Wireless Pneumatic Thermostat (WPT)
Server and Wireless Network FAQ
December 2008

Q. What is the topology used by WPT Wireless network?

A. The WPT wireless network uses a Hybrid Mesh topology that allows for repeaters to extend wireless transmission range, and provides multiple redundant communications paths to increase robustness. Wireless Thermostats connect to repeaters or hub in a star configuration, and the repeater network is a mesh, which optimizes overall battery usage and service life. See Figure I.

Q. What is a Wireless Pneumatic Thermostat (WPT) Hub/Server?

A. The WPT Hub/Server is a wireless hub which communicates with the wireless thermostats deployed in a building. The Server runs Microsoft Windows XP/Pro (SP3), and has Internet Information Services and SQL Server running on it. When connected to a LAN, it provides a user interface for building operators to monitor temperatures and control setpoints using a simple web browser.

Q. How many Thermostats can a WPT Hub/Server communicate with?

A. Typically from 70 to 200 depending on the size of the building. If the building is physically large and dispersed, we would segment the building into different areas and put a server for each area.

Q. What is the wireless technology used in the WPT?

A. The WPT uses Cypress Semiconductor's proprietary WirelessUSB technology. The radios are 2.4GHz Direct Sequence Spread Spectrum (DSSS) which use the ISM band of frequencies from 2.407 to 2.467 GHz. It supports a peak data rate of 250kbps in DSSS, Gaussian Frequency-Shift Keying (GFSK) mode.

Q. Why do we use Cypress Semiconductor's wireless technology?

A. The WirelessUSB technology is a proven technology which was first introduced in 2001, and has over 26 million nodes deployed worldwide. It was initially used in wireless keyboards and mice, and later on extended to industrial and commercial applications. It is optimized for lower power use, and very high interference immunity, and has been deployed in many industrial and commercial sites globally. References are available on request.

Q. What is the RF transmit output power of the WPT?

A. The peak output power is +20dBm (100mW).

Q. Does the WPT radio cause interference with other existing wireless devices?

A. Extensive testing has shown that our wireless solution has no discernable impact on other wireless technologies, such as Bluetooth and Wi-Fi. One of the key reasons is the low duty cycle of 1/60000. The WPT only transmits for 1ms out of every 60 seconds maximum. Most applications transmit only 1ms every 15 minutes. Another reason is that the WPT radios detect the presence of RF energy from other sources, and automatically change channels to find a part of the spectrum that is unused.

Q. What is the operating range of WPT?

A. The operating range of the WPT is mainly dependant on the installation site and its RF environment. However as a general guideline the typical ranges that can be obtained are:

1. Line of Sight (LOS) in open spaces - 400 to 600 meters.
2. Non-line of Sight (NLOS) in buildings, industrial and commercial environment - 30 to 50 meters. These are only indicative values; the actual ranges vary from site to site and time to time depending on many variable elements such as RF interference and RF obstacles.

Q. What is the battery life for WPT?

A. For a typical use of 4 setpoint changes per day and 30 minute update interval, estimated battery life is approximately 2 years. Less frequent setpoint changes and longer update intervals can extend the battery life to 4 years.

Figure I – Overview of Cypress Envirosystems Wireless Topology

- The WPT Hub has a built-in web based user interface for configuration and basic operations
- The WPT Hub may also be connected to existing automation systems via BACnet/IP using a simple CAT 5 Ethernet cable
- BACnet compatible controllers (e.g. JCI Network Integration Engine) can gather data points and control setpoints, and provide a user interfcae
- Users do not need a separate operator station or learn a new interface.

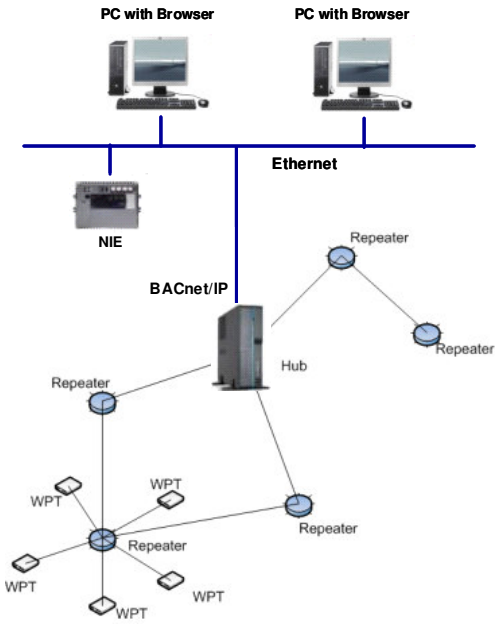

Figure II – Selected Customers Using
Cypress wireless technology for Commercial or Industrial applications

Figure III – Selected Wireless Customer References for Santa Clara County Project

- David Wolf - General Manager, Wolf Mechanical. Main contractor and facilities manager for NVIDIA office in Santa Clara. Uses Wireless Pneumatic Thermostats since August 2008. (408) 910-6873

- Tim Danz - Chief Engineer for 345 California Place in San Francisco. Works for Able Engineering, is Chief Engineer for 45 story building managed by Cushman and Wakefield. He uses Wireless Pneumatic Thermostat since December 2008. (415) 286-3362

- Barkley Flynn - Manager, Genentech Inc. (biotechnology manufacturer). He uses industrial wireless instrumentation from Cypress to monitor Air Handlers and other utilities equipment since January 2008. (650) 580-3670

- Ron Farry - Equipment Maintenance Manager, Micrel Inc. (semiconductor Fab based in San Jose). He uses industrial wireless instrumentation from Cypress since November 2007. (408) 955-1694

- Ted Berg - Engineering Associate, Stanford University Center for Integrated Systems. He uses industrial wireless instrumentation from Cypress since November 2007, in probably the most challenging wireless site we have. (650) 725-9340