A Data Driven Approach to TCP Tuning

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Abstract

Response time is a central metric when evaluating the performance of a computer and is of critical importance when those computers are running DNS software, like Knot. For software so critical to the infrastructure of the internet, even the smallest changes can have a widespread impact. To optimize the performance of DNS servers, three key areas must be addressed; the hardware, the software, and the operating system. The operating system acts as an intermediary between the hardware and software and its optimization usually brings minimal benefit compared with optimizing the hardware or software. Knot is an authoritative DNS server and is the central program of this research. Under minimal loads, knot has a response time in the microseconds, as it has already been heavily optimized. Given that the software response turnaround time is so minimal, we were interested to find if the system parameters themselves may actually have a noticeable effect.

This study we use USC/ISI's DIINER testbed and dnsperf, a DNS benchmarking utility, along with statistical methods to quantify the impact that tuning an array of linux kernel parameters has on the average latency of TCP connections to the Knot server software. The kernel parameters are tested with 50%, 75%, and 100% server utilization to test our results under multiple stress points to see if parameters exhibit no benefits under some conditions, but higher benefits under others. After collecting the results from multiple runs of dnsperf, we use the Anova test to determine if any statistically significant results are present. Both Dunn's and Tukey's tests are applied post hoc to find that significance. In our presentation we will report the full set of findings and discuss the problems of drawing conclusions from single experimental runs.