

Z-WAVE TECHNOLOGY

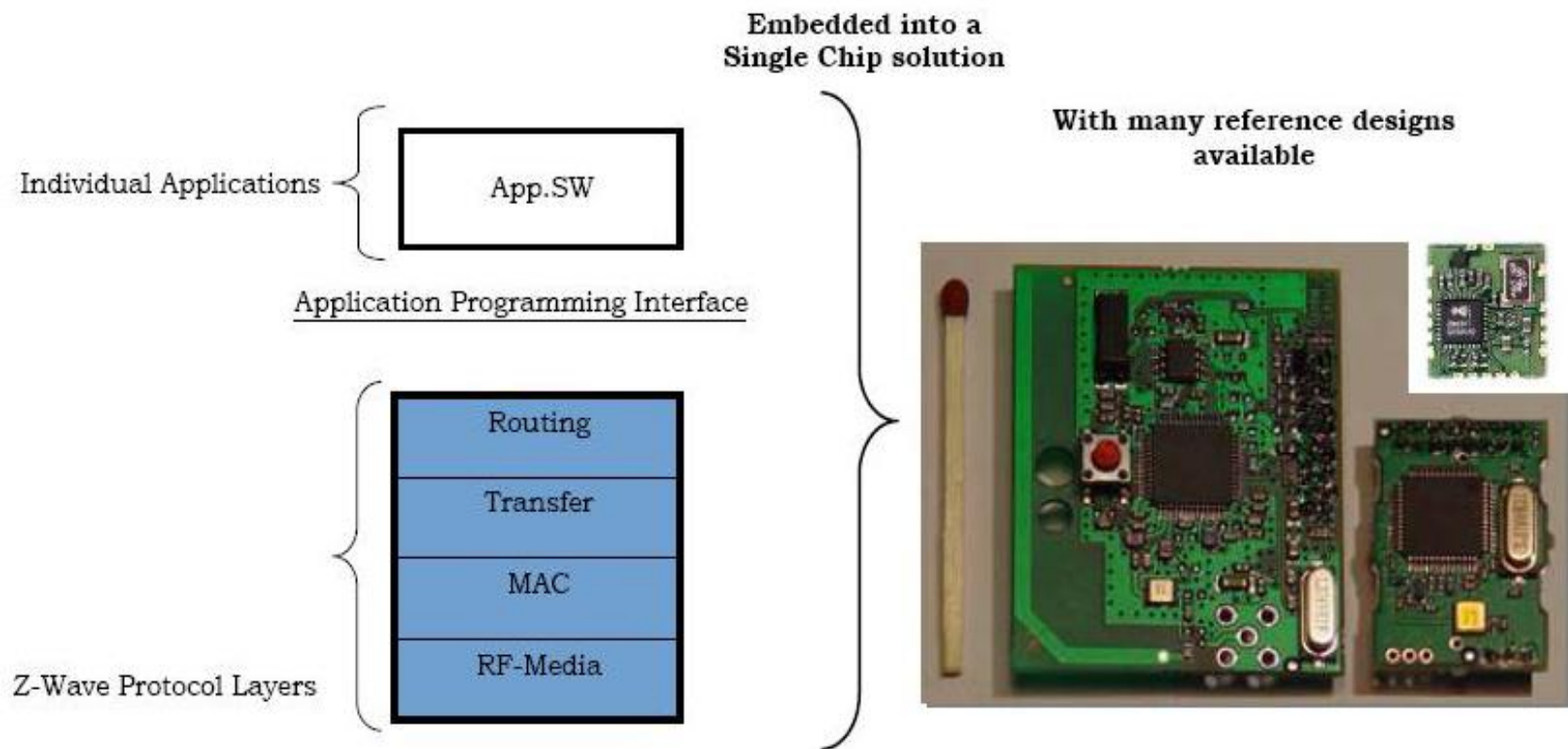
Compiled by :- Asst. Prof. Rashmi Pote

Reference - P.S.R.K Chaitanya(A1225)

INTRODUCTION

- Zensys a Danish-American company founded in 1999 invented the Z-wave technology.
- They are basically providers of Integrated Single chip Solutions. While trying to embed intelligence and RF communication into their products they stumbled upon the idea to produce a new technology combining the pros of the existing technologies.

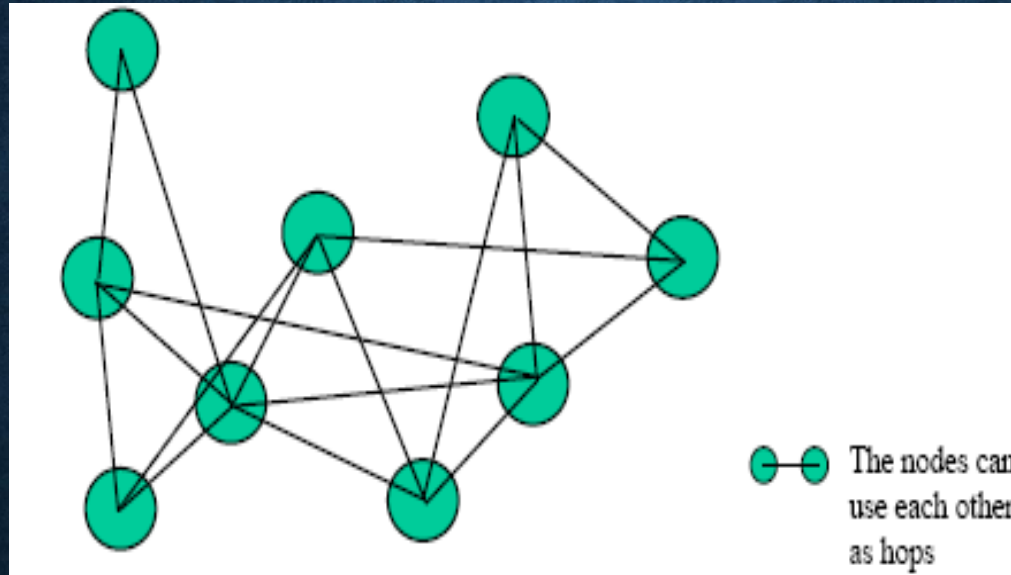
PROTOCOL LAYERS



Z-WAVE CHARACTERISTICS

- The Z-Wave Network is of the mesh architecture.
- Efficiency of the Z-Wave Network is because of the Routing Protocol it uses.
- More than one Z-Wave Network can co-exist.
- A Z-Wave network can consist of 232 nodes to the max.

TYPICAL Z-WAVE NETWORK

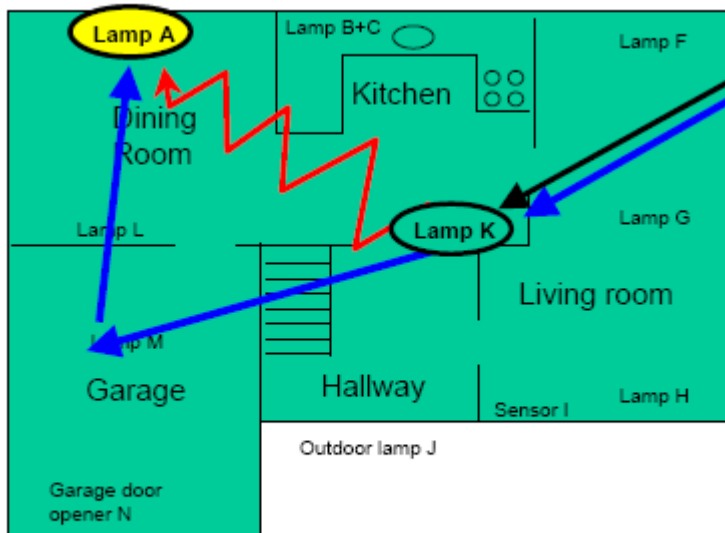


Note: Z-Wave networks devices manufactured by different companies are compatible with one another.

Z-WAVE PROTOCOL

- The first layer Application control SW is the OEM application SW like the thermostat, Sensor, Door, Lock etc.
- The routing layer uses the source routing algorithm and uses one of the Singlecast, Multicast, Broadcast, Routed Singlecast methods.
- The Transfer Layer uses the Locally Administered Addressing scheme with unique Home ID and Node ID.
- The MAC layer uses short frames of size 20-30 bytes while transmitting.
- The Z-Wave protocol uses checksum for error checking and ensure accurate data to be transferred.
- RF-signal used is of the frequency 868.42 MHz wideband FSK. In US it is 908.42MHz.

REAL LIFE EXAMPLE



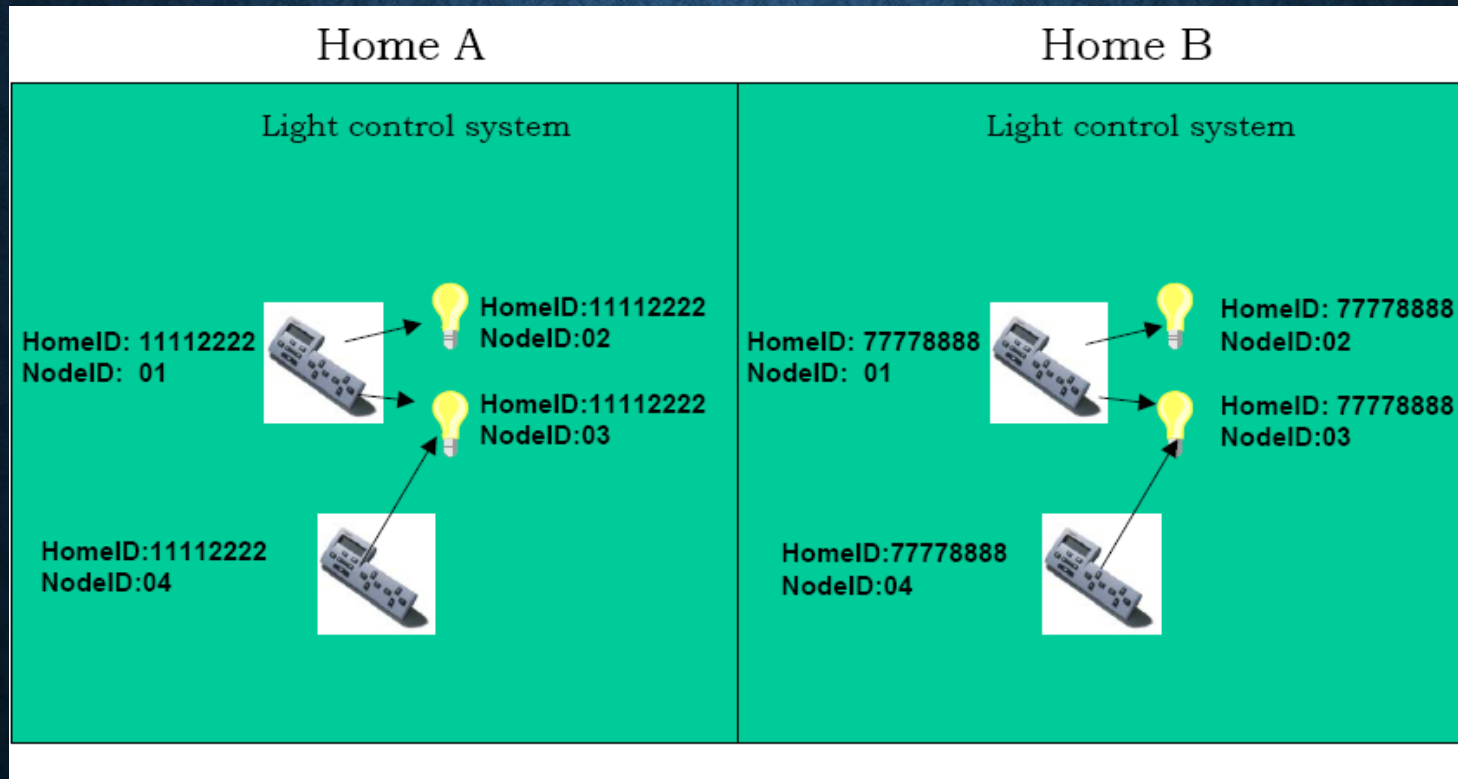
Suppose if a person wants to control the Lamp A from the living room the Lamp A can be reached either through the kitchen devices or the garage devices. If either of the routes is having a dead spot then the Z-wave uses the alternative node to control the Lamp A.

Note: A dead spot is a node through which the network is not completed due to its open state. The fridge maybe in repair condition and hence can be a dead spot.







Z-WAVE NETWORK ADDRESSING

- The Z-Wave protocol uses a 32-bit identifier to address the devices it controls. i.e. if a device needs to be controlled by a microcontroller then every device controlled by that microcontroller is assigned a common Home ID. Once the device is added to the network the device looks for other devices and adds them to the same network.
- When devices are being added to the network through devices that have already been added the device in turn return assigns the same Home ID but a different Node ID.
- The node ID is a 8 bit identifier.
- A device can be spotted by a microcontroller only if the Home ID on the microcontroller is same as the one on the device. Hence the path to be chosen by the microcontroller to send a signal is through devices which have the same Home ID only.
- When two different networks are present, they know each other are present but they are not interoperable.

TYPICAL NETWORK



Z-WAVE NODE ARCHETYPES

Archetypes	Illustration	Main Network System Functions
Controllers 		<ul style="list-style-type: none">• Have a complete topology map and can calculate routes• Can address all nodes in the network• Can act as repeater in the network• Can be portable or static in the network• Can have the added functionalities of Bridge and/or SUC + SIS
Routing Slaves 		<ul style="list-style-type: none">• Have a partial topology map and cannot calculate routes• Can address a subset of the network• Can act as a repeater in the network
Slaves 		<ul style="list-style-type: none">• Have no topology map and cannot calculate routes• Can only respond to requests from Controllers or Routing Slaves

NETWORK NODE TYPE CONTROLLERS

There are two types of controllers:

- Portable Controllers – Controllers those which can be moved around in a Network.
- Static Controllers – Controllers those which cannot be moved around in a Network.
- Bridge – Makes it possible for the Z-Wave to control up to 128 devices.

A “Virtual Node” is created by a Bridge which act as proxies for the non Z-Wave devices present on the other network which thereby can be controlled by the Z-Wave Network.

NOTE: A non Z-Wave Network can be imagined as a Bluetooth Network.

NETWORK NODE TYPES – ROUTING SLAVES

- Routing Slave is a AC powered which is present in a fixed location. It can receive commands and replies from/to all nodes. It can send unsolicited routed frames to up to 5 other nodes.
- Enhanced Slave is the same as a routing slave but can support an external EEPROM.

NETWORK NODE TYPES - SLAVES

- Slave – Must be in a fixed position and should be listening every time. It can receive commands and send reply using the same route.

TYPICAL NODE TYPE CONTROLLERS



A Portable
Controller



Static Controller



Bridge



Routing
Slave



Slave