

ZIGBEE® [802.15.4]

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TECHNOLOGY OVERVIEW

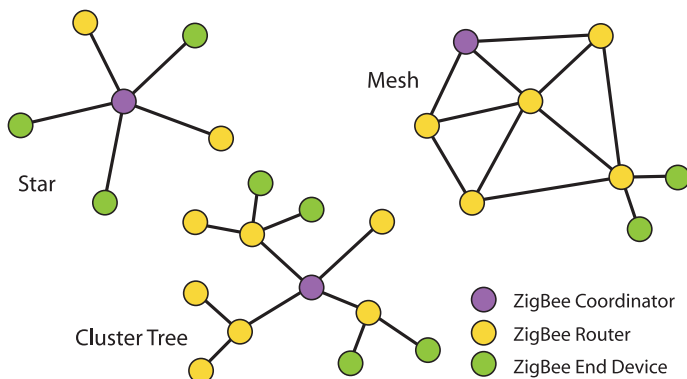
ZigBee® operates in the industrial, scientific, and medical (ISM) radio bands; 868 MHz in Europe, 915 MHz in the USA, and 2.4 GHz worldwide. It is a low-cost, low-power, wireless mesh networking standard. The low cost allows the technology to be widely deployed in wireless control and monitoring applications. The low power usage allows longer life with smaller batteries, and the mesh networking provides high reliability and larger range. The overall focus of ZigBee is to define a general-purpose, inexpensive, self-organizing, mesh network that can be used for industrial control, embedded sensing, medical data collection, smoke and intruder warning, building automation, home automation, etc. The ZigBee mesh networks can contain hundreds of nodes (64,000 nodes possible). Such networks permit messages to travel a number of different routes to get from one node to another, making a reliable network that is able to function independently of any particular individual node.

	Coverage	Data Rate	# of Channels
2.4 GHz	Worldwide	250 kbps	16
868 MHz	Europe	20 kbps	1
915 MHz	Americas	40 kbps	10

There are three different types of devices in a ZigBee network:

- ZigBee coordinator (ZC): As the most capable device, the coordinator forms the root of the network tree and might bridge to other networks. There is exactly one ZigBee coordinator in each network. It is able to store information about the network, and can act as the repository for security keys.
- ZigBee Router (ZR): Routers can act as an intermediate router, passing data from other devices.
- ZigBee End Device (ZED): Contains just enough functionality to talk to its parent node (either the coordinator or a router); it cannot relay data from other devices. It requires the least amount of memory, and therefore can be less expensive to manufacture than a ZR or ZC.

The resulting network will use very small amounts of power, so individual devices might run for a year or two using the originally installed battery.



The radios use direct-sequence spread spectrum coding, which is managed by the digital stream into the modulator. BPSK is used in the 868 MHz and 915 MHz bands, and the orthogonal QPSK that transmits two bits per symbol is used in the 2.4 GHz band. Transmission range is between 10 meters and 75 meters, although it is heavily dependent on the particular environment. The maximum output power of the radios is generally 0 dBm (1 mW). The basic channel access mode is “carrier sense, multiple access/collision avoidance” (CSMA/CA).

APPLICATIONS:

ZigBee protocols are intended for use in embedded applications requiring low data rates and low power consumption. ZigBee’s current focus is to define a general-purpose, inexpensive, self-organizing mesh network that can be used for industrial control, embedded sensing, medical data collection, smoke and intruder warning, building automation, home automation, etc. The resulting network will use very small amounts of power so individual devices might run for a year or two using the originally installed battery.

Typical application areas include:

- Home Entertainment and Control – Smart lighting, advanced temperature control, safety and security, movies, and music
- Home Awareness – Water sensors, power sensors, smoke and fire detectors, smart appliances, and access sensors
- Mobile Services – m-payment, m-monitoring and control, m-security and access control, m-healthcare, and tele-assist
- Commercial Building – Energy monitoring, HVAC, lighting, and access control
- Industrial Plant – Process control, asset management, environmental management, energy management, and industrial device control

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Please contact your local Arrow Electronics branch at **800-777-2776** for further information about technology, services, and solutions to meet your wireless, technical, and supply chain needs. If you’d like to learn what the ACES program could do for you, visit www.arrownac.com/ACES.