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Dynamic Session Management for Static and Mobile Users: A Competitive On-Line Algorithmic Approach

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Abstract

Most modern communication systems that support real-time communication (ATM, ISDN, Frame-Relay, etc.) are based on connection oriented technologies. This is also true for cellular and Personal Communication Systems, where the users are mobile. Consequently, selecting good routes for Virtual Channels (VCs) is considered as one of the most important problems in modern networks. Usually, the VC route is determined during the session initialization along the shortest path (with respect to some metric) between the users and remains the same during the entire session. However, the user mobility and the fact that the cost of a session may also depend on its duration, motivate the development of "dynamic session management" algorithms. Such algorithms may reroute the VCs dynamically during the sessions for improving session cost and for supporting handoff operations of mobile users.

This work deals with the general "Session Management" problem and proposes several on-line algorithms for managing session between static or mobile users. In the case of static users, we present a 4-competitive algorithm for the situation where the path cost functions are concave. In the presence of mobile users we prove that for a general graph, mobile users and arbitrary link cost functions with positive setup cost, the competitive ratio of the best on-line algorithm is at least $\Omega(\log n)$, where "n" is the number of nodes in the network. We also present constant competitive on-line algorithms for several practical topologies and movement assumptions.