



Chapter IX

Voice over Internet Protocol (VoIP): Evaluation of Technologies for Deployment¹

Bhumip Khasnabish
Verizon Labs, USA

Traditionally, real-time voice communications—both within and outside of corporations (enterprises)—are achieved using public domain circuit-switched telephone networks (PSTNs). These networks use technologies that have been maturing over the last 150 years. However, the recent advances in and proliferation of packet-based switching technologies, World Wide Web (WWW) and PC-based user interfaces, and innovative digital signal processing (DSP) techniques are making real-time voice transmission using packet switching—particularly IP-based techniques—more feasible, at least within the logical boundaries of enterprise networks. Although the IP-based Internet is only about 25 years old, its compatibility with Ethernet², and its flexibility, openness and low-cost availability have enabled it to gain more than 260 million users worldwide³. In addition, proliferation of the WWW, multimedia PCs, and innovations in DSP during the last five years has made voice transmission over packet networks, particularly over IP, very attractive economically.

In this chapter, we briefly review the technologies and standards—as recommended by IETF and ITU-T—that are making voice over IP (VoIP) a reality in both public and enterprise networks. Our focus is on low bit rate speech compression and silence suppression, voice packetization and encapsulation, sources of packet-voice impairments and methods to mitigate them, and packet-voice transmission engineering.

We then present a recently developed laboratory testbed that has been used both to prototype and to develop operational engineering rules to deliver high-quality VoIP services over an IP network. Finally, a series of “dos” and “don’ts” are offered to guide in the design of VoIP services using any operational IP network within an enterprise (Intranet).

BACKGROUND AND INTRODUCTION

Traditional telephone companies currently provide voice transmission services over the Public Switched Telephone Network (PSTN), using mostly the traditional circuit switching technology. It is a very robust technology but it is neither flexible nor cost-effective. Therefore, other switching methods like packet switching must be explored. Large Telecom companies are building packet-based (mostly Internet protocol or IP) network infrastructures (Minoli & Schmidt, 1998) so that they can provide a variety of packet-based services including enhanced service like voice over IP (VoIP), fax over IP, messaging over IP, etc., using the same network. Figure 1 can be used to explain the evolving scenario. In order to establish a connection between POTS-Phone1 (Plain Old Telephone System phone or black phone) to POTS-Phone2 there exists the following two possible routing scenarios: (A) From PSTN to PSTN, and (B) From PSTN through the Internet to PSTN.

Although most of today’s PC/IP phones are software-based clients running on PCs, a number of standards and vendors are emerging to support packet phones (Ethernet phone, IP phone, SIP phone, etc.) and integrated packet and analog (POTS) phones (see, www.dsstechnology.com for details). In order to connect from PC/IP-Phone1 to PC/IP-Phone2, there exists the following four possible routing scenarios: (A) From Internet to Internet (worse performance, but cheap or free), (B) From PSTN to Internet to PSTN (desirable), (C) From Internet to PSTN to Internet (not desirable), and (D) From PSTN to PSTN (best performance but expensive).

In case of PSTN-based routing, the call establishes a direct or transparent connection from POTS-Phone1 to POTS-Phone2. However, if the call is routed through the Internet, it uses a connection-less circuit for the call. There is a translation of the E.164 telephone address to the IP address, which is done through the media gateway controller (MGC), and then the call is routed to the IP address of the media gateway (GW) that is serving the destination phone (POTS-Phone2). The details of the mechanism are as described in ITU-T recommendations H.225, H.245, and H.323. In some implementation, the MGC can also support interconnection to the SS7 network via access or A-links, thereby supporting efficient call control and setup. These types of MGCs may also be called softswitch (see, www.softswitch.org for further details). IETF’s signaling transmission (SigTran) working group is currently pursuing standardization of IP-based encapsulation of PSTN signaling (SS7) messages. A similar effort in ITU-T is known as the bearer independent call control (BICC) protocol.

29 more pages are available in the full version of this document, which may be purchased using the "Add to Cart" button on the publisher's webpage: www.igi-global.com/chapter/voiceover-internet-protocol-voip/18420

Related Content

Post-Implementation Use of a Complex Technology: The Case of a Southeastern U.S. University

Marie-Claude Boudreau (2005). *Qualitative Case Studies on Implementation of Enterprise Wide Systems* (pp. 22-39).

www.irma-international.org/chapter/post-implementation-use-complex-technology/28242

Extensible Business Reporting Language (XBRL): Potential of Research in XBRL as a Social Artifact- An Essay

Jagdish Pathak (2013). *International Journal of Enterprise Information Systems* (pp. 99-102).

www.irma-international.org/article/extensible-business-reporting-language-xbrl-potential-of-research-in-xbrl-as-a-social-artifact--an-essay/100385

Initial Adoption vs. Institutionalization of E-Procurement in Construction Firms: The Role of Government in Developing Countries

De Chun Huang, Quang Dung Tran, Thi Quynh Trang Nguyen and Sajjad Nazir (2014). *International Journal of Enterprise Information Systems* (pp. 1-21).

www.irma-international.org/article/initial-adoption-vs-institutionalization-of-e-procurement-in-construction-firms/119166

Product Lifecycle Management: State-of-the-Art and Future Perspectives

Wai M. Cheung and Dirk Schaefer (2010). *Enterprise Information Systems for Business Integration in SMEs: Technological, Organizational, and Social Dimensions* (pp. 37-55).

www.irma-international.org/chapter/product-lifecycle-management/38192

People-Oriented Enterprise Information Systems

Giorgio Bruno (2009). *International Journal of Enterprise Information Systems* (pp. 17-33).

www.irma-international.org/article/people-oriented-enterprise-information-systems/37505