

# Blackboard Performance Tuning Summary Report

## Summary

Blackboard Consulting collaborated with St. Louis Community College to deliver a performance audit service in preparation for STLCC's spring 2009 term. The goal of this project was to enable STLCC to better understand the performance characteristics and capacity of their environment, as well as to project when and how their infrastructure would need to grow in order to meet an active and demanding user base. STLCC sought through this engagement to gain an understanding of their environment and validate their investment.

Prior to load testing, interview sessions with key stakeholders and the Blackboard consultant were conducted. These interviews confirmed that the Blackboard application is a mission critical system for St. Louis Community College. Usage expectations were defined to get a better understanding of system performance in relation to expected usage loads. To that end, a series of performance benchmark tests were conducted, culminating in a detailed assessment of the system response time and resource utilization under stress.

Blackboard Consulting worked hand in hand with STLCC staff to troubleshoot any issues as they were encountered, and to provide recommendations regarding the architecture, database, and blackboard configuration. Since that time, STLCC has worked to bring their environment in line with the recommendations from the Blackboard Consulting team.

Stability and capacity were demonstrated through extensive load testing with real traffic. Below are some highlights of the results:

- The configuration of the application servers in the DMZ (Demilitarized Zone) showed instability during the peak hours of 8 am to 4 pm. It also showed a 77% decrease in throughput as compared to the application servers behind the firewall. **This was the network configuration that was in place during the beginning of the Fall 2008 semester.**
- The configuration of the application servers behind the firewall proved to be stable with a majority of response times under two seconds with a few outliers. **This is the configuration that is currently in use.**
- The current hardware is capable of processing anticipated growth to approximately 300,600 hits per hour. This is more than twice the 130,000 hits per hour generated at peak usage times on the current production environment.
- Capacity testing determined that the primary bottleneck in the environment was the application tier which reached CPU saturation while the database tier remained 60 percent idle.

The final performance report details the work performed throughout the engagement and the full findings. Work centered on optimizing the environment to better utilize its resources and identifying several configuration options for performance improvement. These configuration options were further validated by leveraging the consulting benchmarking framework to demonstrate their overall impact.

## Goals and Conclusion

The St. Louis Community College deployment of the Blackboard learning system has the ability to support twice the current observed peak usage. Proper resources have been allocated to an environment that is seen as being mission critical. Blackboard Consulting, in close collaboration with the STLCC staff, performed extensive tuning on the application and database side to make sure that the production system can fully utilize the existing hardware. After these changes were put in place, the stability and capacity of the Blackboard Learning System were demonstrated through extensive load testing with real web traffic matching closely the usage patterns observed on the STLCC systems.

With the current configuration and hardware deployed, the STLCC system can now handle approximately 300,600 hits per hour, which is more than double the amount of traffic currently seen on the production environment. Peak load was determined by analyzing the Fall 2008 web server log files. Peak utilization was determined to be 130,000 hits per hour as seen in the September 2008 log files.

In addition, Blackboard Consulting was able to demonstrate that at current peak load, the Blackboard version 7.3 system (as now configured) is stable and robust with sub-second average response times for most test cases. The configuration of the application servers behind the firewall proved to be stable with a majority of response times under two seconds with a few outliers.

The proposed network configuration of the application servers in the DMZ showed instability during the peak hours of 8 am to 4 pm. It also showed a 77% decrease in throughput as compared to the application servers behind the firewall. Throughout the 2009 year, STLCC will make changes to the DMZ and firewall, and then reengage Blackboard Consulting to test capacity and performance in this configuration.

In short, all project objectives set out at the beginning of the engagement were successfully addressed. This success was in no small way due to the work of the entire STLCC team.