Wireless Data Made To Order

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When carriers first announced intentions in 1992 to deploy a new wireless data technology called Cellular Digital Packet Data (CDPD), market reaction was enthusiastic. The primary reason: Unlike other wireless data networks that use proprietary networking protocols, CDPD would use industry-standard TCP/IP protocols. These protocols, already the foundation of the Internet, were rapidly being adopted by corporations for enterprise networks. CDPD promised numerous benefits. Customers could use existing TCP/IP applications over wireless connections; they could more easily connect to their servers at the back end; they could readily develop new wireless applications; and they would have a wireless connection to the Internet.

As developers and potential customers learned more about the technology and its deployment, they discovered some complications. For instance, it quickly became clear that nationwide coverage would require a large number of cellular carriers--many of whom are normally competitors--to work closely together. This, combined with the inherent difficulty of communicating data reliably over radio links, delayed deployment.

Meanwhile, software developers learned that their "off-the-shelf" TCP/IP applications would not work well over CDPD without being optimized.

Today there is encouraging progress in both deployment and application development. CDPD service is spreading. At the end of 1995, service was available in approximately 45 U.S. cities. By the end of 1996, service is expected in some 60 cities. Customers can finally deploy applications over reasonable service areas. Meanwhile, the software industry is beginning to design products for this new environment.

Application Issues If existing TCP/IP applications are supposed to work over CDPD, users might run into problems of cost, reliability and performance if developers don't optimize their applications for wireless.

Anyone with a cellular telephone knows that wireless communications can be expensive, and wireless data is no different. A typical charge for CDPD service is about 8 cents per KB, which equates to $80 per MB. Carriers offer volume discounts, but even at half or a quarter of that rate, users don't want to receive large e-mail attachments. Users must have control over what their application transmits and receives.

Users shouldn't have to worry about reliable connections, and CDPD uses innovative measures to communicate data reliably between client and server. But the radio environment is delicate, and if a user is out of range of the base station, the radio connection can suddenly be lost.

Many existing applications designed for stable LAN environments may falter when subjected to intermittent connections between mobile client and server. These applications need to be upgraded to handle intermittent connections. The same applies to TCP/IP protocol stacks and middleware solutions.

Performance is another important issue. CDPD networks have strong throughput, with a channel rate of 19.2 Kbps, and actual throughput to the user of about 10 Kbps. But a couple of factors affect overall data throughput. First, the CDPD channel is a shared channel. Multiple users in the same cell must contend for the same channel. Second, while typical round-trip times between mobile systems and a server are often under a second, these delays are still longer than other WAN connections. Moreover, under network stress conditions, like network congestion, channel hopping and communications errors, delays can increase to several seconds or longer, and bog down transactions.

How Vendors Are Addressing the Issues There are several strategies for developing wireless solutions. At the highest level, we can differentiate between wireless applications and wireless-enabling technologies. Wireless applications are end-user applications where the vendor has optimized the application for the wireless environment by addressing the issues we discussed.

In some cases, the wireless-enabling technology makes it easier for application developers to optimize new as well as existing applications for the wireless medium. In other cases, the wireless-enabling technology allows IS managers to take applications never designed to operate over a wireless link and to do so without changing the application.

Most software progress with CDPD has been in the area of wireless-enabling technologies. For instance, although existing TCP/IP stacks can be used over CDPD, users will experience better results when stack vendors have made enhancements such as having the stack's lower-level drivers automatically reconnect to the network after a connection is lost. WRQ's stack has this optimization and other innovations for reliable communication over CDPD.

Special messaging middleware optimizes the wireless link by providing a software piece for the mobile system and a matching software piece on a server back at the enterprise network. Applications on the mobile system make simple calls to the local middleware layer, which exchanges messages with the middleware residing on the network. There, the middleware acts as an "agent" on behalf of the mobile client to conduct transactions, such as sending e-mail or doing database queries. Oracle Mobile Agents is a good example of this category.

LAN access middleware fools LAN applications into thinking they are connected directly to the LAN, instead of being intermittently connected by a wireless link. With MobileWare/Informix MobileWare, for example, users can run cc:Mail over CDPD as if they were directly connected to their corporate LAN and its mail servers.

Finally, host access middleware lets existing host/terminal applications operate over a wireless link. It works by encapsulating the terminal traffic in IP datagrams. For example, Attachmate's Attachmate ZIP! SNA Server now supports CDPD.

In addition to these exciting software developments, standards bodies are completing standards that will prove important for CDPD applications. These include standards by the Portable Computing and Communications Association (PCCA), which has formalized an AT command set for wireless modems and worked closely with Microsoft to develop a set of wireless extensions to the NDIS. Finally, there is work to standardize how applications access wireless networks using the new WinSock 2 standard.

Using Circuit-Switched Connections As effective as packet data is over cellular connections, users also have the option of using the cellular network for circuit-switched communications. Armed with "cellular-ready" modems and "data-capable" cellular phones, it is relatively straightforward for users to connect a cable directly from their PC Card modems to their cellular phones.

Since these modems use special error protocols designed specifically for cellular connections, best results occur when the modem on the other end of the connection supports the same protocols. But most modems today do not, whether they are at corporate modem pools, Internet service providers or online services. Cellular providers are solving this problem by deploying modem pools at their mobile switching centers.

Wireless packet data is best suited for short and bursty communication. Circuit data is better suited for longer transactions, such as batch operations and file transfers. Users and applications developers will appreciate the flexibility. Developers should consider dual-mode applications that connect over CDPD or circuit data, depending on the type of transaction or coverage available.

Carriers are considering blending circuit data and packet data in a hybrid network referred to as Circuit Switched CDPD (CS/ CDPD). With CS/CDPD, users will use a circuit connection over the air, but most of the rest of the connection will be packet switched. CS/CDPD will offer users even more options to communicate.

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