Softswitch
Architecture for VoIP

Franklin D. Ohrtman, Jr.

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CHAPTER 5

SIP: Alternative Softswitch Architecture?

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If the worldwide *Public Switched Telephone Network* (PSTN) could be replaced overnight, the best candidate architecture, at the time of this writing, would be based on *Voice over IP* (VoIP) and the *Session Initiation Protocol* (SIP). Much of the VoIP industry has been based on offering solutions that leverage existing circuit-switched infrastructure (such as VoIP gateways that interface a *private branch exchange* [PBX] and an *Internet Protocol* [IP] network). At best, these solutions offer a compromise between circuit- and packet-switching architectures with resulting liabilities of limited features, expensive-to-maintain circuit-switched gear, and questionable *quality of service* (QoS) as a call is routed between networks based on those technologies. SIP is an architecture that potentially offers more features than a circuit-switched network.

SIP is a signaling protocol. It uses a text-based syntax similar to the *Hypertext Transfer Protocol* (HTTP) like that used in web addresses. Programs that are designed for the parsing of HTTP can be adapted easily for use with SIP. SIP addresses, known as SIP *uniform resource locators* (URLs) take the form of web addresses. A web address can be the equivalent of a telephone number in an SIP network. In addition, PSTN phone numbers can be incorporated into an SIP address for interfacing with the PSTN. An email address is portable. Using the proxy concept, one can check his or her email from any Internet-connected terminal in the world. Telephone numbers, simply put, are not portable. They only ring at one physical location. SIP offers a mobility function that can follow subscribers to whatever phone they are nearest to at a given time.

Like H.323, SIP handles the setup, modification, and teardown of multimedia sessions, including voice. Although it works with most transport protocols, its optimal transport protocol is the *Real Time Protocol* (RTP) (refer to Chapter 3, "Softswitch Architecture or 'It's the Architecture, Stupid!'" for more information on RTP). Figure 5-1 shows how SIP functions as a signaling protocol while RTP is the transport protocol for a voice conversation. SIP was designed as a part of the *Internet Engineering Task Force* (IETF) multimedia data and control architecture. It is designed to interwork with other IETF protocols such as the *Session Description Protocol* (SDP), RTP, and the *Session Announcement Protocol* (SAP). It is described in the IETF's RFC 2543. Many in the VoIP and softswitch industry believe that SIP will replace H.323 as the standard signaling protocol for VoIP.

SIP is part of the IETF standards process and is modeled upon other Internet protocols such as the *Simple Mail Transfer Protocol* (SMTP) and HTTP. It is used to establish, change, and tear down (end) calls between one or more users in an IP-based network. In order to provide telephony services, a number of different standards and protocols must come together—

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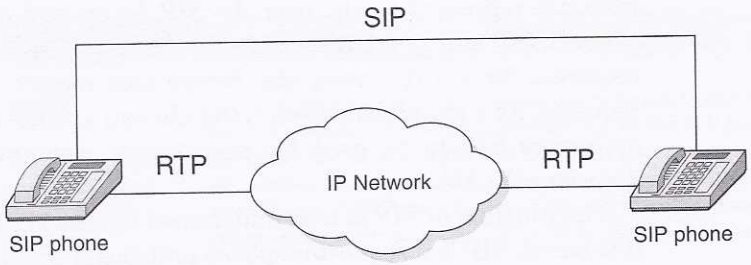

Figure 5-1 SIP is a signaling protocol and RTP transports the conversation protocol.

specifically to ensure transport (RTP), provide signaling with the PSTN, guarantee voice quality (*Resource Reservation Setup Protocol* [RSVP]), provide directories (*Lightweight Directory Access Protocol* [LDAP]), authenticate users (*Remote Access Dial-In User Service* [RADIUS]), and scale to meet anticipated growth curves.

What Is SIP?

SIP is focused on two classes of network entities: clients (also called *user agents* [UAs]) and servers. VoIP calls on SIP to originate at a client and terminate at a server. Types of clients in the technology currently available for SIP telephony include a PC loaded with a telephony agent or an SIP telephone. Clients can also reside on the same platform as a server. For example, a PC on a corporate *wide area network* (WAN) might be the server for the SIP telephony application, but it may also be used as a user's telephone (client).

SIP Architecture

SIP is a client-server architecture. The client in this architecture is the UA, which interacts with the user. It usually has an interface towards the user in the form of a PC or an IP phone (an SIP phone in this case). Four types of SIP servers exist. The type of SIP server used determines the architecture of the network. Those servers are the *user agent server* (UAS), the redirect server, the proxy server, and a registrar.

SIP Calls via a UA Server A UA server accepts SIP requests and contacts the user. A response from the user to the UA server results in an SIP

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