Application Note

Using Digi® Cellular Gateways as Backhaul for MaxStream® Wireless Networks

Overview

This application note discusses the benefits of combining Digi cellular gateways/routers with MaxStream wireless networking products to create integrated, low cost end-to-end wireless data connections from a remote location to a central office. It includes sample applications, integration instructions, product overviews and benefits.

© 2006 Digi International Inc.

Business Need
Customer has a local network of devices that needs to communicate from a remote location to a central office.

Solution
Combine MaxStream wireless networking solutions with a Digi Connect® WAN cellular gateway for an integrated, low cost wireless data connection to the home office.

Overview
As information technology continues to expand and move ahead, more applications are requiring immediate remote access to distributed data. In many of these applications, access to a local network or PC is readily available and each data collection node can be easily connected. Frequently though, only a single node is conveniently located near a PC or Ethernet port. In such circumstances, MaxStream radios can be used to create a wireless network to connect devices back to the PC or collection point. Most MaxStream radios can be used in point-to-multipoint topology where numerous remote devices all communicate back to a single base station. In these types of situations, a software program is typically used to coordinate from which remote node data is collected at any given time. In a peer-to-peer topology, the user protocol will determine data collection. If data traffic is infrequent enough so as not to produce a large number of collisions, the communication can alternatively be initiated by the remote node.

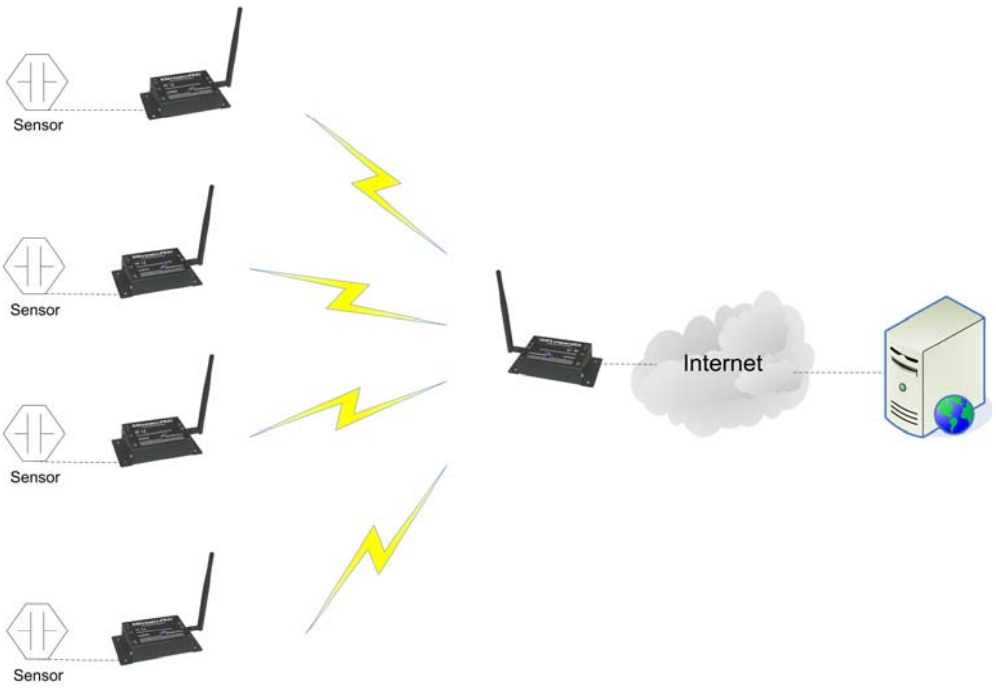

Fig. 1 Point-to-multipoint communication with a local connection

© 2006 Digi International Inc.

Wired interfaces are often not accessible because the cost of running wires to the remote location prohibits direct connectivity from the radios to Ethernet, serial or other collection devices. In these types of situations, any MaxStream RS-232/422/485 PKG can be connected to a Digi cellular router/gateway to provide complete end-to-end data communication for almost any remote installation.

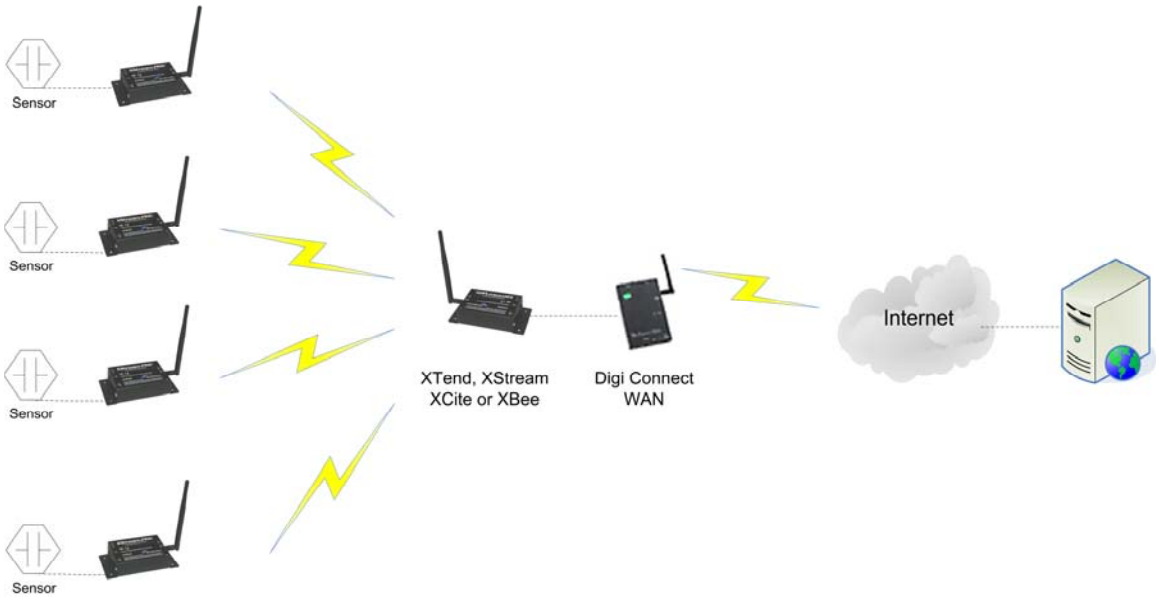

Fig. 2 Connection Using Cellular Digi Connect WAN

The Digi Connect WAN cellular router/gateway has both an Ethernet port for data or configuration and an RS-232/485 data port. Since the cellular router/gateway offers continuous availability, once it is configured and assigned an IP address data can be sent directly through the serial port of the Digi Connect WAN and then wirelessly routed to any PC with a TCP/IP connection without the need for additional hardware or protocol conversion. By contrast, solutions using standard cellular modems require an analog modem on the opposite end, so periodic dial-up connectivity is required to collect data.

The Digi Connect WAN is available with support for GSM GPRS/EDGE or CDMA 1xRTT from multiple carriers, which allows for a broad range of service options depending upon where the installation is deployed.

How to Integrate

By default, the serial ports of both the 9XTend™ and Digi Connect WAN are configured for 9600 baud, 8 data bits, no parity and 1 stop bit (8-N-1). Both devices can support serial interface data rates up to 230.4 kbps. The Digi Connect WAN's serial port has a male connector and is configured as a DTE device. The XTend's serial port has a female connector and is configured as a DCE device. To connect the two devices a standard straight-through serial cable can be used.

© 2006 Digi International Inc.

Once the Digi Connect WAN is configured, it will be assigned a unique IP address by the wireless carrier. Data can be sent and received from the Digi Connect WAN's serial port through TCP Port 2001 by default or other user defined ports via configuration. The Quick Start Guide also outlines a test for serial to cellular connections using a telnet client. A similar test can be performed with the proprietary radio links inserted.

Standard Cellular to Serial Test setup

Cellular to Serial Test setup with radios

Conclusion

Oil and gas, water/wastewater, alternative energy (e.g., wind farms), agriculture and weather tracking are just a few of the markets where remote installations can be found, but reliable data collection is desired. All of MaxStream's stand-alone radios can interface via RS-232, so while the diagrams and applications noted here specifically feature the 9XTend, any of the radio families can be connected to a Digi Connect WAN device for data backhaul via cellular connection. This offers integrators and OEMs multiple solutions for different distance, power and service provider requirements.

Benefits

- MaxStream provides low cost/low power solution for wireless networking of local devices
- MaxStream wireless networks extend the range of serial or Ethernet devices without costly, vulnerable wiring
- Digi provides a cost-effective cellular gateway for "real-time" connectivity to the home office
- By using the Digi cellular gateway as a concentrator for all devices, only one cellular connection to the home office is needed, consolidating cellular billing on one account for lower service cost
- Cellular provides network connectivity to devices in remote locations, where landlines are unavailable or prohibitively expensive
- Digi Connectware Manager offers enterprise remote management of Digi cellular gateways for management and monitoring of many remote devices

© 2006 Digi International Inc.

Example Applications

Vending Machines	Tank Farms	Wind Turbines
Moisture Sensors	Oil & Gas Equipment	Weather Stations
Generators	Water/Wastewater Equipment	Agricultural

Products

MaxStream Wireless Solutions

- XTend™ RF Modem
  - 1 Watt license free 900 MHz RF Modem for up to 40 miles range
  - RS-232/485 product page: http://www.maxstream.net/products/xtend/rf-modem-rs232.php
  - Ethernet product page: http://www.maxstream.net/products/xtend/rf-modem-ethernet.php
- XStream™ RF Modem
  - 2.4 GHz or 900 MHz license free100mW RF Modem
  - RS-232/485 product page: http://www.maxstream.net/products/xstream/rf-modem-rs232.php
  - Ethernet product page: http://www.maxstream.net/products/xstream/rf-modem-ethernet.php
- XBee-PRO™ RF Modem
  - 2.4 GHz license free 100mW ZigBee/802.15.4 RF Modem
  - Product Page: http://www.maxstream.net/products/xbee/xbee-pro-pkg-r-modem-zigbee.php

Digi Cellular Solutions

- Digi Connect® WAN Family
  - Commercial-grade 2.5G (60-130 Kbps) cellular router/gateway with 1 serial port and 1 Ethernet port; supports GSM GPRS/EDGE or CDMA 1xRTT
  - Product Page: http://www.digi.com/products/wireless/digiconnectwanfamily.jsp
  - Quick Start Guide: http://ftp1.digi.com/support/documentation/9000067088_d.pdf
- ConnectPort™ WAN VPN
  - Module-upgradeable, commercial-grade 3G (up to 700 Kbps) cellular router/gateway with 2 serial ports and 4 Ethernet ports; supports UMTS/HSDPA and EVDO
  - Product Page: http://www.digi.com/products/cellulargateways/connectportwanvpn.jsp
  - Quick Start Guide: http://ftp1.digi.com/support/documentation/9000076688_b.pdf

- Digi Connectware® Manager
  - Enterprise remote device management software for management and monitoring of many remote devices
  - Product Page: http://www.digi.com/products/cellulargateways/digiconnectwaremanager.jsp

Where to Buy

Digi International: 952-912-3444
www.digi.com

MaxStream: 801-765-9885
www.maxstream.net

© 2006 Digi International Inc.