Computer Science Lecture Series

NORTHWESTERN UNIVERSITY

Building Robust Network Services Through Efficient Resource Management

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Room 381 - Computer Science Dept.

Abstract:

Network services have been increasingly integrated into our daily lives, but their accessibility and stability are also frequently impacted by flash crowds or Denial of Service attacks. To be immune from DoS attacks or flash crowds, robust network services must possess two important qualities: completeness and generality. Completeness implies that all resources must be protected, including CPU time, memory and disk capacity, and link bandwidth. Generality means not handling attacks or faults as extraordinary events, but instead treating them within the same framework as used during normal operations. Fundamentally, this is a matter of efficient management of networked resources.

In this talk, I will investigate request redirection schemes' impact on the robustness of Content Distribution Networks (CDNs). CDN systems deploy redundant resources (mainly servers) geographically distributed across the Internet and rely on request redirectors to distribute client requests to an appropriate server based on a variety of factors---e.g., server load, network proximity, cache locality---in an effort to reduce response time and increase the system capacity under load. In this work, we explored the design space of request redirection strategies employed by redirectors, and defined a class of new algorithms that carefully balance load, locality, and proximity.
We developed a novel hybrid simulator that provides detailed modeling at both the network level and the server/OS level, and conducted large-scale simulations to evaluate various redirection strategies. These simulations clearly demonstrate the effectiveness of our new algorithms, which yield a 60-91% improvement in system capacity when compared with best published CDN technologies, yet user-perceived response latency remains low and the system scales well with the number of servers. I will also discuss our current effort on deploying a academic testbed CDN, named CoDeeN, on Planetlab.