ZigBee

and 802.15.4 and other related wireless things

ZigBee: Overview

- Standard for high-level communications protocol for sensor systems, building control, automation, et cetera
- Built on top of 802.15.4
- Designed for microcontrollers and sensor nets (low complexity, low power)

Wireless Comparisons

	Wi-Fi	Bluetooth	ZigBee
Power	high (up to 1W)	moderate (mW)	low (mW to µW)
Setup Time	seconds	10+ seconds	milliseconds
Data Rates	54+ Mbps	1+ Mbps	250 kbps
Topology	star + roaming	star	mesh
Complexity	need OS, powerful CPU	moderate	simple to moderate

IEEE 802.15.4

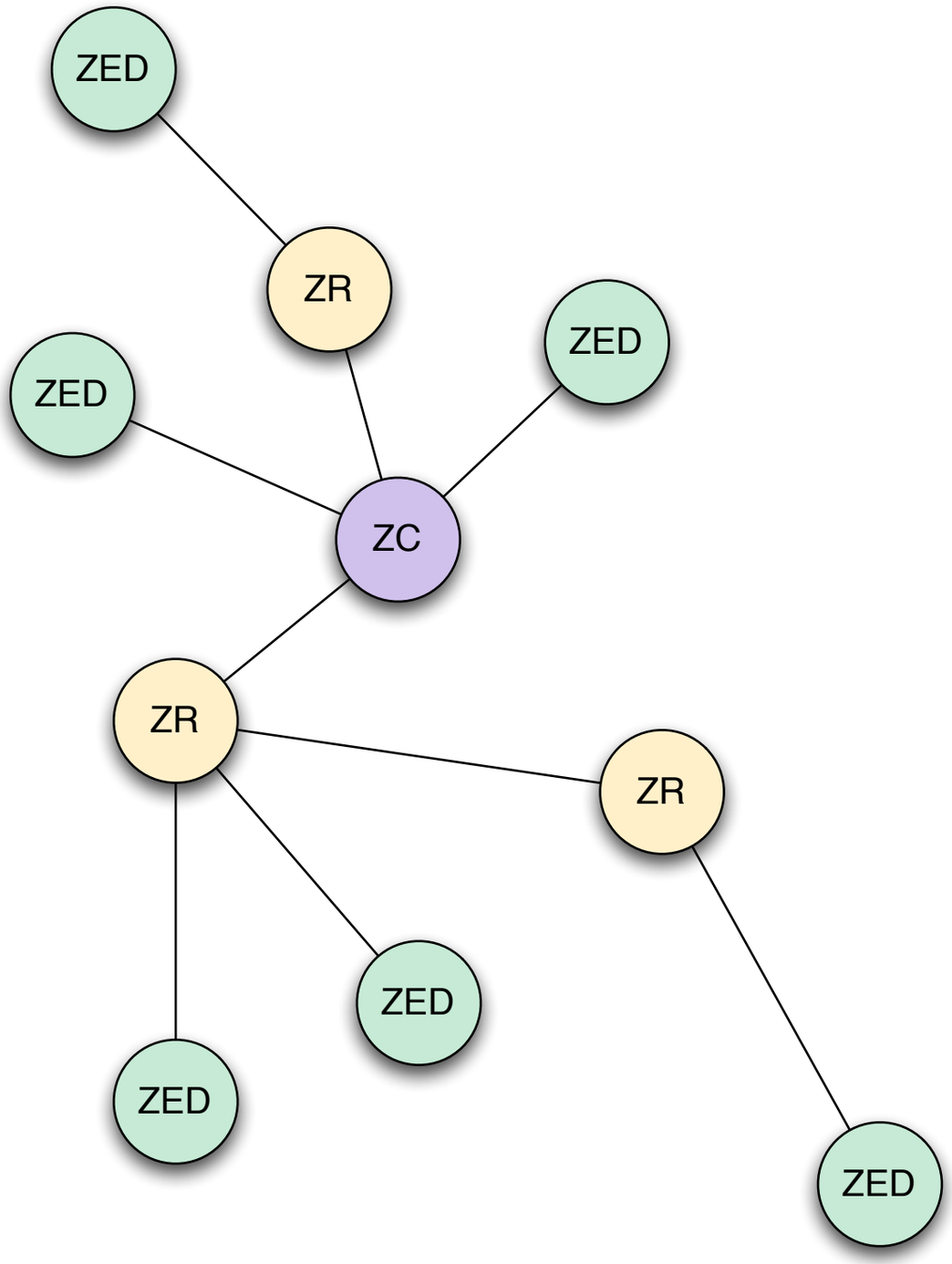
- wireless protocol that underlies ZigBee
- PHY+MAC
- 2.4 GHz / 900 MHz bands
- CSMA/CA, with ACK (reliability)
- 16-bit device and PAN IDs
- 128-byte frames

ZigBee

- higher-level protocols on top of 802.15.4
- adds meshing, security, dynamic addressing, endpoints, other nice things
- set of standards (‘application profiles’) for automation, smart energy, etc.
- standards available from zigbee.org for non-commercial use

ZigBee Node Types

- ZC (Coordinator)
- ZR (Router)
- ZED (End Device)

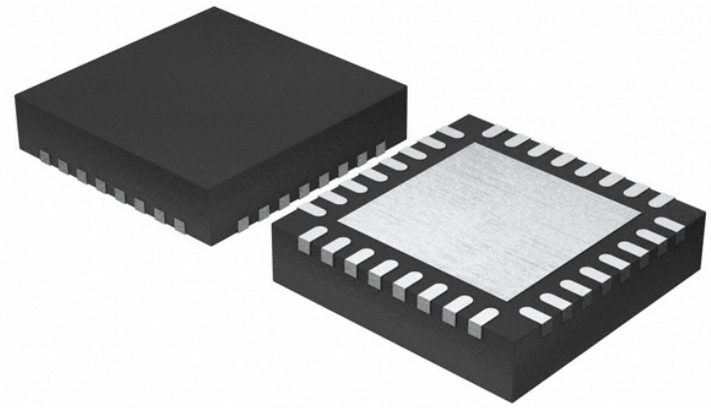


Implementations

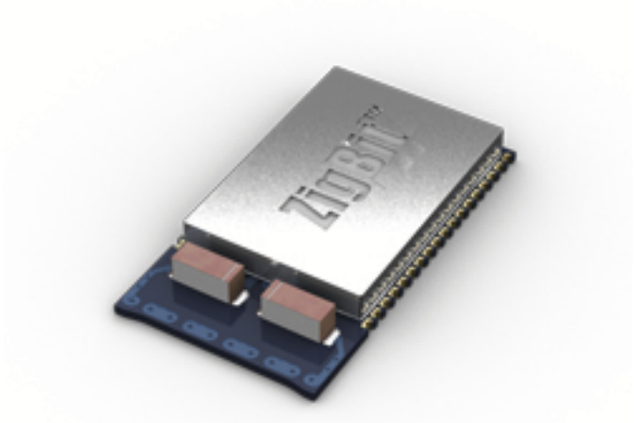
- Silicon provides PHY and most of the MAC (address filtering, auto ACK, etc.)
- Some solutions provide higher-level ZigBee support, either through software libraries or a dedicated μC
- Sometimes you have to write parts of this yourself—make sure you know what you're getting.

Implementations

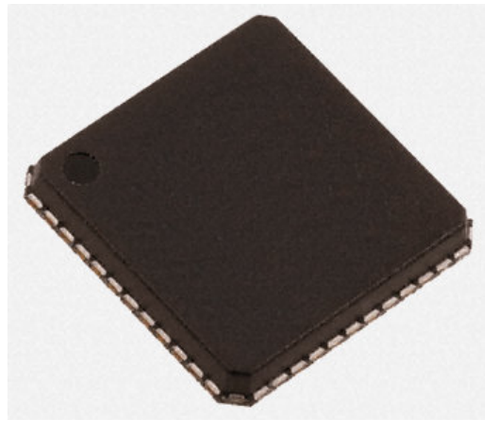
- Atmel AT86RF230
  (SPI interface)



- ZigBit modules
  (AVR µC + radio)



Implementations



- TI's ChipCon 24xx, 25xx radios
- ZACCEL (SPI interface, includes small µC to handle ZigBee)
- CC2430/1 (radio + MSP430)
- CC2530 (radio + 8051 + USB)

Implementations

- Digi XBee
- Series I are 802.15.4,
  Series II use ZigBee / ZB Pro
- Can be set up as point-to-point links, or with simple GPIO

Implementations

- Many others
- Ember, Freescale, ST Micro, and more