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Management of Large-Scale Multimedia Conferencing

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Abstract

The goal of this work is to explore management strategies and algorithms for large-scale multimedia conferencing over a communication network. Since the use of multimedia conferencing is still limited, the management of such systems has not yet been studied in depth. A well organized and human friendly multimedia conference management should utilize efficiently and fairly its limited resources as well as take into account the requirements of the conference participants. The ability of the management to enforce fair policies and to quickly take into account the participants preferences may even lead to a conference environment that is more pleasant and more effective than a similar face-to-face meeting. We suggest several principles for defining and solving resource sharing problems in this context. The conference resources which are addressed in this paper are the bandwidth (conference network capacity), time (participants' scheduling) and limitations of audio and visual equipment. The participants' requirements for these resources are defined and translated in terms of Quality of Service (QoS) requirements and the fairness criteria.

A suggested solution for the problem of Capacity Resource Management (CRM) allocation is the Extended Max Min Fairness (EMMF) criterion, an extension of the well-known Max Min Fairness criterion. Both centralized and distributed algorithms that satisfy this criterion are presented. Further trade-offs between fairness and total throughput are also suggested. The conference time allocation problem is defined and mapped to known problems of time scheduling which are widely discussed in the literature. We examine the well-known Generalized Processor Sharing system (GPS) in that context, and select (after some adaptation) its Worst-case Fair Weighted Fair Queuing (WF^2Q) version, a scheduling policy based on the GPS system which satisfies the participants' requirements. Finally, we describe methods for combining the Time Resource Management (TRM) and the Capacity Resource Management (CRM) into complete management of multimedia conferencing.