Dial-Up Modems Still Ring a Bell

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Years ago I ditched my 9600 bps modem, but I still rely on dial-up modems. Those modems exist in automated teller machines, gasoline pumps, traffic controllers, medical instruments, security systems, point-of-sale (POS) equipment, and other devices. According to several sources, dial-up modems still provide the largest number of access points to the Internet. Fortunately, several OEM vendors supply dial-up modem modules that offer drop-in communications in small packages.

Figure 1. This Multi-Tech Socket Modem module uses standard connections so engineers can easily substitute one module for another. The company supplies a variety of embedded servers as well as wired and wireless modems.

Embedded modems from Multi-Tech Systems, for example, comply with the de-facto "Socket Modem" standard the company has promoted for about 8 years. "The analog/digital interfaces and the design of the analog circuits that connect to a phone line can get tricky," said Duane Wald, an OEM sales manager at Multi-Tech. "Buying a modem eliminates the risk of designing your own modem. And we certify the modems, which helps ease engineers through regulatory steps." Wald adds another reason to adopt an embedded modem: Engineers will not have to answer technical questions about remote third-party modems they know nothing about.

"If engineers plan to send data in short bursts, a low-speed modem (<2400 bps) could do the job," explained Keith Chu, a senior product-line manager at Teridian. Chu also serves as the chair of the ITU group on modems and also chairs the US TR30.1 (TIA) group on modems. "If you put a V.90 or a V.34 modem into a POS terminal, the modem could take 15 to 30 seconds to connect and only three seconds to send the data -- 33 seconds in all.

"A low-speed modem could connect in two seconds and transmit the data in nine seconds -- 11 seconds total. So, the low-speed modem communicates three times faster than a high-speed modem," said Chu. That difference becomes important if you have customers waiting in line. "The POS terminal could include a high-speed modem, too, to handle bulk transfers of daily sales information."

Almost every processor includes a serial port. "That means even a small processor

such as an 8051 will control a modem and communicate with remote devices," noted Alex Tsau, vice president at Radicom. "You do not need much electrical or processing power." The interface appears simple, but Tsau cautions engineers to remember design criteria such as EMI compatibility and operating environments.

Modem modules seem simple, but engineers can make design mistakes. "Engineers might specify the wrong operating voltage," noted Tsau. "They specify a 3.3V modem for 5V logic, or vice versa. Also, they mix up the received-data and the transmitted-data signals or they confuse the data-terminal equipment (DTE) and the data-circuit-terminating equipment (DCE). The modem acts as DCE, and the processor acts like the DTE. The other control signals, such as DTR, CTS, RI, and RTS also can confuse engineers." (For information about RS-232 signals, see "For Further Reading.")

In addition to saving money, designers of portable equipment must save power. Dial-up modems from Radicom, for example, include a second-ring-detect capability. When inactive, a modem shuts down completely and draws no current. The first ring activates the modem, which then detects the second ring signal, powers up, and asserts its Ring Indicator output.

Radicom's modules also work with older, or "legacy," modems. "A customer may call and say, 'We cannot connect to XYZ-type modems.'" said Tsau. "Even though those modems are 10 years old, the customer has no choice but to communicate with them. We have worked with modems long enough to know what commands to use to set up the proper features and handshaking in our modules for older equipment." So, designers must ensure modems will work properly with equipment at the other end of a line.

"Even though modem suppliers sell certified modules, those certifications do not apply to your finished product," said Teridian's Keith Chu. "You must comply with each country's regulations. In the U.S. and Europe, companies may self-certify products. But, you must have the lab’s test products so you can provide test data if someone asks for it."

To meet requirements throughout the world, you may have to provide different external components, different matching circuits, and different current sinks. "The Holy Grail amounts to one programmable device that meets all requirements in Europe, Japan, and other countries," said Chu. Companies such as Teridian offer circuits and modules that meet local requirements.

The future for dial-up modems looks bright. Engineers can incorporate soft modems -- essentially real-time modem algorithms -- in their processors and use external analog/digital circuits to connect to a phone line. According to Chu, soft modems offer a cost saving over "hard" modem modules.

Modem manufacturers also can offer cellular-phone modems. "You might think a dial-up wire line does not cost much these days; but for a business line, the costs can add up," said Wald of Multi-Tech. "So you might save money with a cellular-modem connection. On the other hand, you can find a wire line almost anywhere

and engineers understand exactly how it works."

How you send data depends on your application. You can still find legacy devices that use X-modem, Z-modem or other communication protocols. If you would like to know more about these and other protocols, send me a short email note at jontitus@comcast.net [1].

For further reading

Axelson, Jan, "Serial Port Complete," Lakeview Research [2].

"The RS232 Standard", CAMI Research [3].

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