

Chalmers University of Technology

DAT300 Paper Presentation

- ❑ **Wireless sensor networks: A survey on the state of the art and the 802.15.4 and ZigBee standards.**

Paolo Baronti, Prashant Pillai, Vince Chook, Stefano Chessa, Alberto Gotta, Y. Fun Hu

- ❑ **A ZigBee-Based Home Automation System**

Khusvinder Gill, Shuang-Hua Yang, Fang Yao, and Xin Lu

Brian Mwambazi

May 2014

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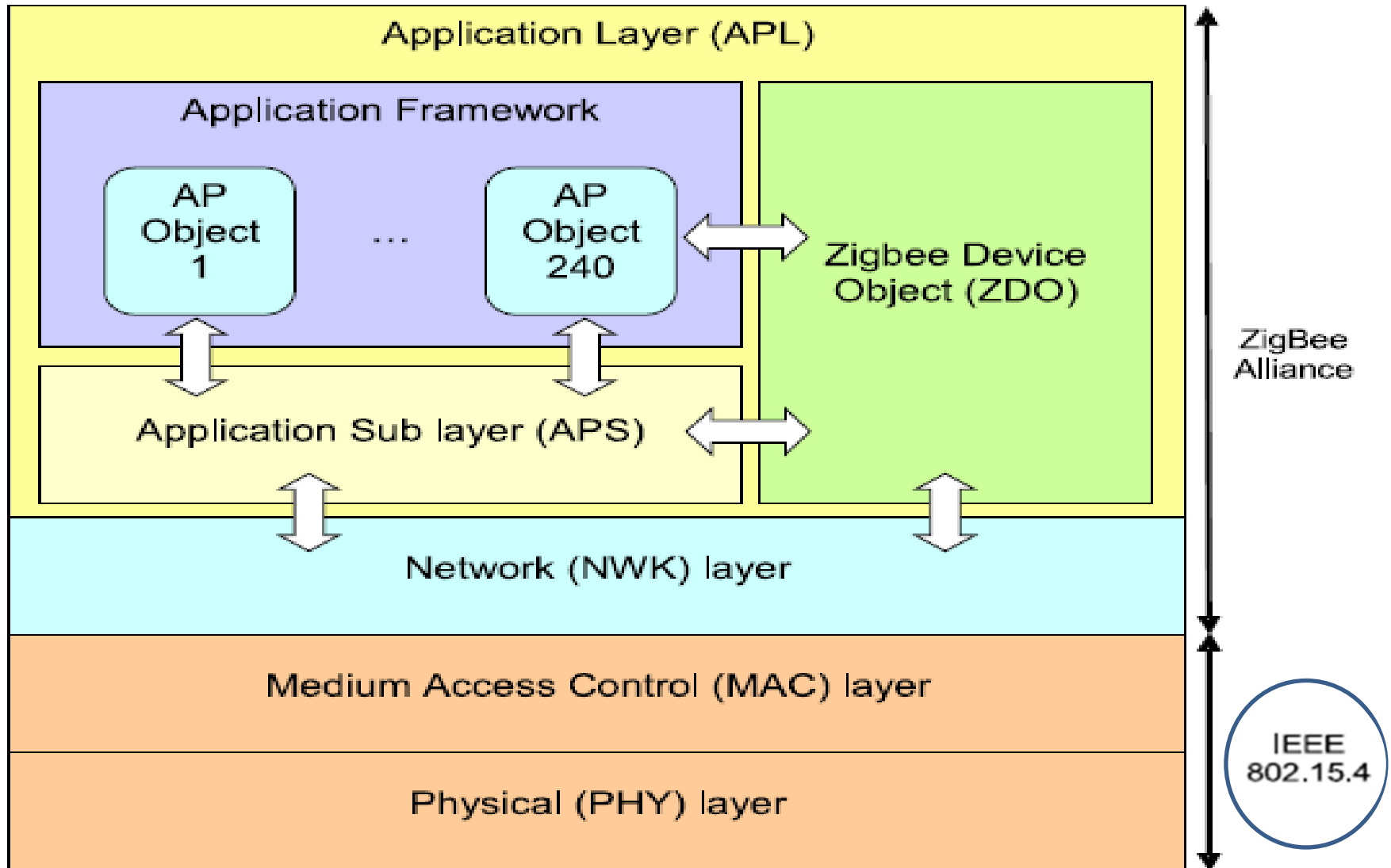
❑ **A ZigBee-Based Home Automation System**

Khusvinder Gill, Shuang-Hua Yang, Fang Yao, and Xin Lu

Overview

- Introduction
 - IEEE 802.15.4
 - Zigbee
- WSN Solutions in Zigbee
 - Routing
 - Energy Efficiency
 - Security

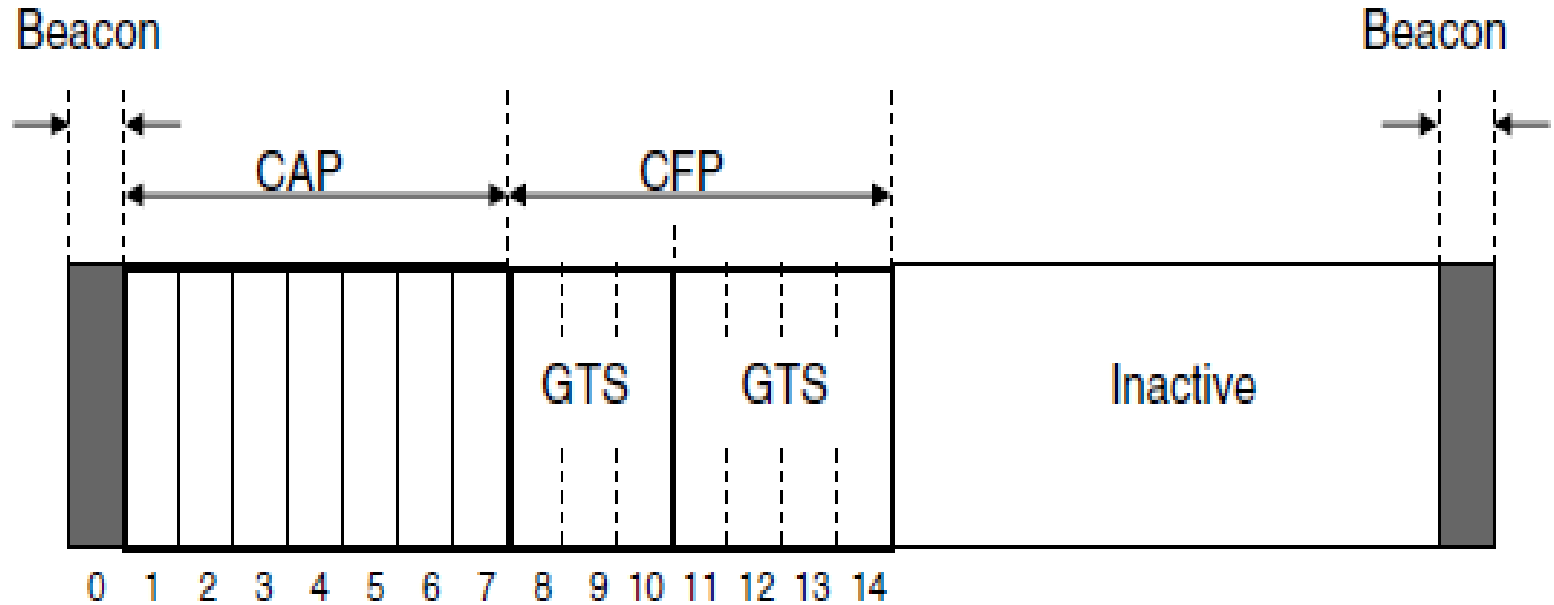
Zigbee Protocol Stack



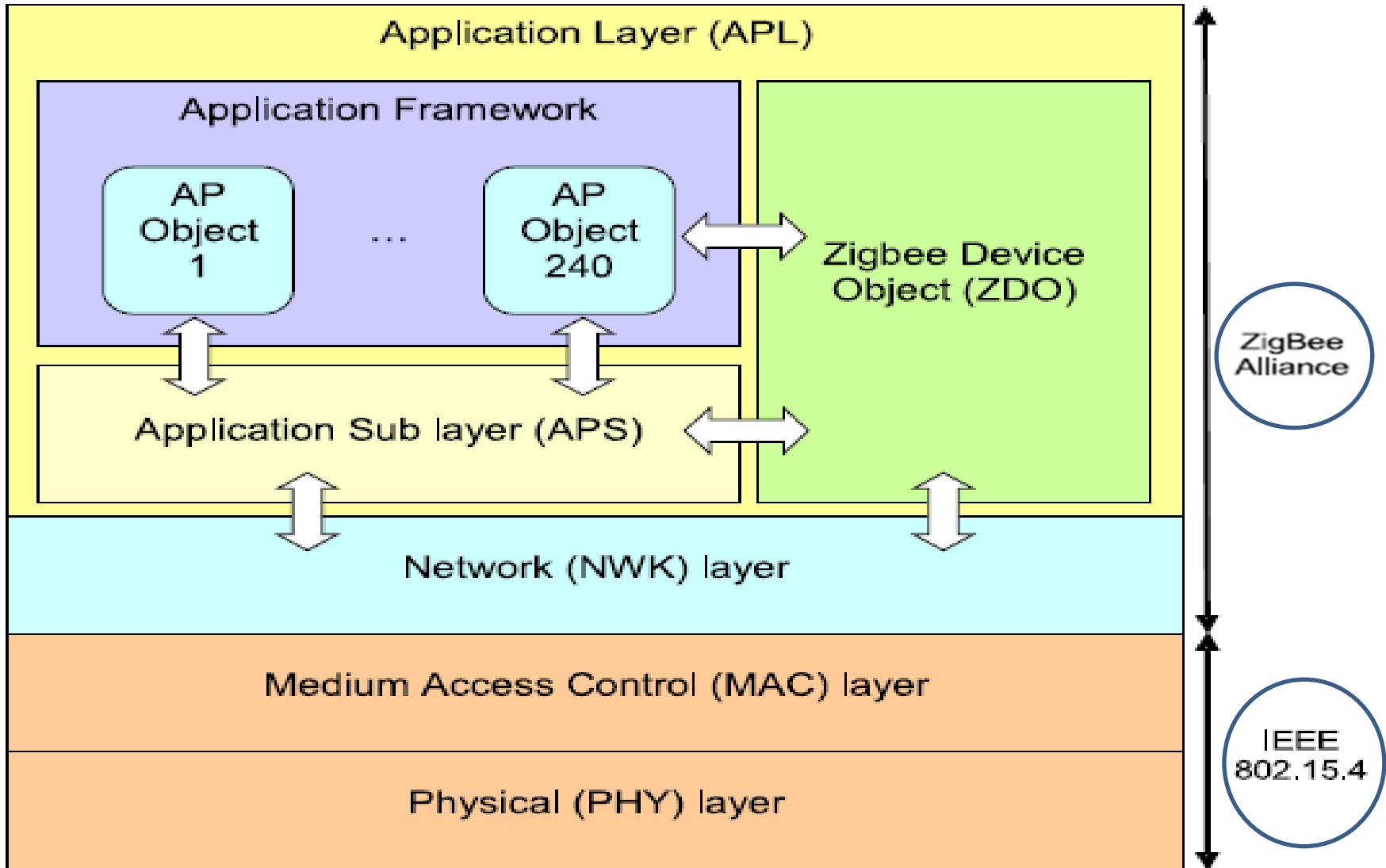
IEEE 802.15.4 Standard

- Physical Layer
 - 3 Freq bands: 2450 MHz, 915 MHz, 868 MHz
 - Direct Sequence Spread Spectrum
- Media Access Control
 - 2 types of Nodes:
 - Reduced Functional Devices
 - Full Functional Devices - beacons, superframes
 - CSMA-CA

IEEE 802.15.4 Standard



Mac Super Frame



Zigbee Standard

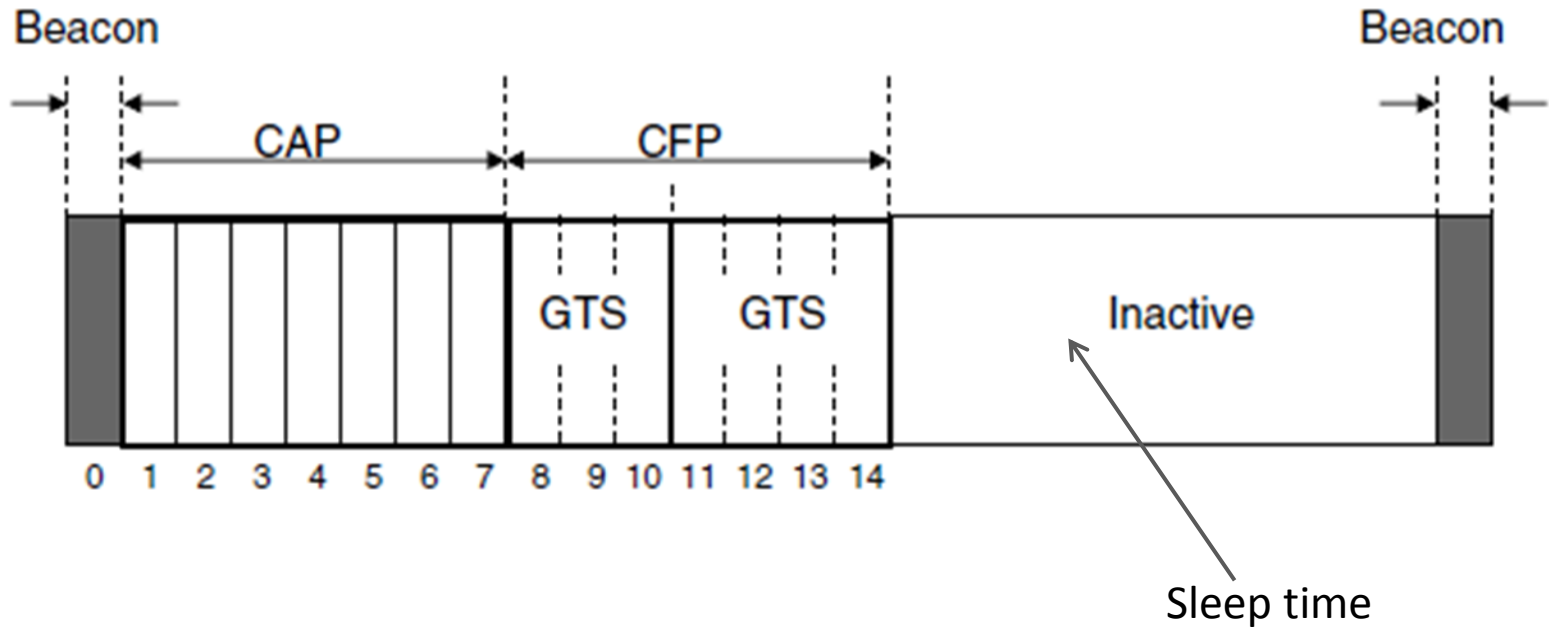
- Device types
 - Coordinator, Router, End Device
- Implemented Layers
 - Network: discovery, routing
 - Application
 - Application Framework – developer apps are built here
 - Zigbee Device Objects – provides device discovery
 - Application Sub Layer – data, security services

Routing

- Ad hoc On-Demand Distance Vector Routing
 - Reactive protocol
 - Nodes maintain Routing Table
 - Route discovery uses flooding

Energy Efficiency

- Saving done at MAC layer



Security Threats

- Eavesdropping
- Dos
- Message Tampering
- Selective Forwarding
- Sinkhole Attack
- Wormhole Attack
- Sybil Attack- multiple identities

Security

- AES 128 bit Encryption at
 - Network Level
 - Device Level
- Authentication
- Message Integrity : 0 – 128 bit
- Freshness Counters

END of Part 1

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□ **A ZigBee-Based Home Automation System**

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Overview

- Introduction
 - Problems limiting Smart Homes
- Proposed System
 - Features
 - Architecture/Implementation
 - Evaluation
- Conclusion

Problem

- Complex architecture
- Intrusive wiring
- Interoperability issues
- Inflexible Interface
- Safety and Security

Proposed System

- Features
 - ‘Plug and play’ for appliances
 - Variety Control Interfaces
 - Home Gateway
 - Virtual Home

Architecture

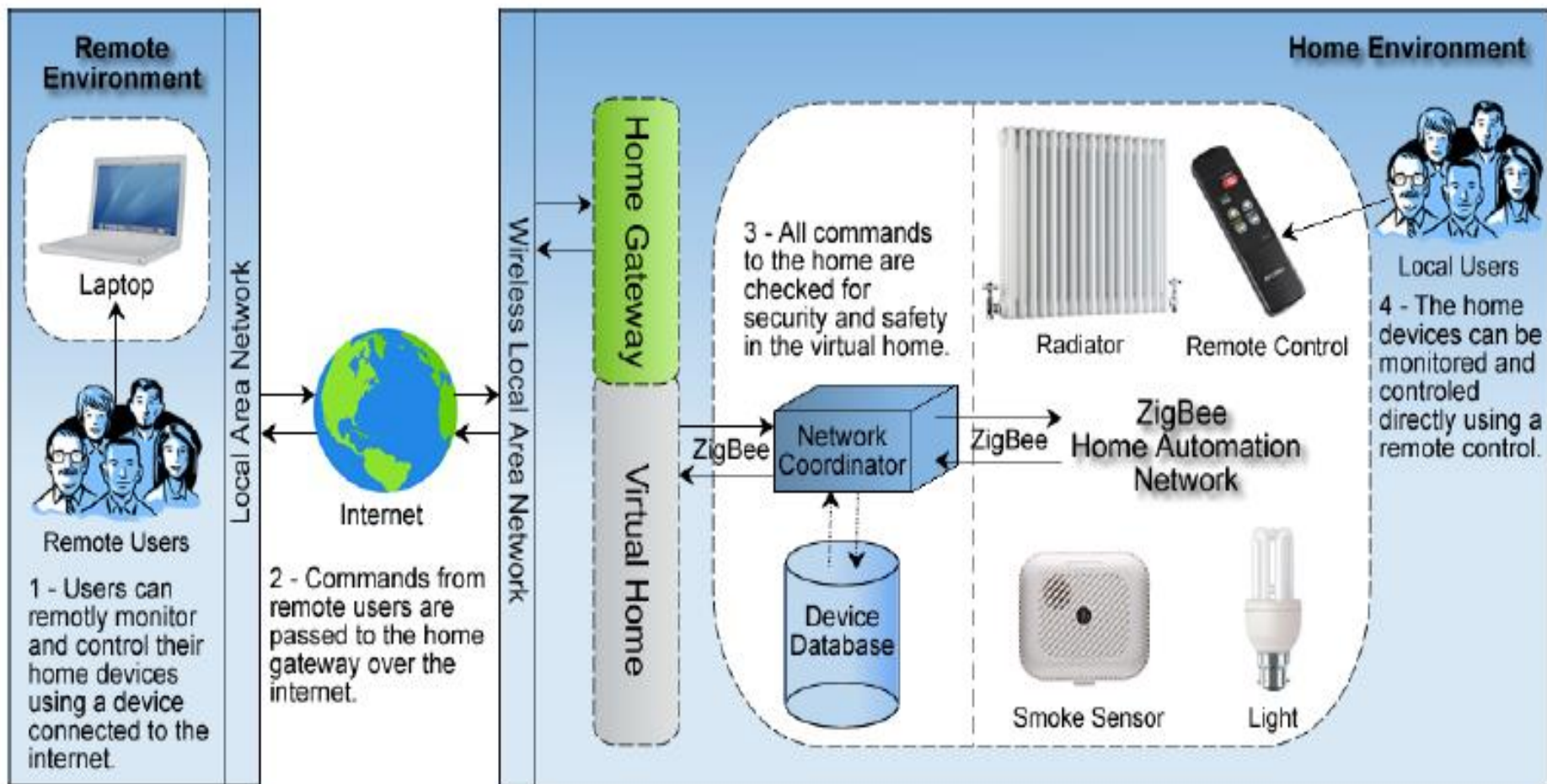


Fig. 1. Conceptual Architecture Overview.

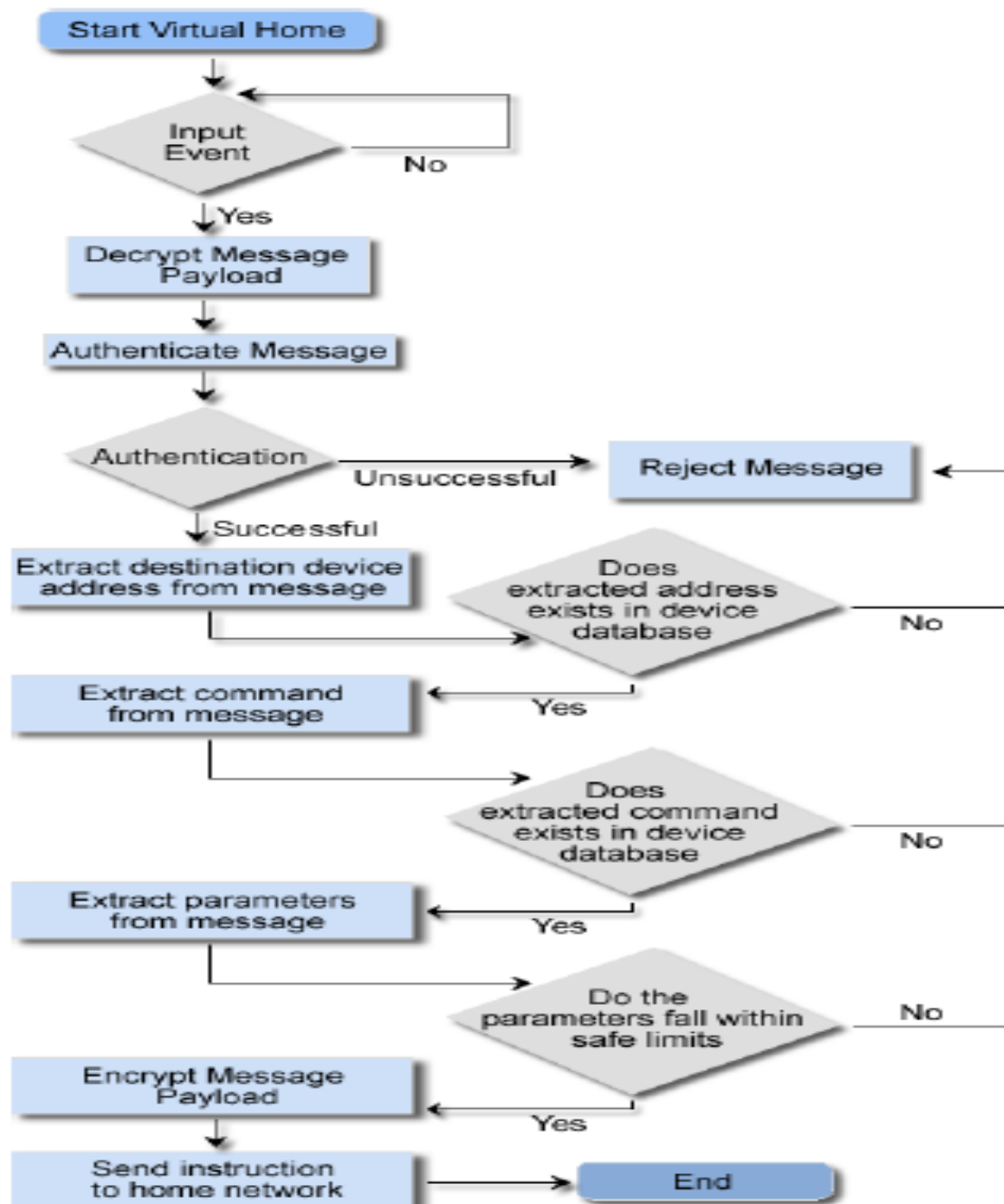


Fig. 5. Virtual Home Flow Chart.

Implementation



Fig. 3. System Implementation.

Evaluation

TABLE 1
ZIGBEE AND WI-FI CONTROLLER ACCESS DELAY

	Light Switch	Radiator Valve
ZigBee Controller access delay in ms	670	*N/A
Wi-Fi Controller access delay in ms	1337	613

*N/A indicates that the time delay was too short to be recorded by the test equipment.

Evaluation

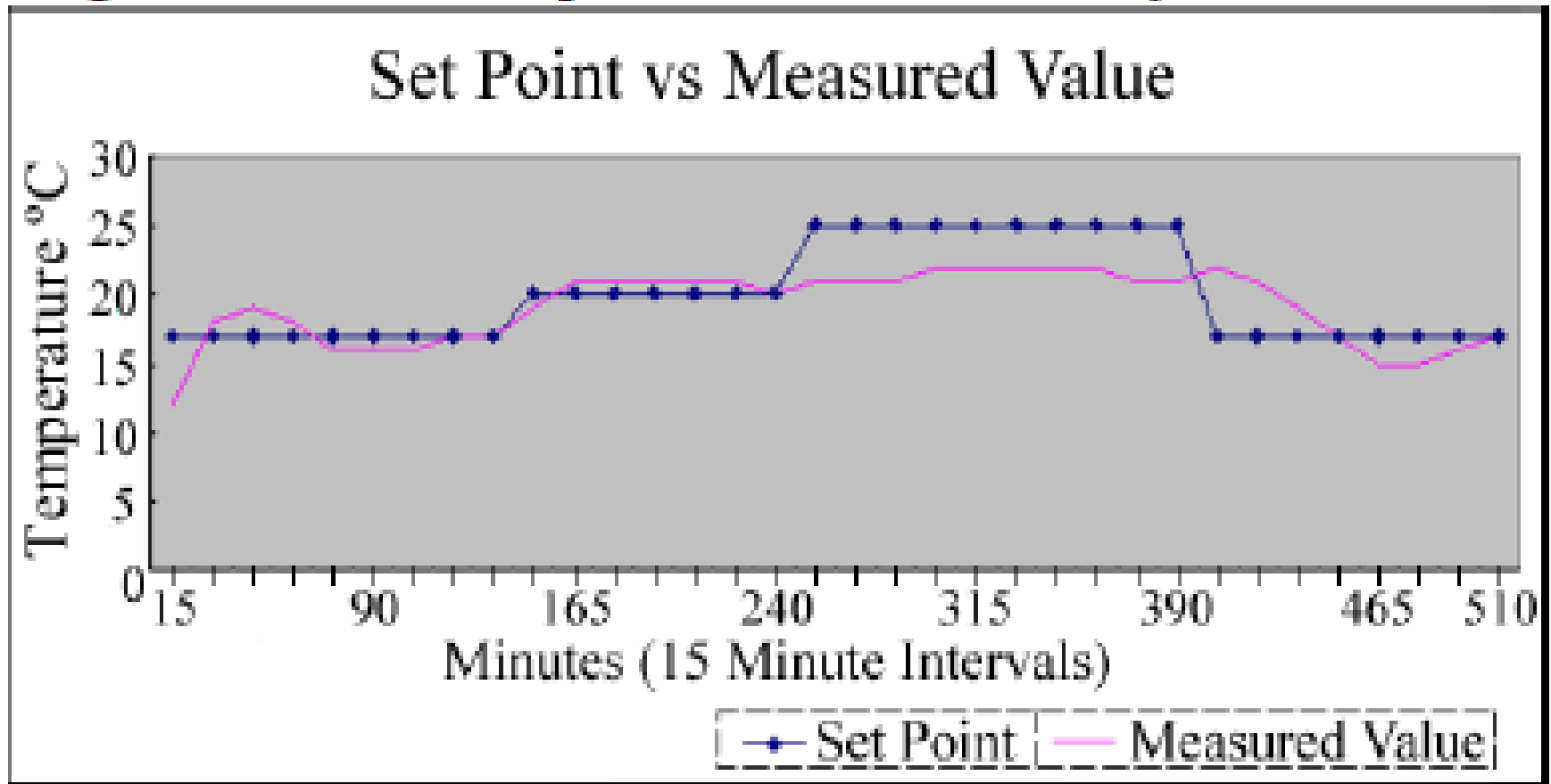


Fig. 9. Set Temperature and Measured Temperature

END of Part 2

Questions ?