



The Tale of the CyberCANOE: the Cyber-enabled Collaboration Analysis Navigation and Observation Environment

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Gather around as I tell the tale of settlers of a distant island called 'Oahu nestled in the mysterious Polynesian island chain of Hawai'i. It is a tale of danger, great courage and ultimately triumph...

The Landing

The Laboratory for Advanced Visualization and Applications (LAVA) got its start at the beginning of 2014 by Dr. Jason Leigh who was also the director of the Electronic Visualization Laboratory or EVL at the University of Illinois at Chicago. The mission of LAVA is to conduct research and development in big data visualization techniques, and to apply these techniques in cutting edge domain science, engineering, and training applications. Its first residence was within his office space at the Pacific Ocean Science and Technology (POST) Building 309. Over there, the meeting space was setup with two Seiki 50-inch 4K Ultra HD TVs connected to Samoa, a Dell Aurora-R4 outfitted with an i74960X CPU, 32 GB of RAM and a GeForce GTX 780.



Big monitors are nice, but by themselves require users to directly connect to them. The extra work for cable organization and having the correct adapters to allow user access generated a large setup time before a meeting could be started and still caused downtime when switching



between presenters. To enhance the meeting discussions by reducing hardware setup, the Scalable Amplified Group Environment (SAGE2) software was deployed to enable not only a quicker, smoother transition between presenters, but an open collaborative environment that could take advantage of both monitors at the same time.

Immigration

While the space at POST was sufficient it couldn't fit more than seven people comfortably. For spring 2015, Dr. Leigh was to host a class and needed a room to accommodate more than 30 people at once. Thus the move to the Kuykendall Building (KUY) began. Among the first issues to address was how to display information that could be seen from the opposite of the room. It did not come with whiteboards, projectors, or any of the usual infrastructure to teach a class. The decision was made to forgo such equipment and build upon the SAGE2 setup that was in POST. However the equipment brought over was no longer sufficient. While great for a gathering of members around a table, miniscule in the context of showing a room of students. Three new monitors were bought, LG 84-inch 4K Ultra HD 3D TVs. While initially there was worry about whether or not the computer could run it, these fears were quickly put to rest. Only when trying to stream more than four video sources at once was when lag became noticeable.



Settlers of Keller

Keller was a larger space and the goal once again was to improve upon the equipment setup. 18 Planar panels each driven by one computer. However Samoa wasn't strong enough. To take its place an Area-51 model, called Pele, was ordered. A significant improvement over Samoa, one of the major hardware improvements was the i7-5960X CPU and the two(SLI) GeForce 980 video cards. However, between the the two 980's there were only six ports available to drive the 18 monitors. To get around this, the Planar controllers connected to the Pele through three Matrox TripleHead2Go splitters to allow three planar panels to receive input from one HDMI cable. The current setup recognizes three of the planar panels as one monitor and they are arranged in the following format.



In addition to the visible hardware, SAGE2 relies heavily on an infrastructure that supports streaming and powerful endpoints (GPU and 10Gbps networks). With the development of SAGE2 and lighter-weight technologies (client-side rendering in browser, cloud, javascript), it was now possible to drive a large display wall with a single PC. Using Microsoft Windows allows teachers to use the wall for various classes (SciVis, InfoVis, Gaming, Design, etc) and in various configurations (SAGE2, Unity3D, presentations and web pages).

Rations

Pele is an Alienware Area-51, classified on Dell's store as a gaming computer. The intention of using a gaming computer is that the usage shows commonly available equipment is sufficient and specialized equipment is not needed to operate a SAGE2 wall. Other non-visualization groups will be able to easily order a machine of their own to mimic our setup without a significant hassle over part lookup. Other great benefits include a reasonable price range, reduced noise (compared to a server class computer), and the ability to purchase hardware upgrades since the computer uses standardized parts. At the time of writing Dell is already offering better hardware options than Pele is outfitted with.



Pele's major components:

CPU: Intel Core i7 5960X 3.00GHz 20MB L3 Cache

RAM: 4 x 8GB DDR4-2133 1066MHz

Graphics: 2x (SLI) NVIDIA GeForce 980 4GB GDDR5

Primary Storage: SSD 512GB

NIC: Gigabit ethernet



The Planar wall is comprised of 46" panels each with 1360x768 pixels. The panels themselves have controllers that fit into a server rack. Pele, itself however is only outfitted with two video cards totaling 6 ports. Matrox 1-to-3 extenders were necessary to connect up all 18 Planar panels. The server rack was placed to the right of the panels with Pele on the bottom and Planar controllers on the top.





A wired keyboard and mouse are impractical for usage due to distance requirements. An all-in-one Logitech wireless keyboard is used.



In addition to the above equipment a Yamaha Digital Sound Projector, which included a sub-woofer, is used for its low profile and decent quality sound. The meeting area of the room occupies roughly half of the 50'x32' room and even though the Yamaha is only one emission unit, it is still able to throw directional sound around the meeting area.



For video conferences a Logitech ConferenceCam CC3000e All-In-One bundle was setup. In terms of software, Google Hangouts was able to make full use of the resolution offered by the camera. However to make use of the higher resolution settings the camera offered, the network had to be sufficiently robust otherwise everything started to lag. The base station had decent noise cancelling built in, to date we have not had to adjust the settings. The receiver seems to be able to detect normal talking voices with clarity up to 20'. However to ensure each of the desks, including a lecturer's podium had sufficient audio pick up we decided to purchase 3 daisy-chainable Phoenix Audio Smart Spider MT503 voice conferencing speaker-mics, and a Q3 Power Adaptor (MT320). The MT320 enables power to be passed through the master unit to the slave units through the daisy-chain Ethernet cable. This meant that each of the slave MT503s could operate with merely the daisy chain cable and no additional power supply- which helps reduce the number of cables in a conference room setting.



Logitech CC3000e (left). Phoenix Audio Spider MT301 (right).



The Kuykendall room used three LG 84-inch 4K Ultra HD TVs (Left). The POST room used Seiki 50-inch 4K Ultra HD TVs (Right). Which unfortunately have since been discontinued.

Samoa, the Dell Aurora used to drive the setup in Kuykendall had the following specs:

CPU: Intel Core i7-4960X CPU @ 3.60 GHz
RAM: 4 x 8GB DDR4-2133 1066MHz 19-15-15
Graphics: NVIDIA GeForce GTX 780
Primary Storage: HDD 512GB
NIC: Gigabit ethernet



Epilogue

What new challenges await the crew of LAVA and how will they overcome them? Stay tuned for future exciting Tales of the CyberCANOE.

