COLLABORATIVE RESEARCH: Software Architectures for Distributed Web Services Based on Peer-to-Peer Technologies

Project Abstract

One of the most pressing issues faced by today's IT researchers is how to provide a distributed server infrastructure to accommodate the exponentially increasing web accesses. This project considers web services consisting of geographically distributed servers, client caching, proxy caching, and distributed searching in a virtual network, embedded on top of a physical network. A set of software techniques is developed based on peer-to-peer (P2P) algorithms to achieve optimal overall performance and reliability with existing hardware/software resources. The project is carried out jointly at University of California, Riverside and Suffolk University. Researchers from HP Laboratories are involved as senior personnel.

The web server, considered in this project, consists of geographically distributed heterogeneous nodes in a network based on different functionalities and applications of the web service. Clustering techniques are developed to create suitable P2P structures keeping in mind the topological properties of the Internet systems. Inside the cluster, scalable, efficient and high performance overlay network architectures are identified for web services. Efficient cooperative proxy cache placement and management mechanisms are developed in the virtual network following distributed shared memory (DSM) approaches. Proxy servers are combined with P2P clusters consisting of browser (client) caches, and a cooperative caching strategy is designed at the proxy level by embedding tree structures and directory schemes. Extensive software implementation, simulation, testing and evaluation are carried out using the PlanetLab distributed environment.