Softswitch
Architecture for VoIP

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McGraw-Hill

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Voice over Internet Protocol

What Is VoIP?

Softswitch is a product driven by the need to incorporate intelligence into *Voice over Internet Protocol* (VoIP) networks, interface IP networks, and the *Public Switched Telephone Network* (PSTN) and to coordinate features across networks. As outlined in the previous chapter, the first applications of softswitch were the gatekeepers (aka gateway controllers) that were incorporated in networks of VoIP gateways. In order to better understand a softswitched network, it is necessary to dissect VoIP down to the protocol level. Many volumes on VoIP can be found on the book market, and this book will not attempt to cover it in detail. The importance of VoIP protocols relative to softswitch is that they are the building blocks that make VoIP possible.

Origins

In November 1988, Republic Telcom (yes, one "e") of Boulder, Colorado, received patent number 4,782,485 for a "Multiplexed Digital Packet Telephone System." The plaque from the Patent and Trademark Office describes it as follows: "A method for communicating speech signals from a first location to a second location over a digital communication medium comprising the steps of: providing a speech signal of predetermined bandwidth in analog signal format at said first location; periodically sampling said speech signal at a predetermined sampling rate to provide a succession of analog signal samples; representing said analog signal samples in a digital format thereby providing a succession of binary digital samples; dividing said succession of binary digital samples into groups of binary digital samples arranged in a temporal sequence; transforming at least two of said groups of binary digital samples into corresponding frames of digital compression."

Republic and its acquiring company, Netrix Corporation, applied this voice over data technology to the data technologies of the times (X.25 and Frame Relay) until 1998 when Netrix and other competitors introduced VoIP onto their existing voice over data gateways. Although attempts at internet telephony had been done from a software-only perspective, commercial applications were limited to using voice over data gateways that could interface the PSTN to data networks. Voice over data applications were popular in enterprise networks with offices spread across the globe (eliminated international interoffice long-distance bills), offices where no PSTN existed (installations for mining and oil companies), and for long-distance bypasses (legitimate and illegitimate).

The popularity and applications of VoIP continued to grow. VoIP accounted for 6 percent of all international long-distance traffic in 2001.[1] Six percent may not seem like an exciting sum, but given a mere 3 years from the introduction of a technology to capturing 6 percent of a trillion dollar, 100-year-old industry, it is clear that VoIP will continue to capture more market share.

How Does VoIP Work?

Softswitch is increasingly considered to be almost synonymous with VoIP. However, it also works with *Time Division Multiplexing* (TDM) and *Asynchronous Transfer Mode* (ATM) networks. The first process in an IP voice system is the digitization of the speaker's voice. The next step (and the first step when the user is on a handset connected to a gateway using a digital PSTN connection) is typically the suppression of unwanted signals and compression of the voice signal. This has two stages. First, the system examines the recently digitized information to determine if it contains voice signal or only ambient noise and discards any packets that do not contain speech. Secondly, complex algorithms are employed to reduce the amount of information that must be sent to the other party. Sophisticated codecs enable noise suppression and the compression of voice streams. Compression algorithms include G.723, G.728, and G.729.

Following compression, voice must be packetized and VoIP protocols added. Some storage of data occurs during the process of collecting voice data, since the transmitter must wait for a certain amount of voice data to be collected before it is combined to form a packet and transmitted via the network. Protocols are added to the packet to facilitate its transmission across the network. For example, each packet will need to contain the address of its destination, a sequencing number in case the packets do not arrive in the proper order, and additional data for error checking. Because IP is a protocol designed to interconnect networks of varying kinds, substantially more processing is required than in smaller networks. The network addressing system can often be very complex, requiring a process of encapsulating one packet inside another and, and as data moves along, repackaging, readdressing, and reassembling the data.

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[1]"TeleGeography 2002—Global Traffic Statistics and Commentary," *TeleGeography*, 2001, www.TeleGeography.com.

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