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Implementing Set Objects in Dynamic Distributed Systems

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Abstract

This paper considers a *set object*, i.e., a shared object allowing users (processes) to add and remove elements to the set, as well as taking consistent snapshots of its content. Specifically, we show that there not exists a protocol implementing a set object using finite memory if the underlying distributed system is eventually synchronous and affected by continuous arrivals and departures of processes (phenomenon also known as *churn*). Then, we analyze the relationship between system model assumptions and object specification in order to design protocols implementing the set object using finite memory. Along one direction (strengthening the system model), we propose a protocol implementing the set object in synchronous distributed systems and, along the other direction (weakening the object specification), we introduce the notion of a *k-bounded set object* proposing a protocol working on an eventually synchronous system.

Notes: Some results presented in this paper has appeared in a preliminary form at EUROPAR 2010 in a paper entitled *Value-based Sequential Consistency for Set Objects in Dynamic Distributed Systems*.

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