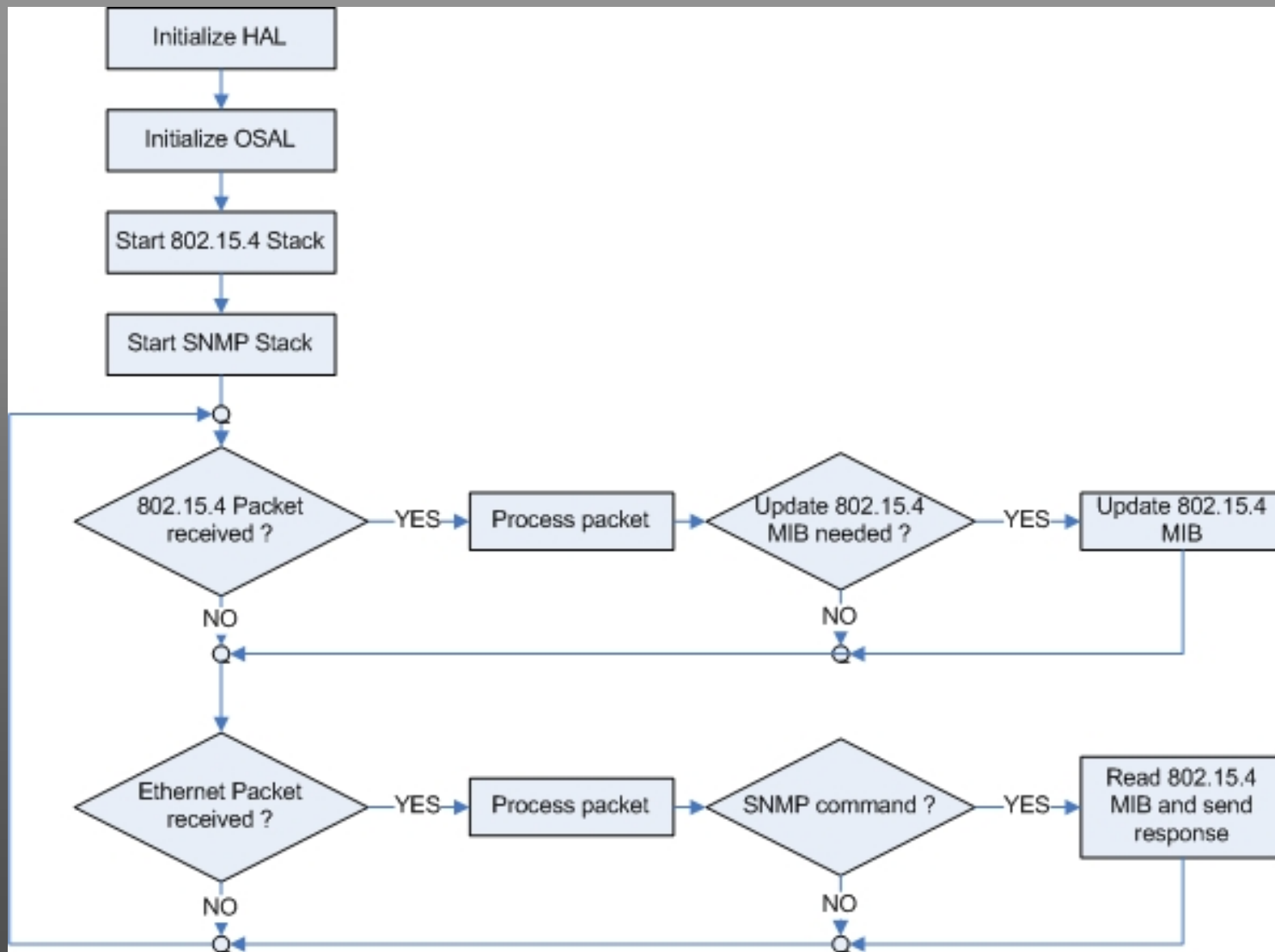


- MCU - M9S12NE64 (Freescale)
  - 100BASE-TX – 100 Mbps
- RF - CC2420 (Texas Instrument)
  - 2.4 GHz band
  - 250 kbps wireless data rate

# SYSTEM'S ARCHITECTURE(4)

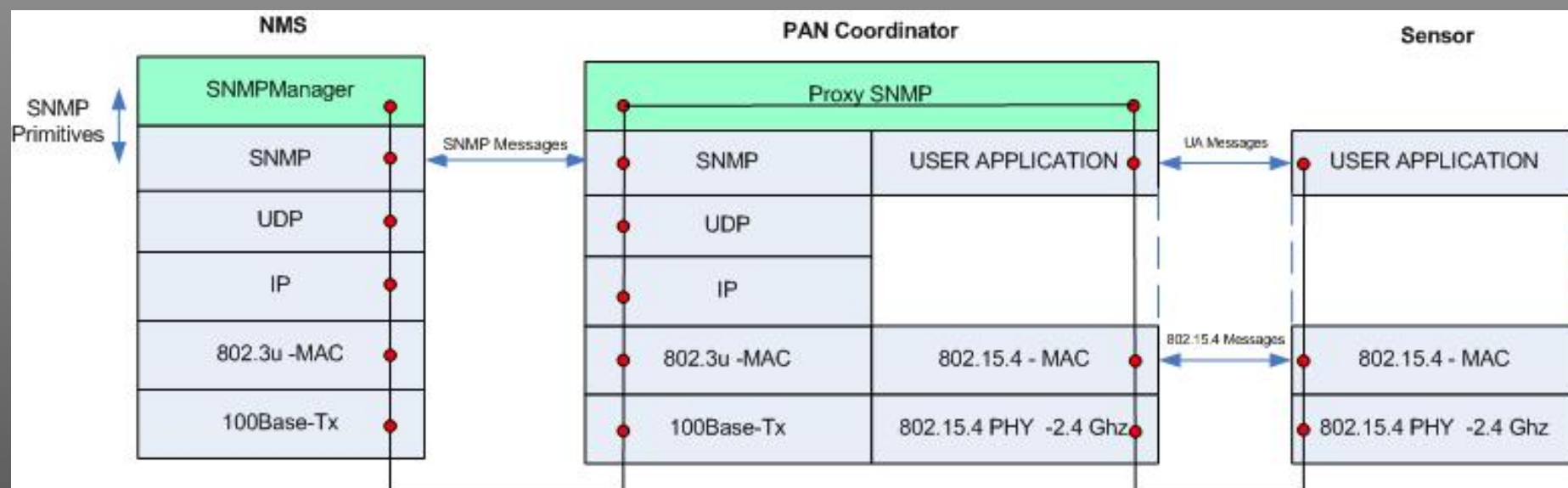


# SYSTEM'S ARCHITECTURE(5)





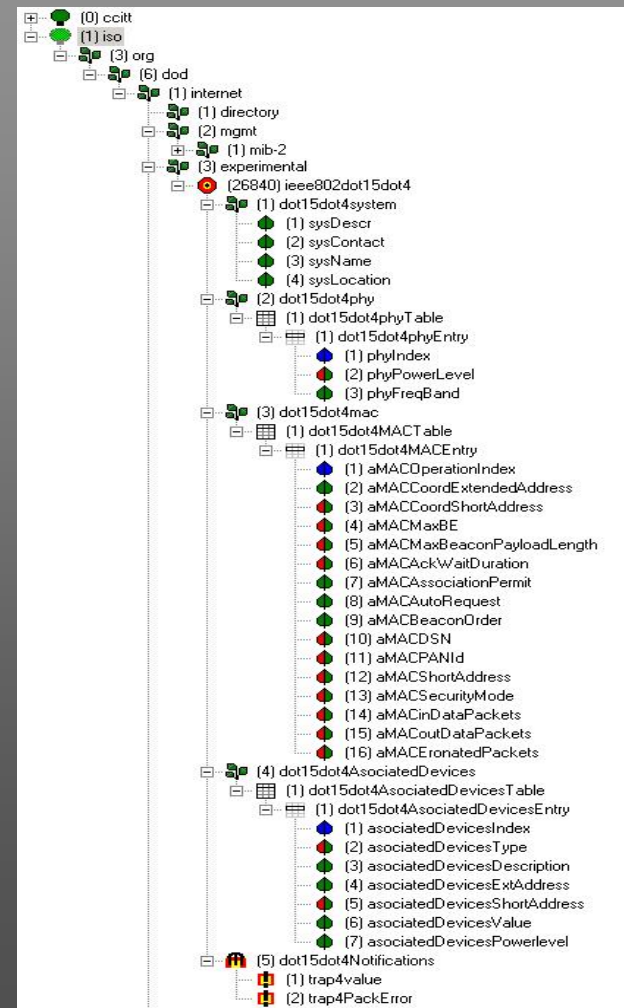
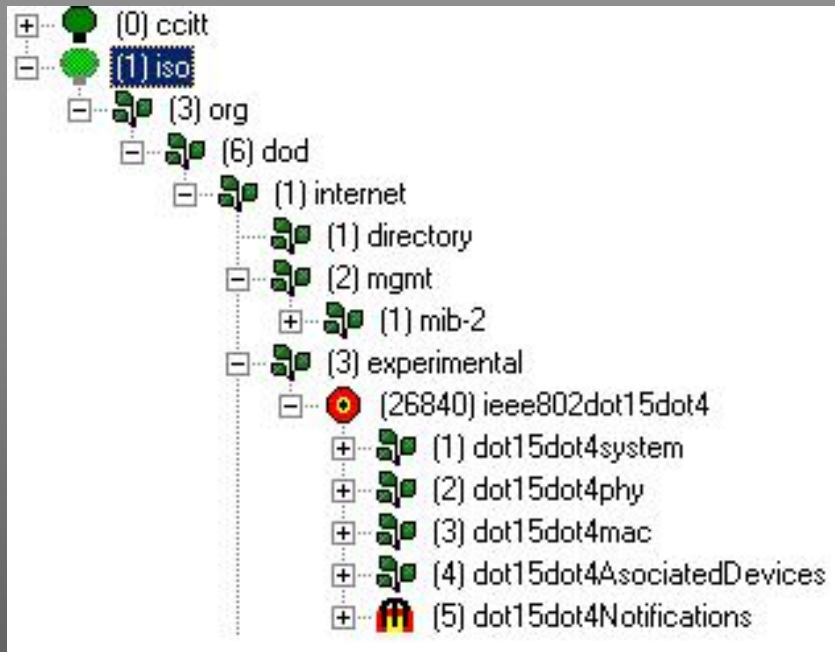
# SYSTEM'S ARCHITECTURE(6)



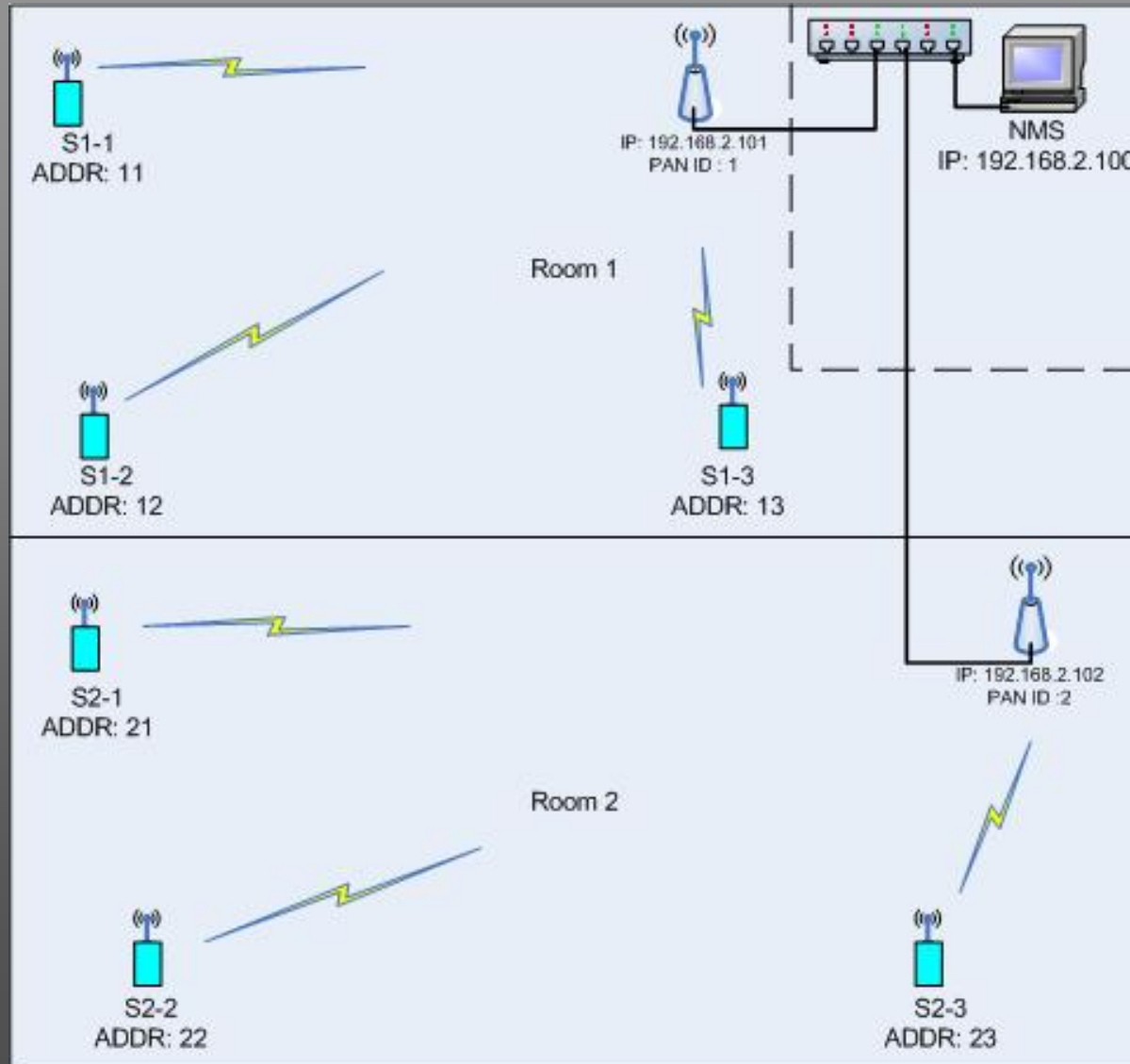
# IEEE 802.15.4 MIB(1)

- Virtual information store
- Written using a subset of ASN.1
- SMIv2
- Has five sections :
  - dot15dot4system
  - dot15dot4phy
  - dot15dot4mac
  - dot15dot4AssociatedDevices
  - dot15dot4Notifications

# IEEE 802.15.4 MIB(2)



# EXPERIMENTAL RESULTS(1)



# EXPERIMENTAL RESULTS(2)

The screenshot shows the SNMP Manager interface with a tree view on the left containing 'SNMP NET Manager', 'Management Information Bases' (with sub-items 'dot15dot4.MIB' and 'MIB-II.MIB'), and 'SNMP Agents' (with sub-items 'Proxy - 1' and 'Proxy - 2'). The right pane displays configuration details for 'SNMP NET Manager'.

Event Type	Date	Time	Source	Category	Event
Data	11/08/07	17:15:03	Sensor2-3	Trap data	Trap
Data	11/08/07	17:25:01	Sensor1-1	Trap data	Trap
Data	11/08/07	17:25:12	Sensor1-1	Trap data	Trap
Data	11/08/07	17:30:10	Sensor1-3	Trap data	Trap

The screenshot shows the SNMP Manager interface with the same tree view as the first screenshot. The right pane displays configuration details for 'SNMP NET Manager'.

Event Type	Date	Time	Source	Category	Event
Data	11/08/07	19:35:05	Sensor2-3	Read value	22 °C
Data	11/08/07	19:35:10	Sensor1-1	Read value	22 °C
Data	11/08/07	19:35:10	Sensor1-2	Read value	21 °C
Data	11/08/07	19:35:10	Sensor1-3	Read value	21 °C
Data	11/08/07	19:35:10	Sensor2-1	Read value	22 °C
Data	11/08/07	19:35:10	Sensor2-2	Read value	22 °C
Data	11/08/07	19:35:10	Sensor2-3	Read value	22 °C

- 2 types of experiments
- First experiment - generating and receiving traps
- Second experiment - monitoring the temperature of sensors

# CONCLUSIONS

- SNMP management for IEEE 802.15.4 devices - a feasible solution
- Using appropriate hardware and software equipment - easy integration into management system

# FUTURE WORK

- Extend the defined MIB - ZigBee
- Improving security for data transfer – SNMPv3
- Implementing SNMP into wireless sensors–IPv6
- Change current OS to RTOS – improve performances

THANK YOU

QUESTIONS?