"A Wireless LAN Voice Over IP Telephone System"

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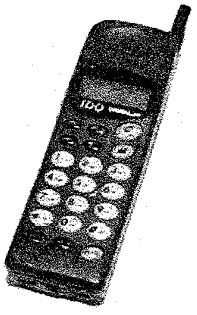
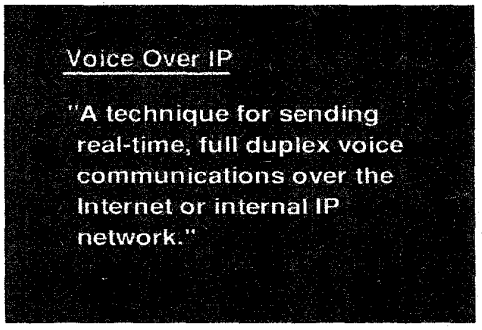
This paper will discuss the first wireless LAN phone based on voice over IP technology. As you can see, it looks like an ordinary cell phone and it works like an ordinary cell phone, with one big advantage – you don't pay for calls between locations covered by your



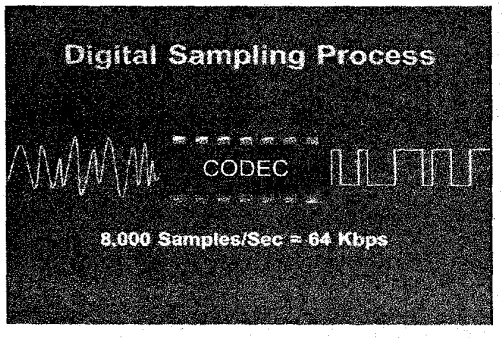
company's internal data network. And, with the addition of a gateway, you can make and receive calls over the public switched telephone network. It's like having a cell phone at work, without paying cell phone charges.

But we're getting ahead of ourselves, so let's start at the beginning with an introduction to Voice Over IP technology.



As the name implies, voice information can be sent over the Internet, or over a company's internal TCP/IP network or Intranet, just like email. But before this can happen, a few things need to be done to the voice signal.

First, we need to obtain digital samples of the analog voice signal. This is done with a common chip called a CODEC, which stands for Coder-Decoder. For telephone quality sound, 8-bit samples taken at a rate of 8,000 per second,



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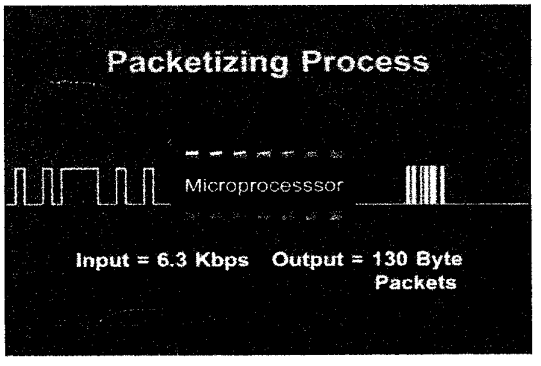
result in a data rate of 64 Kbps.

Since there is silence and redundancy in voice, we can compress the signal by about a factor of 10 to minimize the amount of data that needs to be transmitted. This is done with a special chip called a digital signal processing chip, which conforms to internationally-accepted compression standards, such as G.729 or G.723.

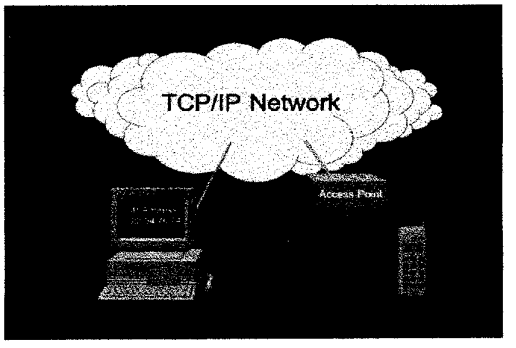
Next, we need to create data packets from the compressed data bit stream and to put them in a format that is suitable for transmission over a TCP/IP data network. Typically, a small packet of about 130 bytes, which includes the TCP/IP overhead, is sent every 30 milliseconds.



At the other end, the process is reversed. The packets are converted to a serial data stream, uncompressed and converted back to an analog voice signal. The entire process, including call set-up, is described in the international standard H.323.

Normal data traffic is carried between PCs, servers, printers and other networked devices through the company's world-wide TCP/IP network. Each device on the network has an IP address, which is attached to every packet for routing. Voice Over IP packets are no different. To place a call from one PC to another, simply enter the IP address of the called party using one of several voice conferencing software packages available today

With a wireless LAN installed, you can use your portable IP phone to talk to other IP phones or to desktop PCs. And these IP phones can be located at any company site, worldwide, provided that a wireless LAN is installed at the site. Since the voice packets travel over the data network, there are no charges for these calls.



Two questions come to mind at this point. Isn't all this voice traffic going to clog up the data network? And what about phone calls to locations outside the company's data network? To answer the first question, remember that the voice was compressed down to about 6.3 Kbps. Even dozens of simultaneous phone calls represent very little data traffic. In fact, each wireless LAN access point can handle more than 25 simultaneous, full-duplex phone calls. Regarding calls over the Public Switched Telephone Network, let's look at our diagram again, with the addition of a gateway.

The gateway shown in this diagram, performs similar functions to the wireless LAN phone. But instead of passing the analog voice signal out through a telephone handset, it places the signal over a telephone line. This line can run into your PBX system, or into the public

switched telephone network, allowing users of NetVision phones to make and receive normal telephone calls to anywhere in the world. Of course, toll charges apply to these normal telephone calls.

The IP phone works like an ordinary cell phone. It can be programmed with a telephone directory for easy speed dialing of both internal IP calls and external calls. Press 9 for an outside line and you will hear the standard dial tone transmitted directly from the telephone line. It features call waiting, placing calls on hold, call forwarding and caller identification.

Installation of the wireless IP phone system into the vertical markets, like retail, health care and package delivery, where a wireless LAN infrastructure already exists, is as easy as assigning an IP address to each wireless handset. This means that existing customers will not incur any additional infrastructure cost in implementing the IP Phone system, greatly enhancing the value of their wireless LAN network. I also believe that this innovation could be the spark that opens up the nascent horizontal wireless LAN market for office applications around the world.