Wireless Modem Overview

Basics

http://www.teledesignsystems.com/wireless_modems.html

Industrial wireless modem is a heavy-duty, high-quality device that accesses a private wireless data network or a wireless telephone system. It accepts serial data (typically using RS-232, RS-422, or RS-485 standards) and transmits it without wires to another device which receives and coverts it. Data is sent from one end to the other as if there were a cable.

Industrial wireless modems use electromagnetic waves to transmit modulated data. This is done using radio modems as access points. Radio modems are radio frequency transceivers for serial data. They transmit to and receive signals from another matching radio modem. Access points are various junctures in the network that enable wireless network connectivity.

Industrial wireless technology has made it possible that processes can be monitored and data can be collated from a remote location. The developments have almost made day-to-day operations independent of human supervision. Today, the applications of wireless technology have entered every sphere of activity.

An assembly of transmitter, receivers, sensors, wireless media, etc. is deployed to study various parameters of natural resources. Research organizations and government agencies use these remote data collection systems.

For real-time monitoring applications, data can be posted to the Internet and easily made available using standard web browsers.

Radio data acquisition systems allow a facility to maintain monitoring stations in remote areas and create large networks of industrial environmental sensors. Data regarding various environmental conditions is collected and then further used for study and research. Data can retrieved instantly by connecting monitoring instruments to a PC equipped with data loggers.

Water data collection: Data collection systems are installed at remote water bodies in order to study and analyze them. Quality sensors are used to constantly watch the planet's vast water resources. These systems usually monitor the following parameters:

- Water flow-water data collection
- Water level-water data collection
- Hydro-electric oxygen
- Temperature-water data collection
- Conductivity-water data collection
- Dissolved oxygen

- pH-water data collection
- Turbidity-water data collection

Oil and gas data collection: Efficiency and safety are often perquisitesa for the oil and gas industry. A constant keen monitoring is required as oil and gas plants are usually located in remote areas or at sea. It is highly desired that such sites be equipped with monitoring, alarming and controlling devices. SCADA systems, implemented using industrial wireless modem technology, play a vital role in this area. Some key oil and gas data collection applications include:

- Detection of overflowing storage tanks-oil and gas data collection
- Detection of compressor failure-oil and gas data collection
- Detection of corrosion in transmission pipelines
- Production automation-oil and gas data collection
- Efficient, error free, real-time, centralized data collection
- Wireless data services and GPs to keep track of service vehicles used for maintenance
- Environment data collection

Advantages of a Wireless Modem

- Wireless modem offers greater extensibility as it allows users to share and extend the Cable/DSL/phone connection anywhere.
- These industrial modems significantly reduce the cost and time otherwise required in Ethernet cabling.
- Wireless modems assure mobility as they offer user the freedom to work on devices such as laptop or PDAs form home or office or from anywhere.
- Wireless modems, whether it is for a laptop modem or Internet modem or cell modem, are easy to install.
- Improved Efficiency – Industrial wireless modems share computer peripherals and data files from anywhere within wireless network for greater efficiency.
- Industrial wireless modems also make data communication possible from places, which are not easily accessible or are dangerous to humans.

Important specifications for wireless radio modems

- Data transfer speed: the maximum rate of data transfer modem can accommodate.
- Network type: includes Ethernet, CPCD, ISDN, GSM, and GPRS etc
- Bus or interface type: includes Type III card, PCI, Firewire and USB etc
- Number of channels: refers to the number of transmitting and receiving channels the device has.
- Maximum output power: is the transmission power of the device
- Full duplex transmission: can transmit and receive signals at the same time.

Radio Link specifications: to consider when selecting wireless modems include

- Frequency band: can be 900 MHz, 2.4 GHz, 5 GHz, 23 GHz, VHF, and UHF.
- Radio technique: direct sequence spread spectrum or frequency hopping spread spectrum.

RADIO MODEMS

Industrial radio modems encode, transmit and decode the data. They use radio waves for data transmission. And this medium of transmission gives user a lot of advantage over the wired data transfer. Radio models operate in a similar fashion to your radio station. There are three stages of communication:

- Data encoding: Transmitting radio modem takes data from the source system and encodes it
- Data transmission: Once encoded, the transmitting radio modem transmits the encoded data as radio waves with certain pre-defined frequency (Just like our radio station broadcasts the program)
- Data Reception: The receiving radio modem receives the radio waves transmitted on the pre-defined frequency (like our radio instrument), decodes the data to its original format and provides it to the connected device

Most radio modems have RS232, RS485 or RS422 ports for communicating with the devices they are connected with.

Applications of radio modems are limited just by imagination. Today radio modems are used in video security applications to mining applications and from oil and gas platforms to sports. Here are some examples, which can help you visualize how you can make best use of radio modem technology:

- Video surveillance: Wired connectivity of video cameras used for surveillance systems in large, widespread geographic area has limitations. It is costly and difficult to maintain. Radio modems overcome this limitation. They transmit video surveillance information in the form of radio waves to central surveillance unit, where another radio modem receives it and decodes it. It saves huge wiring expense and maintenance costs.
- Mining: Mining is possibly the biggest industry using industrial radio modem communication. Radio modems find many applications in mining such as data communication between moving units to centralized data center, automated ore processing and water treatment applications.
- Oil Platforms: Wired data communication between offshore oil platforms and land based control units can be very expensive and difficult to maintain. Radio modems are used extensively for oil data acquisition systems.
- Sports: Sports are also not far behind in using radio modem technology. Long distance outdoor sports such as marathons, cycle races, and car rallies use of radio modems to keep track of participants at every crucial location.

Though radio modems offer a great promise to the industrial world, they also come with technical limitations. The prominent factors affecting the performance of radio modems include:

- Transmitter power: The distance for which the receiving radio modem can receive the radio waves without any loss of data
- Receiver sensitivity: How sensitive is the receiving modem to catch faintest radio signals?
- Battery life: For how much time a radio model can function without changing or recharging the batteries?
- Terrain: Can the selected radio modem work on uneven terrain or does it require line of visibility to receive the radio signals?
- Antenna height: Antenna height can be a problem when radio modems are used in the cramped space or when a moving person carries them.
- Antenna feeder cable loss: how much power is lost while transmitting or receiving data from or to the antenna through the cable?

http://www.globalspec.com/learnmore/communications_networking/networking_equipment/wireless_radio_modems

General specifications that are important to consider when searching for wireless modems include form factor, modem speed, network type, and bus or interface type. There are two basic types of modems: internal modems (computer cards that are installed in a slot of the motherboard of a computer) and external modems (a module that attaches to a computer's communications port via a cable.) Modem speed is the maximum data transfer rate at which the modem can deliver data. It is normally expressed in bits/second. Choices for network type for wireless modems include dial-up, Ethernet, AMPS, CPCD, GSM, ISDN, PAN, and GPRS. Common bus or interface types include Type II card, Type III card, CardBus, ISA, PCI, FireWire (IEEE 1394), MIC, RJ-45, SC, ISDN BRI S/T interface, ISDN BRI U interface, serial ports (RS232, RS422, RS485), ST, USB, and PLC slot mount.

Important radio link specifications to consider when selecting wireless modems include frequency band and radio technique. The frequency band on wireless modems can be 900 MHz, 2.4 GHz, 5 GHz, 23 GHz, VHF, and UHF. Choices for radio technique include direct sequence spread spectrum and frequency hopping spread spectrum. Spread spectrum is a technique that is used to reduce the impact of localized frequency interferences. To achieve this, it uses more bandwidth than the system needs. There are two main spread spectrum modalities: direct sequence and frequency hopping. The principle of direct sequence spreads the signal on a larger band by multiplexing it with a code (signature) to minimize localized interference and noise. The system works over a large band. To spread the signal, each bit is modulated by a code. Frequency hopping uses a technique where the signal walks through a set of narrow channels in sequence. The transmission frequency band is divided in certain number of channels, and periodically the system hop to a new channel, following a predetermined cyclic hopping pattern. The system avoids interference by never staying in the same channel a long period of time.

Important performance specifications to consider when searching for wireless modems include number of channels, maximum output power, and full duplex transmission. The number of channels refers to the number of transmitting and receiving channels of the device. The maximum output power is the transmission power of the device. It is defined as the strength of the signals emitted, often measured in mW. Full duplex devices can transmit and receive at the same time. Two common features for wireless

modems include antennas and RF connectors. An antenna may or may not be an integral part of the modem. Some wireless modems include an RF connector that can be used to connect an antenna, or any other suitable RF device. Type of connectors: BNC, TNC, N, etc.

Security

https://ics-cert.us-cert.gov/sites/default/files/recommended_practices/SecuringModems.pdf

(https://isc.sans.edu/diary/ADSL+Router++Cable+Modem++Home+Wireless+AP+Hardening+in+5+Steps/4282)

1) Change the default passwords, preferably to a strong password (at least 8 characters the include upper/lower case, numbers, special characters). Many of these devices ship with a password of "password" or "admin" and that is just asking for someone to kick over your router.

2) Update the firmware. Check the support site of the vendor of the device when you get it and check for an update. Sign up for e-mail alerts for updates, if available, or check back on a regular basis for updates.