ZigBee™ Technology: Making Connections Everywhere

A world leader in both RF and microcontrollers, Freescale is superbly qualified to introduce a platform solution for devices enabled with ZigBee™ technology, a network layer protocol designed to use the IEEE® 802.15.4 standard. This standard specifies a cost-effective, low data rate (<250 kbps), 2.4 GHz or 868/928 MHz wireless technology for personal-area and device-to-device wireless networking. Freescale's ZigBee-enabled solution supports low data rates, low power consumption, security and reliability—for smart homes and offices with flexibility and seamless mobility, all without wires.

Freescale's ZigBee-Compliant Platform

Freescale's ZRP-1 is a comprehensive, scalable platform designed to reduce the amount of time and money OEMs and ODMs spend developing wireless products for a variety of monitoring, automation and control applications in home, medical and industrial environments. The platform enables cost-effective, low-power applications ranging from simple point-to-point proprietary networks to fully compliant ZigBee technology networks. It's a complete one-stop-shop, including the MC1319x family of transceivers, HCS08 8-bit family of microcontrollers, sensor ICs, software, and development tools.

ZRP-1 Platform Components

The MC13191, MC13192 and MC13193 can be used in a wide range of 2.4 GHz applications. Freescale's example Simple Media Access Controller (SMAC) software supports the MC13191. The SMAC and IEEE 802.15.4 standard-compliant Media Access Controller (MAC) software from Freescale supports the MC13192. In addition to the SMAC and 802.15.4 compliant MAC, the MC13193 includes the complete ZigBee protocol stack. The SMAC software provides a layer of simple primitives that controls basic transceiver activities. Applications based on the SMAC software can establish simple point-to-point or star proprietary network topologies. The IEEE 802.15.4 MAC allows creation of standards-based peer-to-peer and star network topologies. Adding ZigBee technology to the IEEE 802.15.4 MAC provides a solution for interoperable remote monitoring and control applications, with mesh and cluster tree networks.

Key Benefits

> Worldwide operability in the 2.4 GHz band, which Freescale's solution is designed to support, can simplify OEM product development and certification, minimizing the need to redesign a product for various markets or regions.

> Duty cycle and power conservation modes allow for long battery life, extending it to years, possibly decades. This enormous benefit helps to lower operating costs.

> ZigBee technology is designed to replace costly and complicated proprietary solutions currently on the market and is targeted at applications that already use an MCU. That translates into a small incremental cost for designs that only need to upgrade memory onboard the MCU, not redesign to include them.

> Freescale is first to sample with this solution, providing six to nine months lead time and fast time-to-market.

> ZigBee technology requires a smaller stack size than Bluetooth™ wireless technology. It occupies less memory on a chip, keeping costs low.

Reduce Development Time

In a rapidly evolving industry, accelerated development and deployment cycles are key to market success. Because it is standard-based, Freescale's ZigBee technology helps reduce development time for the OEM, and offers reliability, security, interoperability and certification. To help us achieve comprehensive network analysis, Freescale has cooperated with Daintree Networks, a leading provider of design verification and operational support tools for emerging wireless sensor and control devices and networks. Daintree Networks' professional tools help OEMs, system integrators and installers of wireless sensor and control networks speed their time to market and help make the design process easy and efficient.

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Learn More: For more information about Freescale's ZigBee-enabled solution, please visit **www.freescale.com/zigbee**.

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Sensor Network Analyzer

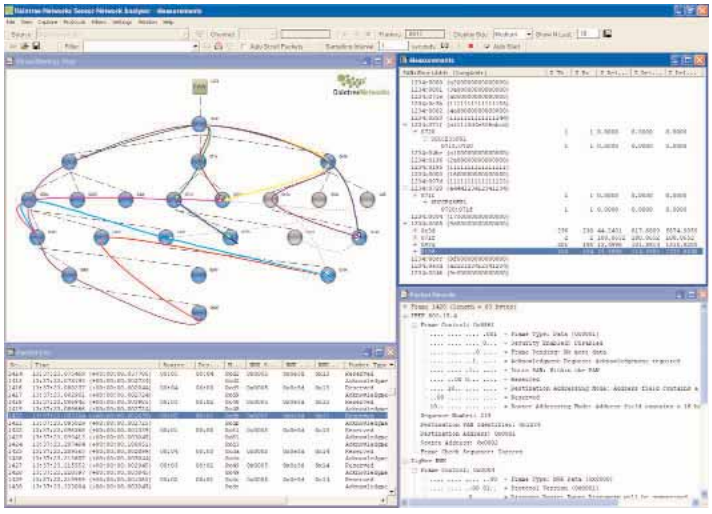
- Visualize and analyze IEEE 802.15.4/ZigBee networks
- Measure network, device and route performance
- Analyze and debug associated protocols
- Cross-reference visual, measurement and packet views for rapid troubleshooting
- Decrypt secure packets in any view
- Multi-node distributed sniffers for large networks

Packet-based protocol analysis is commonly used in the development and test of communications networks. However, wireless sensor networks such as 802.15.4 and ZigBee can be large networks generating many thousands or millions of packets over time for many applications simultaneously. They require new methods of analyzing the network, its connectivity and the sensor and control applications that rely upon it.

The Sensor Network Analyzer extends such traditional methods with powerful network analysis, including visualization of network topologies and information flows. The Sensor Network Analyzer is an essential tool for developers of wireless sensor networking technology and applications.

The Sensor Network Analyzer makes possible the analysis of lab-based and actual deployed networks. With multi-node capture, analysis of large and physically distributed networks is now possible.

With device tree visualization, the network structure may be analyzed and changes to the network structure can be observed. Overlaid on the same device tree are routes and application endpoint flows. These enable developers and implementers to rapidly determine how packets are flowing through the network, how alternate routes are used and to analyze end-to-end application-layer connectivity.



A measurement system also provides detailed measurements such as packet counts and latency, while traditional protocol analysis provides detailed packet-by-packet and field-by-field information, with powerful and easy-to-use filters to focus on relevant packets.

The Daintree Networks Sensor Network Adapter is a data capture accessory which acts as an observation point, enabling the use of Daintree's Sensor Network Analyzer software in live IEEE 802.15.4 and ZigBee network environments. The adapter provides both Ethernet and USB interfaces. The USB interface provides a simple connection to a host computer, enabling you to get up and running quickly with network and protocol analysis on compact networks. With the versatile Ethernet interface, multiple adapters may be placed locally or remotely to provide coordinated and time-stamp synchronized analysis of large and physically dispersed networks.

Sensor Network Analyzer System Requirements
Configure a Sensor Network Analyzer using Sensor Network Analyzer software, a host PC running Microsoft Windows® 2000 or Windows XP, and Sensor Network Adapters or supported third-party development system capture devices.

Partnering with Freescale
Daintree Networks' Sensor Network Analyzer will reduce your development time and cost with scalable visualization, measurement and analysis tools. A range of hardware devices enable comprehensive network analysis through passive observation from one or more vantage points. The Sensor Network Analyzer can be used with a range of third-party evaluation and development boards such as Freescale's. Development systems based on the 802.15.4 standard and Freescale's ZigBee-enabled solutions are supported.

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