Composable Consistency for Large-scale
Peer Replication

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Abstract

The lack of a flexible consistency management solution hinders P2P implementation of applications involving updates, such as directory services, online auctions and collaboration. Managing shared data in a P2P setting requires a consistency solution that can operate in a heterogenous network, support pervasive replication for scaling, and give peers autonomy to tune consistency to their sharing needs and resource constraints. Existing solutions lack one or more of these features.

In this paper, we propose a new way to structure consistency management for P2P sharing of mutable data called *composable consistency*. It lets applications compose a rich variety of consistency solutions appropriate for their sharing needs, out of a small set of primitive options. Our approach splits consistency management into design choices along five orthogonal aspects, namely, concurrency, consistency, availability, update visibility and isolation. Various combinations of these choices can be employed to yield numerous consistency semantics and to fine-tune resource use at each replica. Our experience with a prototype implementation suggests that composable consistency can effectively support diverse P2P applications.