Assessing readiness of IP networks to support desktop videoconferencing using OPNET

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Abstract

OPNET is a powerful network design and simulation tool that has gained popularity in industry and academia. However, there exists no known simulation approach on how to deploy a popular real-time network service such as videoconferencing. This paper demonstrates how OPNET can be leveraged to assess the readiness of existing IP networks to support desktop videoconference. To date, OPNET does not have built-in features to support videoconferencing or its deployment. The paper offers remarkable details on how to model and configure OPNET for such a purpose. The paper considers two types of video traffic (viz. fixed and empirical video packet sizes). Empirical video packet sizes are collected from well-known Internet traffic traces. The paper presents in-depth analysis and interpretation of simulation results and shows how to draw proper engineering conclusions.
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1. Introduction

1.1. Background

The deployment of videoconferencing over IP network in both industry and academia has been increasing rapidly. Desktop videoconferencing applications range from internal company communications, educating and training remote employees, to telecommuting. It can eliminate certain travel requirements, thereby cutting costs. Desktop videoconferencing takes advantage of a key workplace tool that is the PC. In the past few years, an H.323 standard was introduced by the ITU, and thus paved the way to the fast growth and deployment of videoconferencing. H.323 is a full suite of protocols developed by ITU to define how real-time multimedia communications, such as videoconferencing, can be exchanged over packet-switched networks (Recommendation H.323, 1998).

It is very advantageous and cost effective to deploy desktop videoconferencing over their existing IP networks. It is easier to run, manage, and maintain. However, one has to keep in mind that IP networks are best-effort networks that were designed for non-real time applications. On the other hand, videoconferencing requires timely packet delivery with low latency, jitter, packet loss, and sufficient bandwidth. To achieve this goal, an efficient deployment of videoconferencing must ensure these real-time traffic requirements can be guaranteed over new or existing IP networks.

Videoconferencing places a high demand on network resources. When deploying such a network service, network architects, managers, planners, designers, and engineers are faced with common strategic, and sometimes challenging, questions. What are the QoS requirements for videoconferencing? How will the new videoconferencing load impact the QoS for currently running network services and applications? Will my existing network support videoconferencing and satisfy the standardized QoS requirements? If so, how many videoconferencing sessions can the network support before upgrading prematurely any part of the existing network hardware?

A number of commercial tools have been developed to address issues related to videoconferencing deployment over data networks. We summarize most popular commercial tools. EURESOM Jupitor II (Eurescom H.323 Studies) has a provision to test end-to-end Quality of Service (QoS) for Network-QoS-aware applications over IP networks. It considers the relationship between users' perception and network performance. NetIQ's Vivinet Assessor (NetIQ) generates RTP streams to mimic VoIP traffic between pairs of hosts and assesses the quality of these synthetic calls. BMC PATROL DashBoard (BMCsoftware) analyzes the impact of multimedia services on the existing network. This tool can quickly identify specific problems on the network that impact application performance. Spirent's IPTV (Spirent Communications Resources) system is a product that includes various features like video infrastructure testing, IPTV video quality testing, firewall and video server load testing. RADVISION (Radvision H.323 Protocol Toolkit) offers tightly integrated infrastructure processing components called viaIP, for desktop and meeting room conferencing. Also other companies that provide VVoIP testing are Omegon, Lucent VitalSuite (Lucent Technologies), and ViDeNet (VideNet Scout Resources). "H.323 Beacon" tool (Calyam et al., 2004) is a open-source tool for assessing performance of desktop videoconferencing sessions using H.323 traffic emulation.