SSL Backend Forwarding Scheme in Cluster-Based Web Servers

Abstract:

- State-of-the-art cluster-based data centers consisting of three tiers (Web server, application server, and database server) are being used to host complex Web services such as e-commerce applications. The application server handles dynamic and sensitive Web contents that need protection from eavesdropping, tampering, and forgery.
- Although the Secure Sockets Layer is the most popular protocol to provide a secure channel between a client and a cluster-based network server, its high overhead degrades the server performance considerably and, thus, affects the server scalability.
- It improving the performance of SSL-enabled network servers is critical for designing scalable and high-performance data centers. We examine the impact of SSL offering and SSL-session-aware distribution in cluster-based network servers.
- We propose a back-end forwarding scheme, called ssl_with_bf, that employs a low-overhead user-level communication mechanism like Virtual Interface Architecture to achieve a good load balance among server nodes.
- We compare three distribution models for network servers, Round Robin, ssl_with_session, and ssl_with_bf, through simulation.
  - The experimental results with 16-node and 32-node cluster configurations show that, although the session reuse of ssl_with_session is critical to improve the performance of application servers, the proposed back-end forwarding scheme can further enhance the performance due to better load balancing.
  - The ssl_with_bf scheme can minimize the average latency by about 40 percent and improve throughput across a variety of workloads.