

BestPeer: A Self-Configurable Peer-to-Peer System

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1. Introduction

In this paper, we present BestPeer, a prototype P2P system that we have implemented at the National University of Singapore (see <http://sloth.comp.nus.edu.sg/p2p> and [1]). BestPeer is a generic P2P system designed to serve as a platform on which P2P applications can be developed easily and efficiently. The network consists of two types of entities: a large number of computers (nodes), and a relatively fewer number of *location independent global names lookup* (LIGLO) servers. Each participating node runs the BestPeer (Java-based) software and will be able to communicate or share resources with any other nodes (i.e., peers) in the BestPeer network. Each node comprises two types of data: private data and sharable data. Nodes can only access peers' data that are sharable.

2. Features of BestPeer

BestPeer has several features that distinguish itself from existing P2P systems. First, BestPeer, to our knowledge, is the first system to integrate two powerful technologies: mobile agents and P2P technologies. While P2P technology provides resource sharing capabilities amongst nodes, mobile agents technology further extends the functionalities. In particular, since agents can carry both code and data, they can effectively perform any kind of functions. With mobile agents, BestPeer not only provides files and raw data, but processed and meaningful information. For example, in BestPeer, an agent can be sent to a peer with the data file to "digest" its content and to generate reports for the requester. More importantly, the use of agents allows BestPeer nodes to collect information (e.g., what files/content are sharable, statistics, etc.) on the entire BestPeer network, and this can be done offline. This allows a node to be better equipped to determine who should be its directly connected peers or who can provide it better service.

Second, BestPeer not only facilitates a finer granularity of data sharing where partial content of a file may be shared, it also shares computational power. The requester sends his/her request for a file together with an algorithm (exe-

cutable code) that operates on the file. In other words, the requester performs the filtering task at the provider's end! This feature has several advantages: (a) it allows filtering to be performed where the provider's end does not provide the capability (e.g., the owner does not provide an active object); (b) it allows individual requester to filter the content according to what (s)he desires (e.g., different requesters may be interested analyze stock data differently); (c) it facilitates extensibility - new algorithm or program can be used without affecting other parts of the system! (d) existing non-distributed objects can be easily extended for use by a P2P application by leveraging on the support provided by BestPeer; (e) it optimizes network bandwidth utilization as only the necessary data is transmitted to the requester.

Third, a node in the BestPeer network can dynamically reconfigure itself by keeping peers that benefit it most (subject to individual node's definition of 'most benefit'). The rationale is based on a simple assumption: peers that benefit a node most for a query are also likely to provide the greatest gain for subsequent queries. Thus, BestPeer will always try to make a direct connection to these nodes that have highest priority. In this way, promising peers are first traversed before the less promising ones. BestPeer currently supports two default reconfiguration strategies. The first strategy, MaxCount, maximizes the number of objects a node can obtain from its directly connected peers. The second strategy, MinHops, implicitly exploits collaboration with peers by minimizing the number of hops.

Finally, BestPeer introduces a LIGLO server to provide each node with a unique global identity. In this way, nodes that may have different IP address can be 'recognized' as a single unique entity. LIGLO is a node that has a fixed IP and running LIGLO software, that provides a BestPeer Global Identity for a peer and maintain peer's current status. We have implemented the LIGLO service in a distributed fashion to minimize the bottleneck at LIGLO servers.

References

- [1] W. S. Ng, B. C. Ooi, and K. L. Tan. Best-peer: A self-configurable peer-to-peer system. In <http://sloth.comp.nus.edu.sg/p2p/bestpeer.pdf>, 2001.