



# Nervous System #30: The Unexpected History of VoIP

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*With the aggressive pace of technological change and the onslaught of news regarding data breaches, cyber-attacks, and technological threats to privacy and security, it is easy to assume these are fundamentally new threats. The pace of technological change is slower than it feels, and many seemingly new categories of threats have been with us longer than we remember.*

*Nervous System is a bimonthly blog that approaches issues of data privacy and cyber security from the context of history—to look to the past for clues about how to interpret the present and prepare for the future.*

In the wake of the COVID-19 pandemic, significant parts of the workforce have transitioned to teleconferencing solutions in place of physical meetings and offices. Many of these alternatives, especially those oriented around video calls, use Voice Over IP (VoIP) technology, which treats telephone communications like any other type of internet traffic, such as emails or web pages. VoIP has brought service improvements and savings to businesses and residences, but this technology has its roots in video gamers wanting to trash talk each other. Ironically, this early implementation of VoIP occurred at a time when online gaming meant dialing into the Internet with a dial-up modem that transmitted data over the phone lines—meaning that the first proposed use of VoIP involved a curiously circular loop of technology.

At its simplest and most colloquial, VoIP is the technology used to make a free telephone call over the internet. To dig deeper into the technical details, however, the term “Voice Over Internet Protocol” refers to a systematized method of transmitting voice signals using IP packets over distributed networks.

A traditional, non-VoIP telephone call, whether connected on a landline or a cellular service, is managed over the public switched telephone network (PSTN) by one or more telephone companies. Calls take place over a segment of the company’s network (or companies’ networks, as the case may be) that is reserved for the exclusive use of the parties for the duration of the call. It is a temporary point-to-point connection established over the PSTN between the participants. Imagine the call is a secure package, delivered by a private courier service over a dedicated private route reserved for that purpose.

By contrast, internet traffic involves fragmenting the electronic data into small pieces called “packets,” which are then sent out on their own individual and separate journeys across any available path, to be reconstituted at the other end. The various packets that make up a piece of internet traffic, whatever that traffic may be, may each take a different route to their destination; some may never arrive, others may arrive out of sequence.

Services that use VoIP technology to send voice data over the internet cause those packets of voice data to be intermingled with the other types of data transmitted over the internet, including webpages, emails, social media posts, streaming video, and so on.

The first ever (known) use of IP packets to transmit live voices occurred when a technologist named Brian C. Wiles devised a way of streaming his chatter while playing online video games with his friends.

In 1989, before the World Wide Web and broadband service, playing online multiplayer games meant connecting to a network using a dial-up modem. Wiles' idea of digitizing his voice and beaming it over that network connection was, in concept at least, an absurd recursion: using a dial-up modem to connect to the internet over a phone line, only to then use that internet connection to make a phone call.

In fact, the available technology of the time would not allow him to achieve that loopy, lofty goal. Wiles could effectively packetize his speech and transmit it over a wired ethernet connection, but he was unable to slice the audio into packets small enough to send over the creakingly slow dial-up connections of the day. Nonetheless, Wiles' "Remote Audio Sound Card Application Link" (or RASCAL) was a promising proof of concept that would have a lasting effect.

Not long after Wiles' experiments with RASCAL, a similar application began to emerge at the European offices of Autodesk. The software company's founder, John Walker, was overseeing European operations but missed his ability to sit in on in-person discussions back in the California headquarters.

The company had a dedicated line connecting the European and Californian facilities, primarily used for transmitting software. If Walker could find a way to use that data line to transmit live audio, he could use it for teleconferencing.

Walker's biggest technical hurdle, though, was also related to bandwidth. The dedicated data line he hoped to repurpose supported only 56 Kb/s, but successful digitization of the human voice required a bandwidth of 64 Kb/s. Walker devised a means of compressing and expanding the audio to fit into a bandwidth of 32 Kb/s (this compression algorithm, called "simple compression," remains in use).

Walker released his NetFone VoIP software to the public domain in 1991. When Wiles got wind of it, he recognized a kindred spirit. The two developers began sharing ideas, collaborating on incorporating some of RASCAL's solutions into NetFone. By 1995, NetFone was rebranded as Speak Freely. Speak Freely's one-source software is still available for download (the most recent update was apparently posted in 2002).

Today, there are hundreds VoIP providers, and the technology is also often bundled in popular messaging apps like WhatsApp and Signal. According to the most recent FCC statistics, there are approximately 67 million VoIP subscribers in the US today, accounting for around 15 percent of the total base of retail voice telephone service users overall. And, yes, it is now commonplace for video gamers to talk to one another, irrespective of geographic distance, while gaming, thanks to VoIP technology built into gaming platforms.

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