

Charting a Course to Energy Independence

Providence, RI
August 9-12, 2009

New Technology In Building
Automation Systems
Wireless





New Technology In Building Automation Systems

- Topics
 - Wireless -
 - Sensing/Measurement
 - Control – Start/stop
 - Networks – Building to building



Wireless Sensing: Cost-effective & Flexible

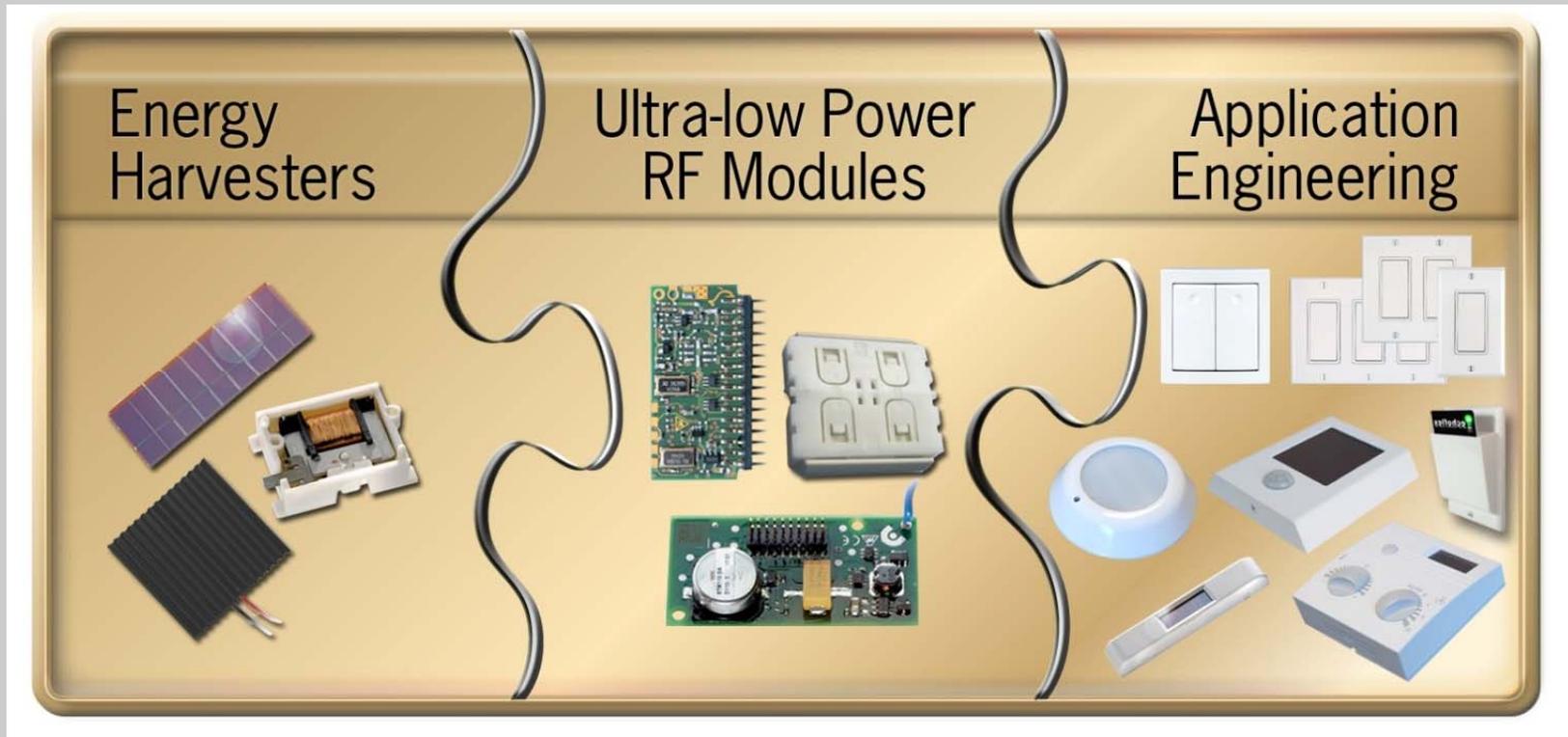
Wireless Standard for Sustainable Buildings

- Application Wireless sensing of values, status and switches





Self-Powered Wireless Sensing



- **Sensors powered by tiny environmental changes**
Light, Temperature & Mechanical Energy



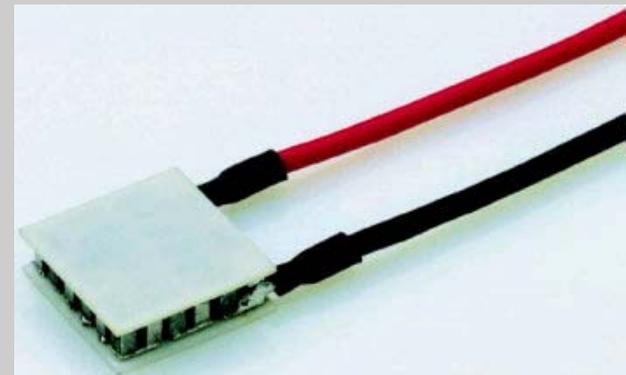
Wireless Sensing Energy Harvesting

Sources of Energy

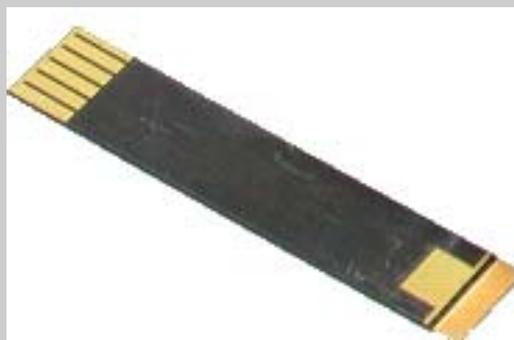
- linear motion
- light
- vibration
- temperature gradient
- rotation
- pneumatic pressure
- electromagnetic noise
- muscle contraction
- etc.



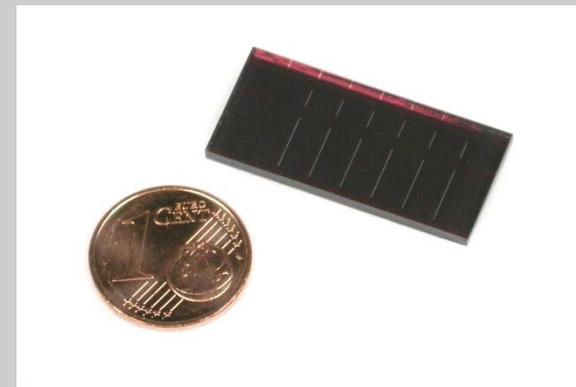
coil & magnet:
linear motion



peltier element:
temperature difference 4K



piezo element:
vibration



mini solar cell:
light



The Wireless Battery-less Solution

Network:

LONWORKS or BACnet



Wireless Communication to Controller

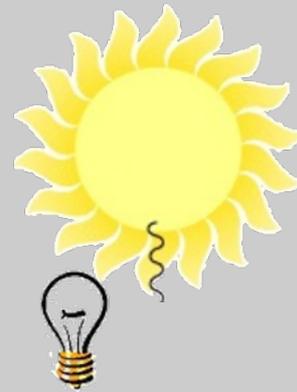
100 ft



Battery-less: Energy Harvesting



Piezo element: Vibration



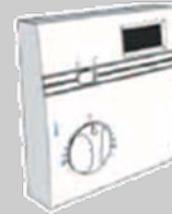
Solar cell: Light

- Sensors - Solar cell /capacitor for 2-3 day energy storage
- Illumination of 200 lx for at least 3-4 hrs/day
- Switches- Piezo power generator
- Practical Range 30-40 meters indoors
- Secure transmissions with 32-bit sender ID using 868 or 315 MHz band



Available Wireless Battery-less Devices

- Room temperature
- Fan speed
- Humidity
- Light level – lux
- Occupancy detection
- Light switches
- Outside air temperature
- Duct temperature
- Cable temperature
- Contact temperature
- Window/door contact
- Manual override





Wireless Sensing - Easy Configuration and Commissioning

The screenshot displays the Distech Controls ECC-VAVS Configuration software interface. The main window is titled "Distech Controls, Inc." and shows a "Sensor Input" list on the left. The "Smart Sensor" tab is selected, and a "Warning: Smart Sensor and Wireless cannot be configured simultaneously on this device" is displayed. The "Hardware Input" section shows a list of inputs, with "SPACE_TEMP" selected for input 1. The "Module Configuration" dialog box is open, showing the "ID" field set to "0000544d" and the "Type" set to "RF_TP_SP_OV_SENSOR". The "Module Manager" dialog box is also open, showing the "Learned Modules" list with one entry: "1 0009c44b". The "Registered Modules" list contains various sensor types, including "RF_TP_SP_OV_SENSOR". The "Status" field indicates "Learning modules ...".

- Easy & quick setup
- Same application as the standard sensors
- No mesh networks to set up

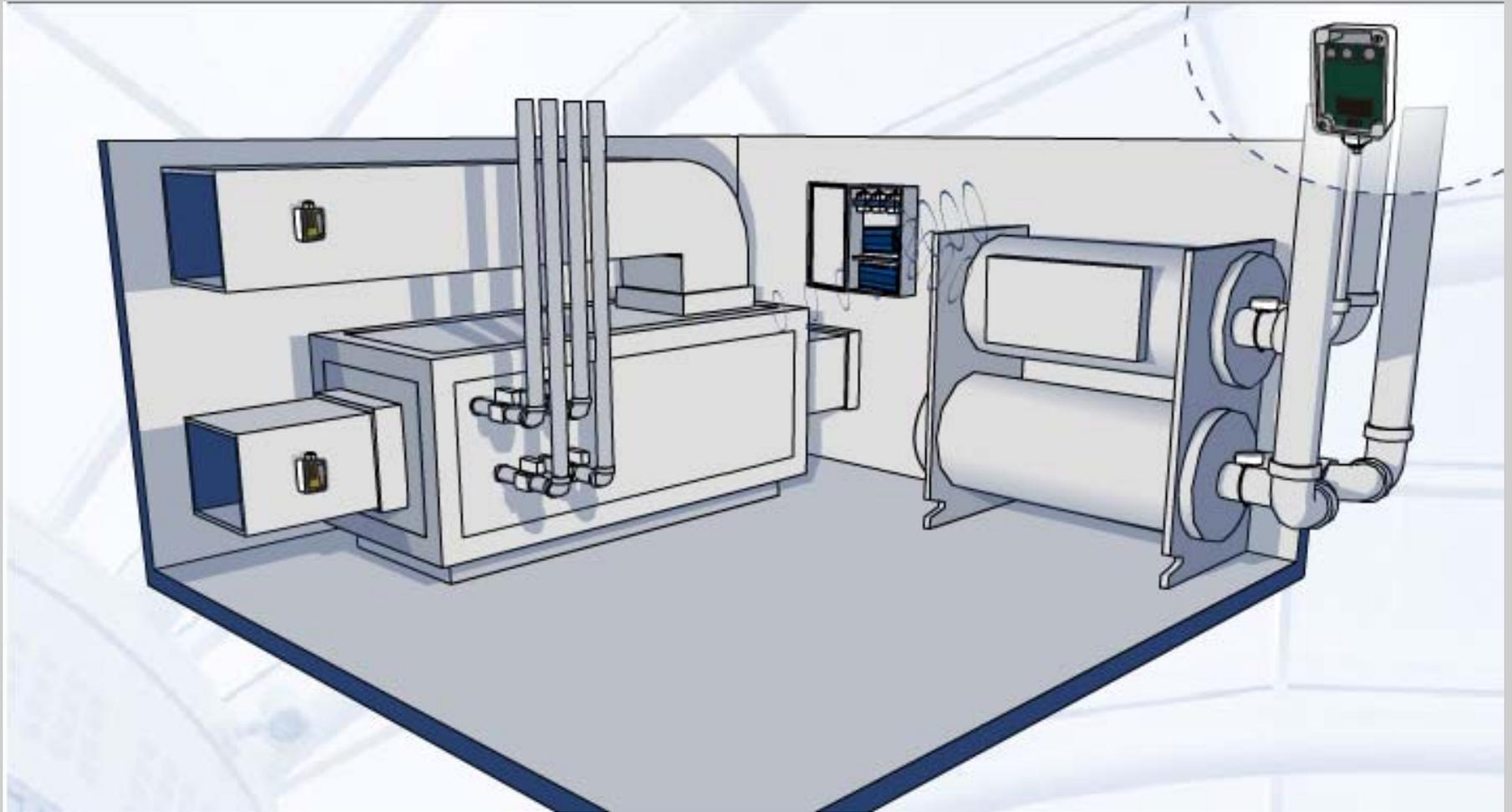


Applications : Office





Applications : Mechanical Room





Wireless Control



- Start Stop Control
 - Fans, Lights, Pumps, Small HVAC loads
- Makes Use of the EnOcean Technology
- Connects to the DO of the Controller
 - Transmits signal to the Relay receiver
 - Can have Wireless status inputs

Wireless Solutions

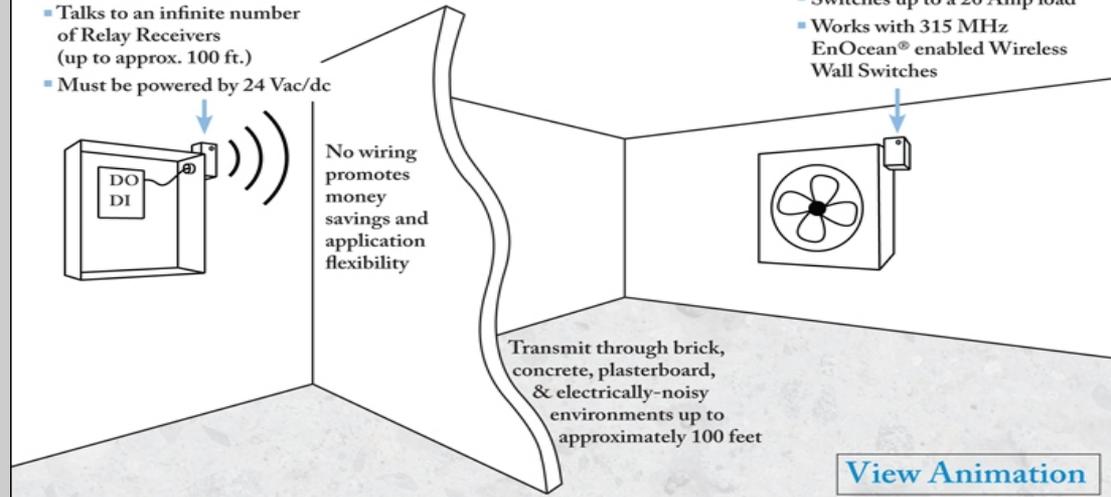
Wireless Transmission from Controller

One-Way Transmitter

- Use with BAS or Lighting Controller's Output
 - 24 Vac/dc
 - Analog (5-25 Vac/dc)
 - Dry Contact
- EnOcean® enabled for 315 MHz transmissions
- Talks to an infinite number of Relay Receivers (up to approx. 100 ft.)
- Must be powered by 24 Vac/dc

Relay Receiver

- Switches up to a 20 Amp load
- Works with 315 MHz EnOcean® enabled Wireless Wall Switches



[View Animation](#)



RIBWE24TDC-EN
One-Way Transmitter
Data Sheet



RIBW01B-EN
RIBW277B-EN
Relay Receivers
Data Sheet



WST-EN
Wall Switches
Data Sheet





EnOcean Alliance – Eco-System

Creating an Open Solution

- 110 Member Companies
- 80 OEMs offering end-products
- 400 Interoperable products
- Interoperability
 - Across OEM, Application





Wireless Sensing in Use

- Readily mounted on any wall or surface
- Easy and cost effective relocation
- Use of green technology – no batteries
- Eliminate time and expenses of electrical installs.
- Helps eliminate design errors
- Easy, low-cost relocation
- No disturbance to tenants caused by noise, dust etc.
- Better management of job cost and schedule



Hospitals



Schools, Colleges & Nurseries



Office Tower Buildings & Corporate HQs



Hospitality



Hard to wire locations



Industrial Plants



Questions On Wireless Sensing



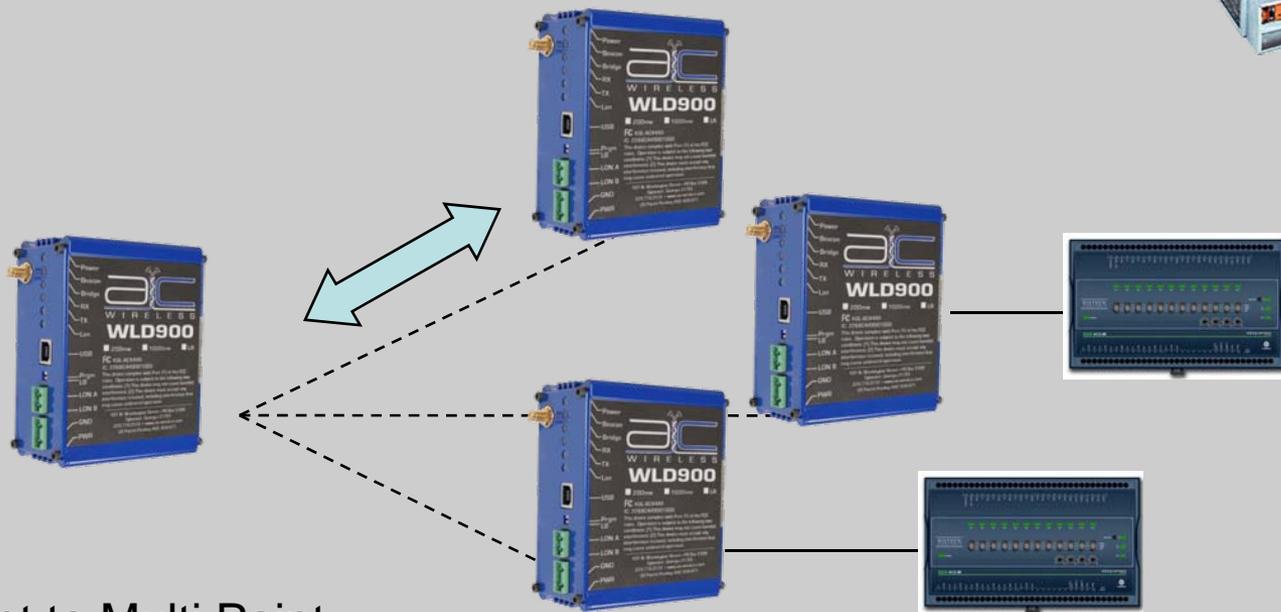
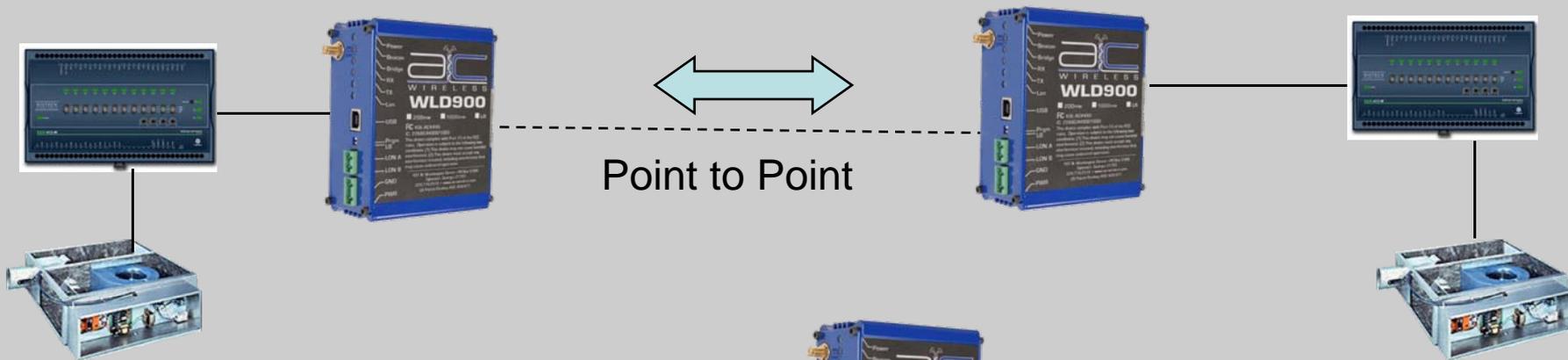


Building Automation System Wireless Networks RF

- Short range communication between Buildings Control Networks
- Application – no Ethernet communication
- Range – 6 Miles or less practical range
- 900mhz – 2.4 GHZ frequency hopping
- Extends Networks
 - LonWorks
 - Bacnet
 - ModBus
 - Ethernet



Wireless Network Topology Designs





Point to Multipoint Example



Ilon Smart Server



HVAC Building Controls

Server Radio



Client Radio



Wireless LonWorks

Wireless LonWorks

Client Radio



Water Meter

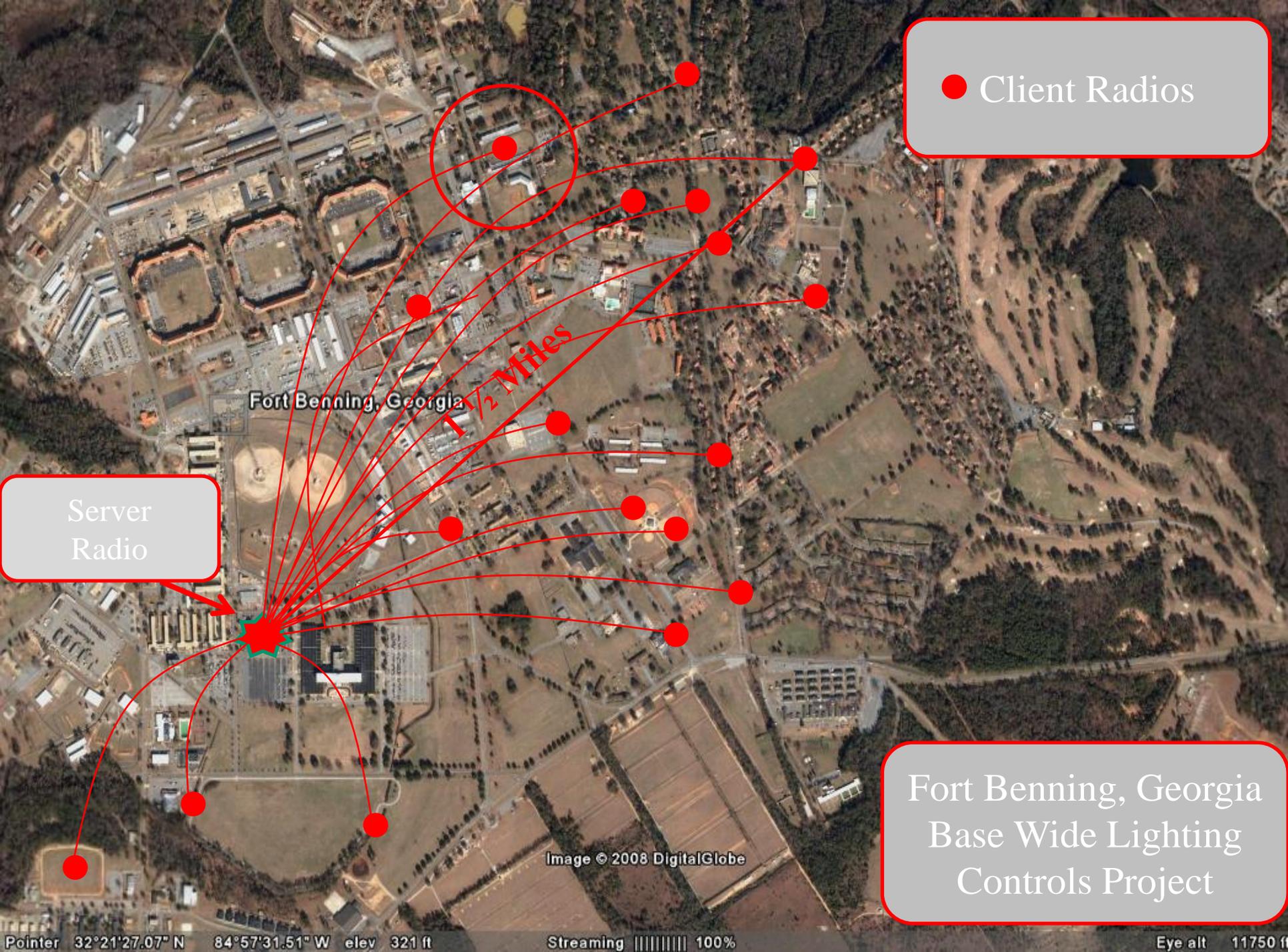


Wattnode Electric Meter



Lighting Controls





● Client Radios

Server
Radio

Fort Benning, Georgia
Base Wide Lighting
Controls Project

Fort Benning, Georgia

1/2 Miles

Image © 2008 DigitalGlobe

Pointer 32°21'27.07" N 84°57'31.51" W elev 321 ft

Streaming ||||| 100%

Eye alt 11750 ft

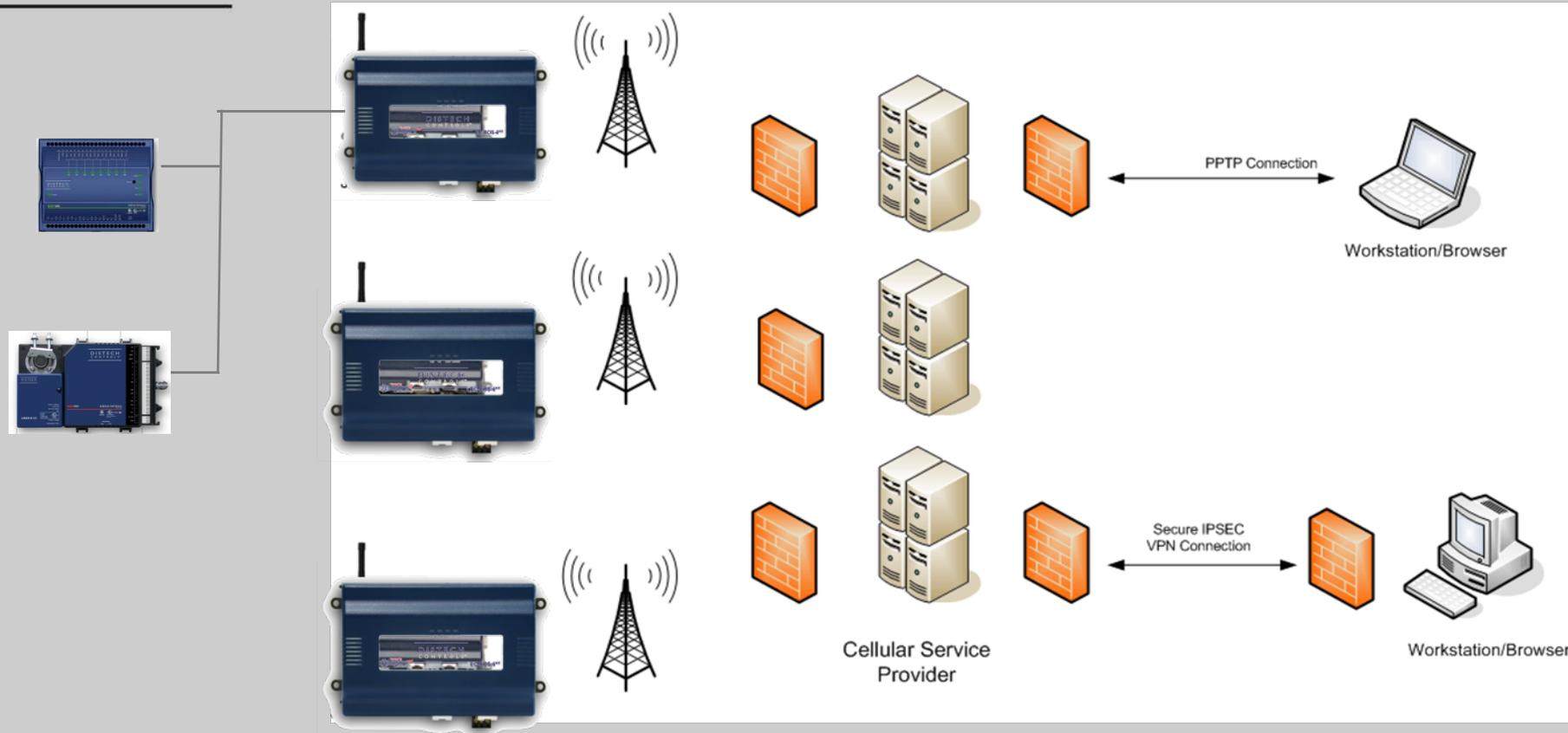


Questions On Wireless RF Networks





Wireless Networks Cellular GPRS Modem

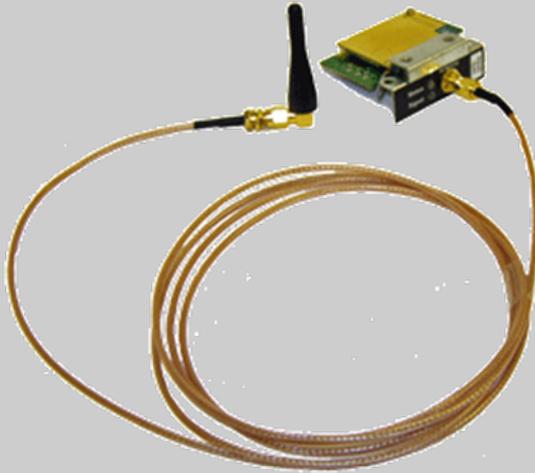


- Application – Long range communication between buildings when Ethernet communication is not available

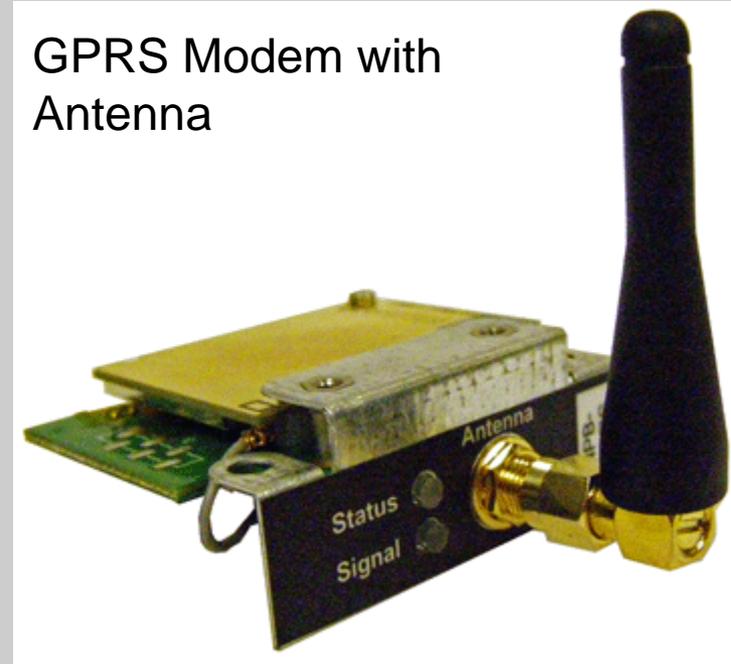


GPRS Modem

Technical Details



GPRS Modem with
Optional Antenna Extension



GPRS Modem with
Antenna



Questions On Wireless GPRS Networks





Information Sources

- Wireless Sensing
 - EnOcean.com
 - EnOcean-alliance.org
 - Distech-controls.com
- Wireless Networks
 - Distech-controls.com
 - Aic-wireless.com
- Patrick Winkelman
wink@distech-controls.com
727-781-9610