

Zigbee Porting on new microcontroller/RF chip

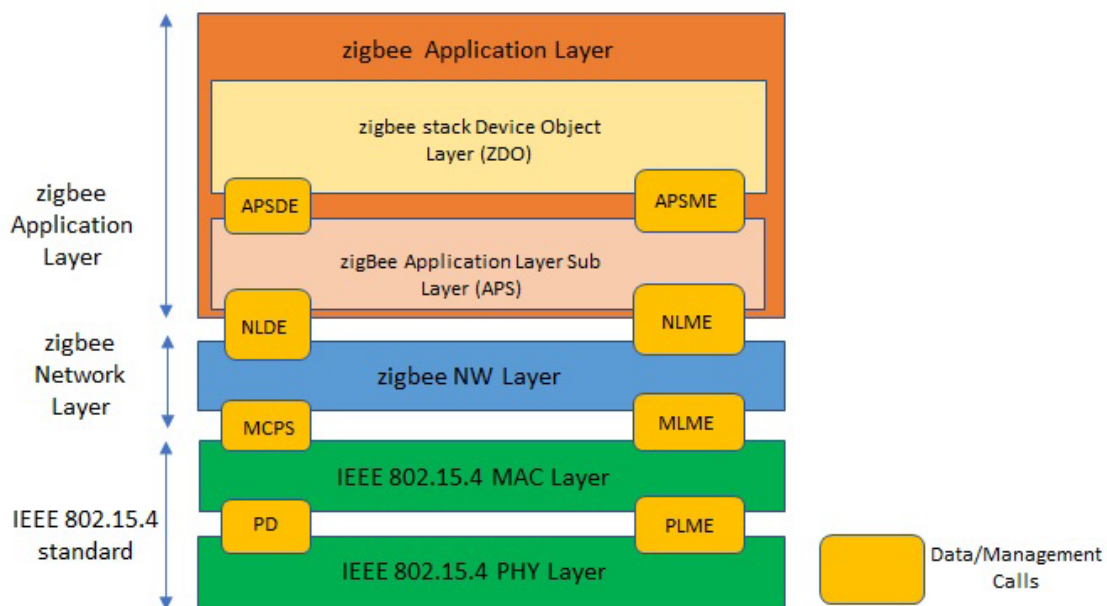
Nishith Goswami, Volansys Technologies

What is zigbee porting?

Integration of zigbee network and application layer stack from one microcontroller/RF chip combination to other is known as zigbee porting. zigbee porting on new microcontroller is possible if it is compatible with IEEE 802.15.4 standard and supporting minimum required footprint (i.e. SRAM).

Zigbee Architecture

Following standard Open System Interconnect (OSI) reference model, zigbee protocol stack is structured in layers. The first two layers, physical (PHY) and media access (MAC) are defined by the IEEE 802.15.4 standard and layers above them are defined by the zigbee alliance.



Why zigbee porting required?

Due to the differences in microcontroller and RF chips i.e. MAC implementation, Platform dependent modules (i.e. Power management, OS, Security, Timer Resolution, Memory Management), each microcontroller/RF chip combination requires its own zigbee stack. This means zigbee stack from one microcontroller/RF chip combination will not work directly on new combination and will require zigbee porting.

Zigbee porting approaches

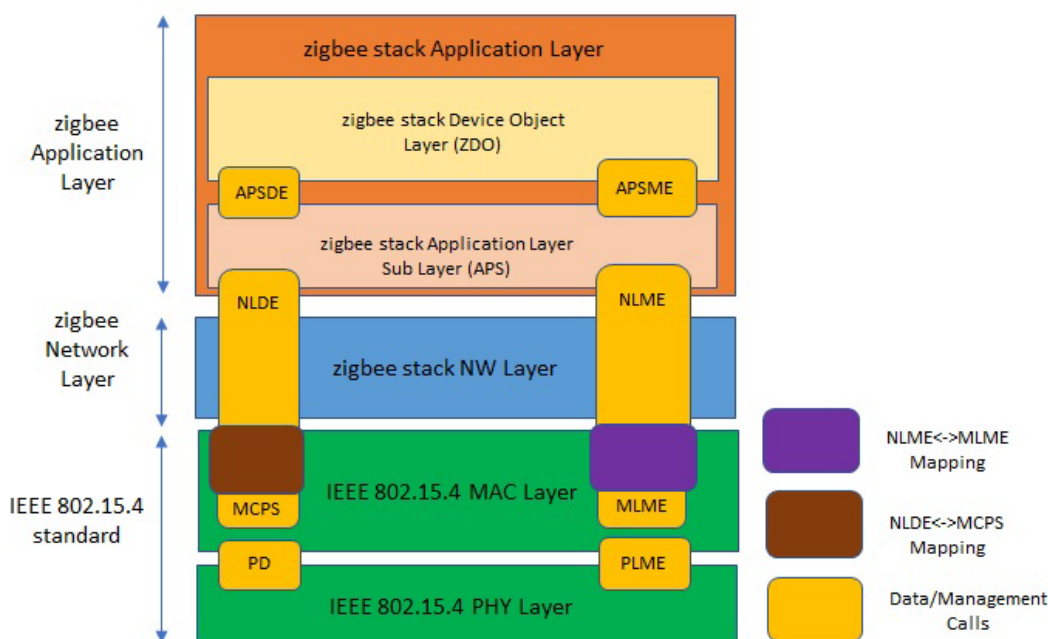
Zigbee porting on new microcontroller/RF chips mainly covers two major tasks.

- Mapping zigbee network layer calls with IEEE 802.15.4 MAC calls (i.e. MCPS, NLDE, MLME, NLME). This is the most challenging part of zigbee porting and requires proper planning.
- Mapping zigbee platform dependent modules with new platform.

Considering the challenges involved in zigbee porting, two most followed industry wide approaches are covered as below.

1 - Do not touch zigbee Stack and modify MAC calls

This approach requires changes in MAC's MCPS/MLME implementation as per zigbee network NLDE/NLME design. Figure provides an overview of this approach.



Advantages and Disadvantages of this approach are covered as below.

Advantages

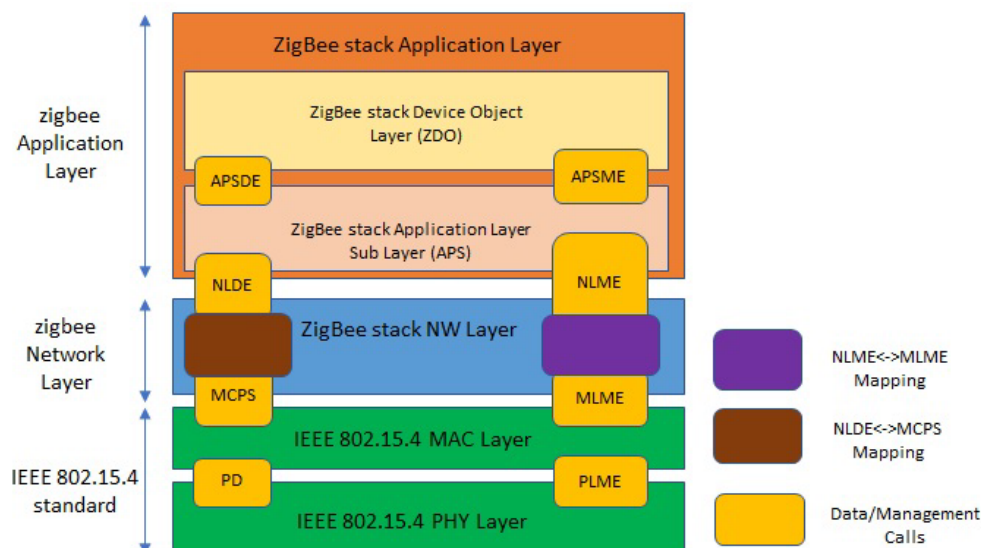
- Fewer chances of failure in ZigBee certification testing
- Zigbee stack remains unmodified
- Save overall porting effort and time
- Porting can be done without prior ZigBee stack experience

Disadvantages

- Changes required in MAC layer call sequence and design
- Porting not possible without prior MAC stack experience

2 - Do not touch MAC Stack and modify zigbee network layer calls

This approach requires changes in zigbee network NLDE/NLME implementation as per MAC MCPS/MLME design. Figure provides an overview of this approach.



Advantages and Disadvantages of this approach are covered as below.

Advantages

- MAC/PHY layer stack remains unmodified
- Porting can be completed without MAC/PHY source code

Disadvantages

- High chances of failure in zigbee certification testing
- Changes required in zigbee NW and Application layer stack
- Overall porting time gets increased
- Porting not possible without prior zigbee stack experience

Zigbee Certification

Zigbee certification is part of zigbee porting validation. All zigbee base products required to pass zigbee certification tests to ensure its conformance to zigbee standards and interoperability between different zigbee base devices.

Implementations

Today zigbee plays key a role in IoT solutions. Its applications include domains such as Healthcare, Consumer Electronics, Home Automation, Industrial Control and many more. In recent VOLANSYS case studies, it has offered zigbee based solutions to multiple clients cross varied industries.

Nishith Goswami
Principal Engineer
Volansys Technologies.

