November 21, 2008

Dear committee Members:

Last year I was accepted as one of the fellows for the Global Cyberbridges program. As my project, I selected "The Development of Collaboration Platform Based on SAGE," (or "SAGE project" for brevity). I chose this project due to my interest in high-resolution visualization and remote collaboration. This project was particularly interesting during GCB since part of the program was taking Dr. Sadjadi's "Grid Enablement of Scientific Applications" class, in which we learned (in addition to the actual course material) about the difficulties of distributed collaboration and learning. One important concept I learned is that there are certain difficulties that cannot be controlled (e.g. difference in time zone), and others that can (e.g. picking the most appropriate software for collaboration).

The "SAGE project" had bold goals, especially considering the fact that the team members were so spread apart (two in China, two in Brazil, and two here in the United States). This project involved first seeing the viability of using SAGE as a collaboration platform, and then figuring out where there was room for improvement. SAGE has the advantage that it comes with collaboration software built-in. Our job was to enhance SAGE and/or its applications specifically for the purpose of collaboration and distributed learning. Still, the tasks could not all be completed with the given time, even with some of our team members dedicating significant portions of their time to the project. Some members are willing to continue contributing to the project during the coming year. We proposed the following three enhancements:

- An improved user interface modality: Make it possible to use a Wii Remote with SAGE
- Improve the remote desktop performance of SAGE, since its performance is not very good on Wide-Area connections
- Create/port a web browser to SAGE: To allow web applications to be displayed on the SAGE display.

A lot of progress has been made over the past year. Not all goals have been met due to unforeseen challenges. Particularly with the web browser and remote desktop projects, many complexities have risen. SAGE attempts to make it possible to port arbitrary applications to work with it, but the multi-layered approach of modern applications makes the actual process difficult. As a case in point, Firefox contains its own display engine, which relies on a widget toolkit and two separate drawing toolkits to perform drawing functions. These two toolkits have additional layers below them. This has made it more difficult than anticipated to port the web browser and the NX remote desktop client to SAGE.

The biggest challenge was overcome, which was the team members' ability to learn to cross the physical barrier of collaboration, but the software development still needs work. If this project is continued for the next year, the work done on it this year will truly show. With the exception of the working Wii Remote implementation for SAGE, our enhancements are still a work in progress. We have been able to port simple graphics to SAGE using the same drawing toolkit that is used by Firefox. Once we solve an existing issue with showing different-sized images on the wall, we can begin porting the actual browser. For remote desktop, we are performing tests that will lead to the optimization of the Virtual Network Computing (VNC) client included with SAGE. We are also actively testing alternative remote desktop implementations. Initially, we did extensive research on the NX paradigm, which was attractive due to its excellent performance. However, we have found that the open source version of the client still uses some components from the commercial version, so it is not clear if porting to SAGE will be possible. Knowing what the bottlenecks in the existing VNC client are, we will be able to optimize its performance. We will also start performing actual tests with the alternative remote desktop paradigms to compare their performance to VNC and begin working on a port to SAGE if deemed appropriate.

Once all of these tasks are completed, a full-featured collaboration platform will be available. After realizing the problems that occur with existing software for remote collaboration, SAGE seems to be a viable option that will be competitive with the existing technology. Plus, it has the distinct advantage of showing computationally-intensive graphics in high-resolution.

Sincerely,

Javier Delgado