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A SELECTOR INDEX FOR MOBILE AGENT DISPATCH SCHEDULES IN CONTEXT-FREE INTERNET APPLICATIONS

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Abstract. *When dispatching mobile agents in context-free Internet applications, network conditions and the selected dispatch schedule are the two key factors that affect the efficiency of the process. Network conditions on the Internet change constantly, but dispatching mobile agents under the same dispatch schedule in different network conditions can have dramatically different results. For example, the schedule may be completed in the shortest possible time or it may fail completely. Longer or less compact schedules are more robust than flatter schedules when network conditions deteriorate, whereas flatter or compact schedules are more efficient when network conditions are good. Therefore, to dispatch mobile agents efficiently in context-free Internet applications, we need a simple way to determine the shape of each schedule. In this paper, based on the concept of betweenness-centrality in graph theory, we propose a measure called the selector index, which can distinguish between compact- and loose-structured schedules. We also present an extended version of the selector index to differentiate schedules that belongs to the same equivalence class. By simply comparing these indexes, the system can quickly select suitable schedules for dispatching mobile agents based on various network conditions.*

Keywords: Selector index, Betweenness-centrality, Rooted trees, Mobile agent dispatch schedule, Internet

1. **Introduction.** Many Internet-based applications, such as distributed information retrieval and network monitoring systems, need to perform repetitive tasks when searching, filtering and extracting information from data sources. We say such tasks are context-free because the results derived from each data source are not related to any other source. In other words, the execution order of a set of context-free tasks does not affect the validity of the whole task.

A mobile agent (MA) is an autonomous software entity that can traverse the Internet from host to host on behalf of the user. It improves the performance of context-free Internet applications because it has two distinct capabilities: self-cloning and off-line computing. Self-cloning allows MA to increase the parallelism of a task by making clones visit numerous data sources simultaneously. Off-line computing enables MA to work remotely without an uninterruptable network connection to the user, thereby avoiding the problems caused by poor networking conditions.

However, dispatching MA and making its clones efficiently work on a large number of data sources on the Internet is not a trivial task. Like peer-to-peer (P2P) systems, MA systems built in the application layer of the OSI seven-layer network model do not have any knowledge about the Internet topology or the network conditions; therefore, they cannot schedule the dispatch order for MA and its clones via the best routes. In addition, as Medina et al. [8] showed, the Internet's topology follows a power-law distribution,