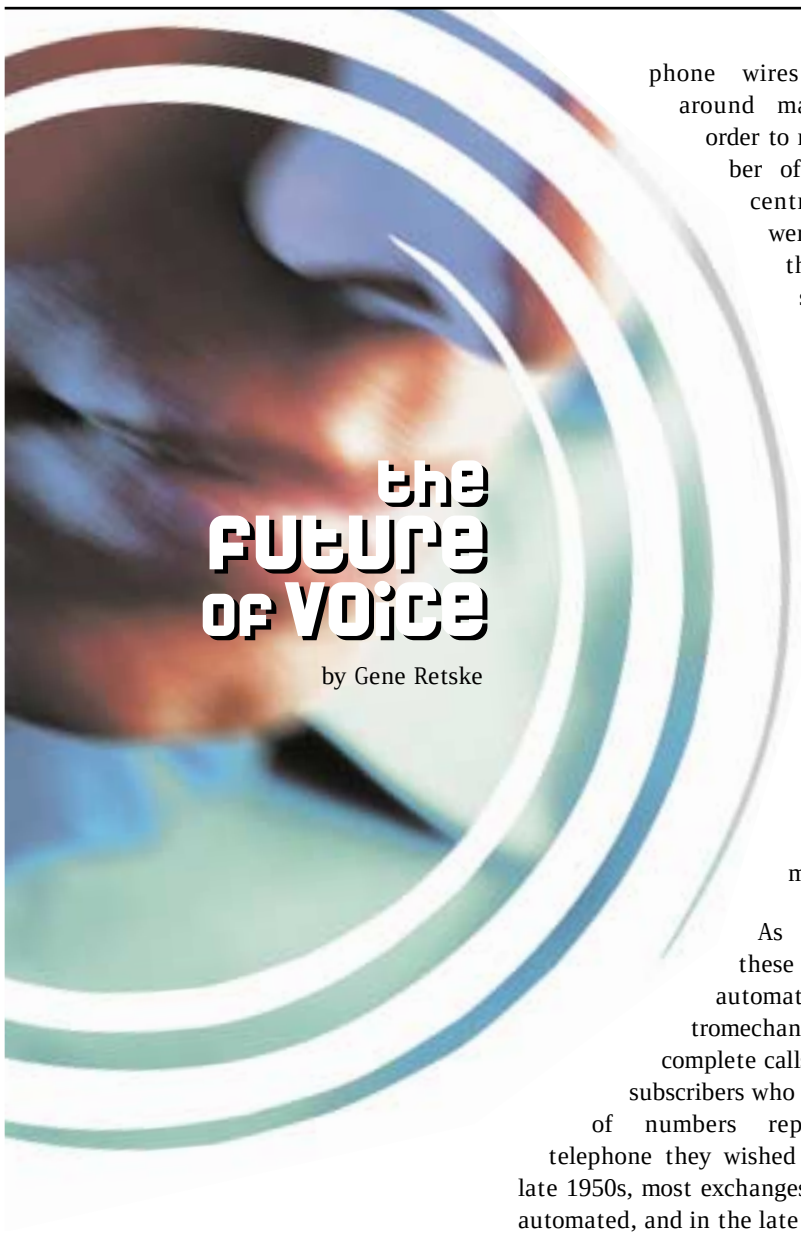

the future of VoIP

by Gene Retske

VOIP. THIS WORD HAS BECOME the most frequently spoken word in the lexicon of the prepaid world, replacing "connection fee," "distributor" and even, "disintermediation" as the hottest new buzzword in the world of prepaid telephony services. Throughout the telecom world, packetized voice transmission, like VoIP, is replacing circuit switched PSTNs (Public Switched Telephone Network) at an ever increasing pace. As we will shortly discover, there are some constraints on the speed of this radical reformation of the global telephone network, but the trend is undeniable and irreversible. The impact of this change is far more than "merely" a change of the basic network architecture, having far reaching implications for all aspects of telecommunications. Prepaid services, always at the forefront of the telecom world, have already been touched by the change, and will likely feel the full force of these changes sooner and more profoundly than other sectors of the telecom industry.

Voice over Internet Protocol, or VoIP, is one of many methods for converting analog voice signals to data packets. It is the most important in terms of impact because its connection to the Internet makes it the premier candidate for converged networks. There are many protocol schemes that implement and control VoIP — H.323, SIP, MGCP and MEGACO, among others. Unfortunately, these protocols are not compatible with each other. In fact, machines with the same protocol are often incapable of interconnecting with each other. We will talk about the solution to this telecom "Tower of Babel," the softswitch, in detail in a few minutes. We will also see that softswitches may offer a new type of network design, one that is especially attuned to the needs of the prepaid community.

From A.G. Bell to VoIP

Let's go back about 126 years, to the invention of the telephone, and trace how we arrived at this point. The first telephone network was a wire, about 18 meters long, from one room in Alexander Graham Bell's lab to another room where Bell's assistant heard the first words spoken over the telephone. The commercial applications of this device became immediately evident so telephone wires were strung around major cities. In order to reduce the number of wires needed, central exchanges were created where the wires to each subscriber were gathered. A simple device called a switchboard was invented, and operators were employed to manually connect the wires between locations on demand to allow point to point calls to be made.

As time went on, these exchanges were automated using electromechanical switches to complete calls, as required by subscribers who "dialed" a series of numbers representing the telephone they wished to call. By the late 1950s, most exchanges in the US were automated, and in the late 1960s, Bell Labs scientists had begun to automate the more complex task of routing "long distance" calls between exchanges. "Direct Distance Dialing", or DDD, allowed telephone subscribers to call from nearly every telephone in the country to any other telephone. This technology remained in place, except for continuing refinements, until the Internet was born in the 1990s.

One other problem had been overcome along the way; the need to increase the number of calls that could be simultaneously handled over a single circuit, or pair of wires. Using "carrier" techniques, AT&T developed a method to enable a single T-1 circuit to carry 24 simultaneous. Again, through a series of refinements, these calls were sometimes compressed, and the "white space" (silent periods) eliminated. Two things happened next that pushed telephony into the next generation. First, as the telephone network grew at unpredictable rates, there was a need to respond faster to rapidly changing traffic patterns. Secondly, the Internet began offering instant connectivity and virtual circuits to nearly every corner of the globe. Visionaries foresaw a day when a "converged" network would carry voice, data, image and even broadcast (or multicast) messages simultaneously, using Internet Protocol (IP) packets as a transport mechanism. (Not bad! We have just covered 126 years of technological development in telecommunications in 3 paragraphs.)

This converged network has been a long time in the making. AT&T announced a converged network in the late 1970s, but it was not able to deliver the technology as promised. The fact that the enterprise market was not exactly beating down AT&T doors for the product was also a consideration that lead to its cancellation a couple of years after it was announced.

But the idea hung on, and others began to pick up the banner for converged network services. DEC, IBM and others began talking about their brand of converged network services, all based, not surprisingly, on proprietary protocols. But it was the advent of the Internet that finally began to deliver on the promises made by others.

This converged network offers many benefits, even though the path to get to a total packet network could be long and expensive. Because of the ultimate benefits of a packet network, nearly every carrier in the world of any consequence has already announced plans to migrate to a packetized, all digital converged network. It is clear that we will ultimately end up with a next gen network.

The good news is that we can begin taking advantage of the benefits of this network today. The bad news is that until the entire traditional PSTN infrastructure, with an estimated US$100 billion worth of equipment, can be economically displaced, we will have to deal with network hybrids and architectures that will accommodate both of these disparate technologies.

Impact of VoIP

VoIP has already had a tremendous impact on the prepaid world by virtue of the fact that it is used for many of the least cost direct routes to and from destinations around the world. These connections are often gray market connections, safe from the normal rigors of regulatory fiat because of the stealthy nature of the packets, and the fact that the voice carrying packets can be interleaved between Internet and other "legitimate" data packets. In a converged world, the form of the data becomes irrelevant.

Because VoIP comes in "under the radar," it is free of the bonds and artificially inflated costs that are often associated with traditional PSTN telephony. Most of the VoIP traffic that crosses international boundaries starts with or ends with an Internet Service Provider (ISP). This is both by design and by convenience. ISPs have a great deal of the infrastructure needed to handle decent volumes of VoIP traffic in the network connections, peering points and routers/data communications equipment that are necessary.

ISPs also have established relationships with business clients for web hosting and other Internet related services. This gives them a quick start in the marketing of voice applications as well. The financial structures of standard ISPs and international voice carriers are also similar, making the assimilation of these services easy. The traffic that is created by these "direct" connections to other carriers in other countries can be carried at very competitive rates that are frequently below and commonly, far below, the rates agreed to by the established carriers and the national carriers, or PTTs.

Hopefully, this application for VoIP is a transitional one that will fade over a period of time as the established carriers bring their rates more in line with the cost of providing the services. (This is, of course, complete heresy to the established carriers, who enjoy having a guaranteed return, high rates relative to the cost of the service, and a virtual monopoly.) The big payoff for VoIP, in prepaid at least, is the potential for reducing backhaul costs associated with bringing all calls to a central stage switch, or an expensive and complex distributed application system, tying multiple switches and host processors together.

In prepaid, the classic example of the advantage of VoIP is in eliminating the so-called "hairpin" effect, where a call originates in a remote node, is transported using backbone circuits to a switch, and then sent back to the node for completion. In a pure VoIP environment, the node could keep the calls within the boundaries of the node, and the application processor in control of the call progress from afar. This eliminates the need for a channel, or a pair of channels, to transport the call itself to the switch location

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dual environments will predominate

While the pure VoIP alternative is clearly the most desirable, the reality is that the majority of the PSTN connections that are available right now are legacy. For this reason, VoIP applications today have to accommodate both VoIP and legacy networks, which is one of the major functions of a gateway. Appropriately named, gateways provide a physical connection between traditional circuit switched PSTN networks and next gen packet switched IP networks.

The networks used by prepaid service providers today are in transition, and often include some VoIP components as well as some traditional telephony elements. Public networks will be in a state of transition for some time, given the great amount of expensive hardware that is already in place. Until such time as the public networks are purely VoIP, likely to be many years or even decades, prepaid service providers will have to modify their network designs to include connectivity with both environments.

"free" bandwidth has its own price

Today, the primary benefit of VoIP for prepaid service providers lies in the alternative routes, often gray market, that are served by VoIP. This includes many countries where competitive services are discouraged or even outlawed. But, the lure of less expensive routes, which enables prepaid services that are much more competitively priced, is enough justification for the risk involved in setting up the services. The Internet is sometimes used to provide the bandwidth, making these "under the radar" connections easy and quick to implement.

The downside to this is twofold. First, the Internet is not generally a reliable source of bandwidth, and does not provide a consistent quality of service. The cost of continual monitoring and tweaking of this "free" bandwidth may negate the cost benefits in the long run. Secondly, these stealthy connections are subject to detection and interruption, causing sudden and irreparable network outages. Building a business on the strength of a route to a destination that becomes more or less permanently unavailable can be very unhealthy for the business.

Where the VoIP connection is officially ordained or condoned, the connection is more stable, and still offers many of the cost benefits. VoIP connections can be less costly to implement and maintain, by virtue of the fact that the hardware needed on each end is significantly less expensive than traditional circuit switched gear. Building networks with VoIP infrastructure is much less expensive than traditional networks, and if properly designed, can provide a quality of service equal to traditional networks. Many of the new carriers are using VoIP technology to reduce the implementation time and cost, allowing them to offer very competitive rates.

the future of voip holds great promise

The real promise of VoIP is in its future. Packet networks where virtual circuits can be established on the fly, and applications can be seamlessly integrated across the entire network, are just around the corner. Even though it will be some time before all public networks are completely packet, more of them are coming on line every day, making it feasible to begin deploying next gen networks today.

The prepaid world is anxiously awaiting the arrival of the next "killer app," an application so compelling that the world will beat down its doors. The anxiously anticipated arrival of the Killer AP may not be as quick and dramatic as some would wish however, and a more evolutionary path may actually take place. VoIP, because of its ability to integrate closely with the Internet and to be converged with data networks, could be the enabling technology to make the next great Killer App possible. We are beginning to see more and more stored value type applications being offered, and many of them are starting to get wide acceptance.

VoIP offers much greater functionality, and a higher level of interoperability with Internet and other data applications. We can only speculate on where it will all lead for the prepaid world, but on thing is clear; the successful prepaid entrepreneur will have to be very adaptable to change and quick to seize new opportunities as they arise. Come to think of it, that has not changed at all!

switches, routers, gateways and softswitches — what they do

In order to understand nex gen VoIP networks, you need to have a basic knowledge of the network elements involved. This brief tutorial will provide enough insight into how these devices operate, to give you a working knowledge.

SWITCH — A traditional telephony circuit switch. All of the network connections are made to ports (typically digital, T1 or E1) on the switch. The switch then allows any individual channel in a port to be connected with any other channel in that port or any port connected to the switch. Switches used for typical prepaid applications usually have a port-oriented architecture with each circuit having its own hardware interface. In the typical prepaid application, voice boards, or special DSP processors are incorporated that will allow the user to interact with the application. This interaction includes the playing of voice prompts, and receiving user input, usually in the form of touchtone digits.

ROUTER — In their simplest form, routers facilitate connections between networks, or subnets, by translating IP addresses and moving packets between the networks. As more intelligence is added to the router, it can take on some of the characteristics of a switch, enabling virtual connections to be made between different IP addresses (endpoints). Networks are constructed using routers to control the flow of information. In a VoIP environment, routers can provide the functions traditionally performed by voice switches by directing the flow of packets to create virtual connections.

GATEWAY — Special routers that incorporate hardware and software that can connect to both VoIP and legacy PSTN connections, can function as "gateways," to bridge between the two disparate architectures. Gateways are configured in a variety of ways, from simple "state converters," allowing VoIP and legacy PSTN networks to be tied together, to providing a functionality similar to a network control processor. Gateways are usually installed at or near the switching facilities to minimize the cost of networking.

SOFTSWITCH — Originally conceived to be the software used to control Advanced Intelligent Networks, softswitches have taken on additional functions to the point that they are now an important part of VoIP networks. Softswitches serve a variety of purposes from being "simple" translators between incompatible network elements to a more robust role as an application server. Because softswitches do not usually do any of the switching or routing themselves, they do not have to be collocated with the switches or routers. In fact, one softswitch can, and often does, control more than one switch or router.

recommended reading list

A Guide to Competitive International Telecommunications, Gene Retske, 2002, CMP Books, ISBN 1-57820-072-5

Voice Over IP, Strategies for the Converged Network, Mark A. Miller, P.E., 2000, M&T Books, ISBN 0-7645-4617-1

Communications Systems & Networks, Second Edition, Ray Horak, 2000, ISBN 0-7645-7522-8

Carrier Grade Voice Over IP, Daniel Collins, 2001, McGraw-Hill, ISBN 0-07-136326-2

Gene Retske is a respected authority on international telecommunications competition. He can be reached at gretske@solvox.net.

New York City Print Media Inventory Update

Advertisers, with their sights on a very specific ethnic market, may find this sharpshooter approach valuable in New York City and, presumably, in other heavily populated urban areas as well.

A new survey, published by the Independent Press Association-New York, finds that the number of newspapers and magazines published in New York City is continuing to grow, hitting 270 publications that target the diverse population of the biggest U.S. city. Last year's survey found 198 ethnic publications in the city, a number roughly triple that of a decade ago.

The study found that over 60 ethnic groups publish newspapers or magazines in 42 languages, and nearly half of the publications in the survey use a language other than English, while 14 percent use more than one language. The survey found dailies serving communities including blacks, Greeks, Israelis, Italians, Russians and Serbs. Six dailies are published for people of Chinese descent, five for Koreans, four for Hispanics and three for Poles.

In 1920, 140 ethnic newspapers were published in the city, some with circulation in the hundreds of thousands. By 1990, a New York University report found only 65 ethnic publications in the city, though Abby Scher, director of IPA-NY, thought the actual number may have been higher. Scher said that the circulation of current ethnic publications was generally around 15,000 to 20,000. Some, like a Bosnian newspaper, survive on circulation as small as 5,000, and others, like the Spanish daily Hoy, can reach circulation well over 60,000.

Among the new papers included in this year's survey is the Bukharian Times, which serves Jewish immigrants from Uzbekistan, written in a combination of Russian and Farsi

Courtesy of MediaPost Communications 2002.