

# Telemetric Digital Cellular Solutions Overview

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Telemetric offers customers the latest in digital wireless technologies to support their communication applications. Telemetric has integrated multiple, best of class digital network technologies into its complete product line, and provides the network services, software and support to deliver powerful end-to-end solutions. This document provides a brief overview of our latest digital communication solutions.

Telemetric now supports two types of digital technologies within our lines of wireless remote telemetry units; **Multimode Analog/Digital Control Channel**, and **GSM/GPRS Digital Radio**. We chose to support multiple technologies because each offers particular advantages for different applications. The main factors considered include; extensive cellular coverage, data bandwidth, cost-effectiveness, security and reliability as a two-way communication medium. The application data requirements usually provide the primary driver for which technology we use. Support of multiple technologies allows Telemetric to deliver the most cost-effective system for the customer's needs. But regardless of the wireless transport – the data is presented using the same secure, standards-based applications and SCADA middleware. This architecture protects the customer's investment in applications and user training.

## **Multimode Analog/Digital Control Channel:**

The Multimode Analog/Digital Control Channel offers the best solution for applications where data requirements are modest and the customer wants the best possible coverage footprint. These devices use tri-band analog/digital radios that support analog control channel (AMPS) and two bands of digital control channel, (CDMA 850MHz/1900MHz). These radios transmit small 'packets' of data on the control channel of the cellular network. The packets are 14 digits on the forward channel (to the Remote Telemetry Unit) and 25 digits on the reverse channel (from the RTU). Telemetric Multimode devices have intelligence to automatically tune to whatever service is available at a given location, starting on digital control channel, with fall-back to analog. The benefit of this technology is that it provides the most extensive coverage in North America, and the control channel is very robust.

Although the packet sizes are modest, this technology provides a reliable and cost-effective technology for applications such as alarm/exception reporting or device control. Applications include voltage monitors (Telemetric TVM), fault monitoring, capacitor bank switching, switchgear, and simple monitoring/control of a few analog/digital status points.

Telemetric products available with Multimode radios include the T646 MicroRTU, the Telemetric Voltage Monitor (TVM1 and TVM3), and the TC012 Capacitor Control Switch/Monitor.

Telemetric partners with Aeris.net to provide direct network connection to over 20 cellular carriers in North America. In any given area, there are usually two analog control channel carriers (A/B side) and one digital control channel carrier. Thus, the coverage is extensive, and a level of redundancy exists with the multiple carriers. This system covers nearly 98% of the population area of North America.

## **GSM/GPRS Digital Radio:**

For more data intensive applications, Telemetric has integrated GSM/GPRS Digital Radios into its products, such as the Remote Telemetry Module (RTM). General Packet Radio Services (GPRS) provides for asynchronous communication using Internet Protocol (IP) based 'packets' over the GSM cellular network. The Telemetric radios

also support EDGE – the higher speed packet data technology on GSM. Once a GPRS radio is connected, it can transmit data at up to 85k bits per second, and up to 200k bps wherever EDGE is available.

Global System Mobile (GSM) is the worldwide standard for digital cellular. GSM is supported in North America by Cingular Communications (acquired ATT Wireless), T-Mobile, and many smaller regional GSM carriers. Telemetric has partnered with Cingular Communications, the nations largest carrier, to offer GPRS solutions on the Cingular network, including all Cingular GPRS roaming partners. Cingular’s GPRS/EDGE coverage is growing rapidly beyond the already impressive coverage area shown below.

## Cingular Wireless

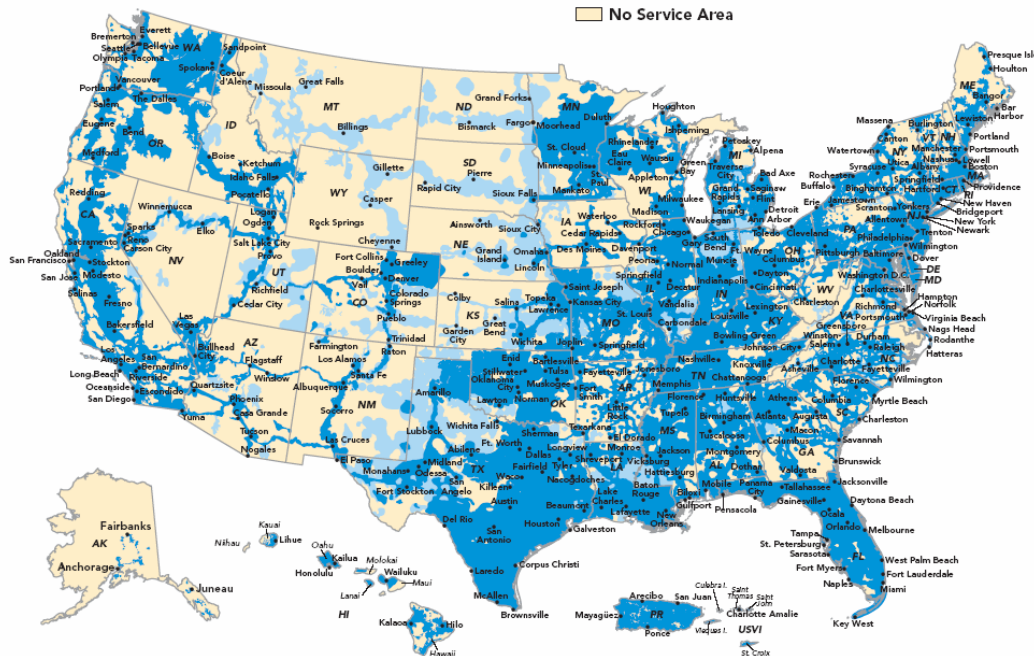
### CINGULAR DATA NETWORK

No data roaming charges nationwide

**EDGE/GPRS Coverage (with an EDGE or GPRS handset)**  
 • Media services on the fastest national wireless data network

GPRS Coverage Only (with a GPRS handset)

No Service Area

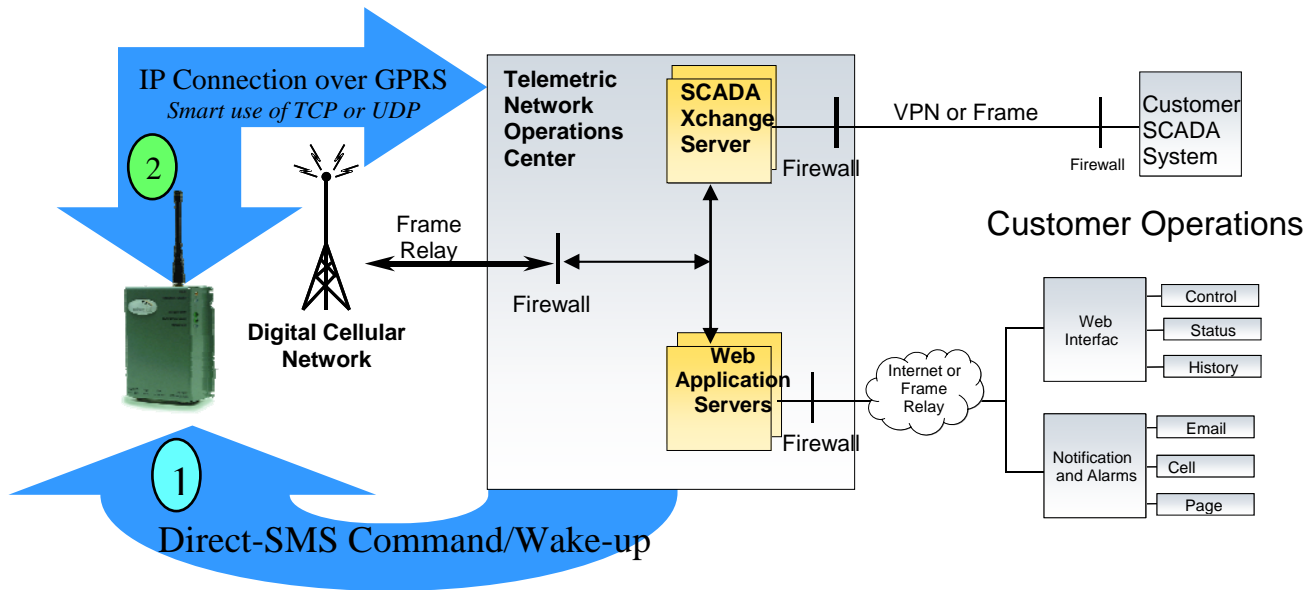


As in all digital cellular plans – users pay network charges based upon the amount of data usage per month – with Telemetric offering plans from as low as 70Kbytes per month to several MB per month. Because users pay by data, efficient usage of the connection is very important. Telemetric has worked with Cingular to deliver several innovations that make for the most cost-effective solution.

Telemetric’s has a secure direct connection to Cingular’s switching centers to enable a fast, reliable end-to-end network. One of the challenges in any digital radio solution is IP address management, and how to initiate the mobile device connectivity from the network – sometimes referred to as ‘device wakeup’. Telemetric worked with Cingular to implement a direct-SMS interface to initiate commands and/or device wakeup ‘on demand’ from our network center. Using the ‘direct-SMS’ application to Cingular, Telemetric uses an SMS message (140

characters) sent directly to the remote device – which can include a command and will initiate a GPRS/EDGE connection over the system. Once connected, the device can communicate all the data it needs over the IP connection. When the data transfer is finished, the device will close the connection. This makes for a fast, reliable, and very cost-effective communication system.

### Telemetric GPRS/EDGE data network operation



Less sophisticated systems of digital cellular communication rely on the remote device to always initiate communication (one-way only), or others require an ‘always on’ connection with a fixed IP address. Telemetric’s system delivers a fast, reliable two-way communication system that makes the most efficient use of data bandwidth costs on the network. Always on connections with fixed IP addresses are very inefficient and costly because the TCP/IP protocol is very ‘chatty’, (lots of maintenance packets on the network, even when no data is being transferred).

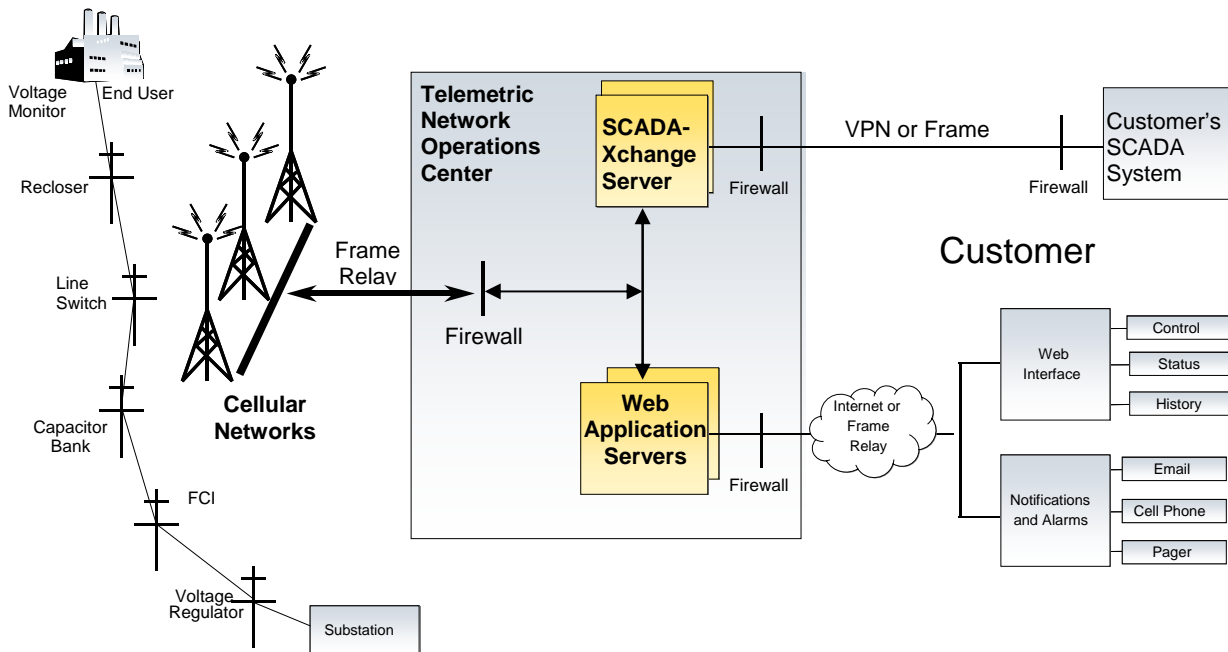
Another area where Telemetric has provided innovation is in the intelligent usage of UDP vs TCP protocols on the GPRS/EDGE connection. For transmitting relatively small data packets, (less than 1000 bytes), it is much more efficient to use the UDP protocol with acknowledgement than to use TCP. Even a fairly sophisticated IED control might have say 50 analog values and 30 digital status points that the user wants to monitor frequently. This amount of data would amount to less than 300 bytes including overhead, in a UDP packet. Thus, most control applications involve frequent point status reports well below 1000 bytes. The Telemetric remote telemetry device has the intelligence to use UDP when it makes sense for smaller data reports, and TCP when it makes sense. The resulting smart use of protocols makes for more efficient use of data bandwidth – delivering a more cost-effective solution.

As a result of Telemetric’s Cingular network connection, direct-SMS wakeup, and smart protocol usage – combined with the intelligence in the Telemetric RTM for ‘report by exception’ – customers can have fast, reliable two-way communication using cost effective data plans. For example, an application may be built on the Telemetric system that might utilize a 1 or 2MB per month plan, while with other less sophisticated systems the

same application might require a much more expensive ‘unlimited’ plan. The net result – powerful applications – cost-effective and easy to deploy.

Current Telemetric models that support GSM/GPRS include the DNP-RTM and the RTM for other protocols.

### TELEMETRIC END-TO-END SOLUTION – Multiple Networks, Single Application Interface



Telemetric will continue to support the best radio technologies to support its customer’s needs. But regardless of the wireless transport – the data is presented using the same secure, standards-based applications and SCADA middleware. This architecture protects the customer’s investment in applications and user training, while supporting migration paths to the future as application needs warrant.

## Other Digital Packet Data Technologies

As many know, there is another competing digital technology called CDMA/1xRTT for digital packet data, offered by Verizon and others in North America. Telemetric chose to implement GSM/GPRS solutions first because of the extensive coverage, very cost-effective low data volume plans, and ability to create a secure, direct carrier network for two-way communication. GSM/GPRS is also the worldwide standard, which means that these products can work in nearly any country in the world where there is service.

Telemetric is currently working on architectures and network relations to support CDMA/1xRTT in the future. We are also monitoring customer needs/requirements in this area.

	GSM/GPRS	CDMA/1xRTT
Connection	Packet-switched (GPRS) or EDGE	Packet-switched (1xRTT) or EV-D0
Data Rates	9600bps – 85k bps GPRS Up to 200k bps on EDGE	9600bps – 153k bps 1xRTT Up to 300k bps on EV-D0
SMS Support	Yes + Cingular provides enterprise gateway for speed/reliability	Yes
Billed	Per KB of packet data	Per KB of packet data
Carriers	Cingular/AT&T, T-Mobile, Worldwide Standard	Verizon, Sprint, AllTel, US Cellular
Costs	Lower cost radios, due to higher WW volume, lower license fees	Higher cost radios

## Radio Technologies Supported on Current Telemetric Products

Product Family	Analog Control Channel	Multimode Digital + Analog Control Channel	Cingular/ATT GSM/GPRS
DNP-RTM		Future Evaluation	
TVM1 & TVM3			
T646			
TC012			