Abstract

The increasing capability to interconnect computers through internetworking, wireless networks, and high-bandwidth satellite networks has generated a new class of information centered applications based upon data dissemination. These applications, which often provide service to the large client population, employ broadcast to efficiently deliver data to the clients. In data dissemination, the server, a clear deviation from the traditional client-server approach, initiates the transfer of data. In this thesis, we first motivate why the rise of asymmetric environments (i.e., networks which have significantly higher bandwidth from server to clients than in the opposite direction) and the scale of the emerging distributed information systems is triggering a shift from the traditional client-server model to a periodic broadcasting model.

In this environment, it is very crucial for the server to broadcast a directory along with the data. However, broadcasting a directory leaves less bandwidth for the data itself, yet this enables battery powered clients to selectively download only the relevant portion of data. Thus, there is a need for efficient multiplexing of the directory along with the data in order to remove as little bandwidth as possible and simultaneously offer efficient solutions for power conservation at the clients. The tuning and access time are the two important metrics that can be used to compare the performance of access methods in various index allocation techniques. However, robustness of access methods is also very crucial in an error-prone mobile environment. In this thesis, we designed the access methods which not only deal with the access failures but also work very well in the real-time environment. This dissertation analytically demonstrates that the proposed access method result in the...
best performance. Further, the impact of redundant version number on the performance of the proposed access method is also addressed.

- Finally, we propose the imbalanced index tree structure to minimize the average cost of index probes taking into consideration the access frequency of different data items. To further improve the performance of index tree, a factor is proposed to convert the already skewed data into a pure skewed form.

The underlying theme driving the studies in this thesis is to develop the access methods (based on the indexing techniques) to improve the performance which adapt to a new tradeoffs in the emerging computing landscape.