

Preface

The wide-scale deployment of Internet combined with several advancements in hardware and software technologies created opportunities for several Internet-based applications such as Voice over IP (VoIP) that involves the delivery of voice, video, and data to the end user. In recent years, Internet Protocol (IP) telephony has been a real alternative to the traditional Public Switched Telephone Networks (PSTNs). The IP telephony offers more flexibility in the implementation of new features and services. The Session Initiation Protocol (SIP) is becoming a popular signaling protocol for Voice over IP (VoIP)-based applications. SIP is a peer-to-peer multimedia-signaling protocol standardized by the Internet Engineering Task Force (IETF) that plays a vital role in providing services to IP telephony. The SIP proxy server is a software application that provides call routing services by parsing and forwarding all the incoming SIP packets in an IP telephony network. The efficiency of this process can create large-scale, highly reliable packet voice networks for service providers and enterprises. We established that the efficient design and implementation of the SIP proxy server architecture could enhance the performance characteristics of a SIP proxy server significantly. Since SIP proxy server performance can be characterized by its transaction states of each SIP session, we emulated the $M/M/1$ performance model of the SIP proxy server and studied some of the key performance benchmarks such as average response time to process the SIP calls and mean number of SIP calls in the system. We showed its limitations and provided an alternative analytical solution based on $M/D/1$ model in our first part of the research. Later, based on the latest advancement in software engineering and networking technologies, we studied another $M/M/c$ -based SIP proxy server performance model with enhanced performance and predictable results. Then, we studied the performance and scalability of the SIP proxy server, when the calls are routed through local and wide area networks. Finally, we expanded the research further to evaluate the performance impacts of the SIP proxy server when secured

and non-secured transport protocols are used to transport the packets, since the deployment and delivery of SIP value-added services in the public network carries significant security issues.

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