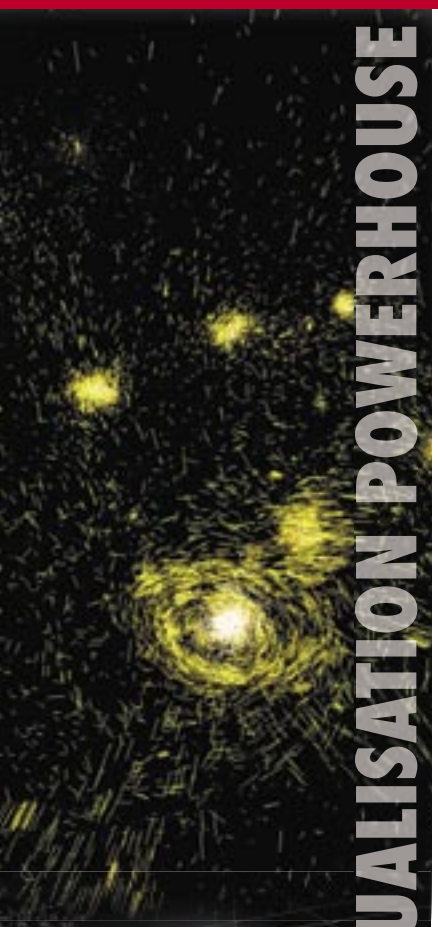

UNIX TIES MAKE MAC OS X A VISUALISATION POWERHOUSE

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Scientific visualisation involves the presentation of datasets in such a way as to provide additional insight into the underlying science that produced that data. Aspects of data can be mapped onto any of the human senses, but the most receptive is our visual system thanks to the powerful depth perception we experience through stereopsis.

Visualisation software has some highly desirable characteristics and some very unique requirements. At the Centre for Astrophysics and Supercomputing at Swinburne University of Technology, Apple hardware running the Mac OS X operating system is helping us meet those requirements.

Many of those requirements grew out of the Unix platforms used for visualisation in the past. For example, the sharing of source code written by collaborators and other researchers is an important aspect of scientific computing in general. There is the expectation that this source code can be compiled on the particular computer system owned by the research institution, irrespective of where it was written. This issue is even more difficult for applications that use media rich information, such as audio, and rely on graphical user interfaces.

While specific tools and conventions support this activity on a Unix platform, it has been significantly more difficult on Microsoft Windows platforms and the pre-Mac OS X Apple Macintosh. This issue is alleviated on most UNIX platforms through a large collection of cross platform libraries and because of the X-Windows windowing environment. X-Windows is uniformly supported on UNIX based systems and, thanks to Mac OS X's Unix roots, on that platform as well.

Graphics are another area where Mac OS X has proved worthy. Visualisation applications generally deal with large volumes of multidimensional data, and real time performance (at least 25 frames per second) is critical to being able to effectively interact with these datasets. This generally requires hardware assisted 3D graphics in the form of OpenGL compliant graphics cards. The standard support across the whole Macintosh range for OpenGL graphics, including uniform driver support, further ensures that such applications have a better chance of performing adequately across the various vendor hardware options.

Most high performance computing resources, whether based upon clusters or not, are running the Unix operating system. This means there are significant advantages for researchers to also be using Unix as their desktop operating system. The Centre manages a large cluster of Linux based machines, and staff within the Centre have a mixture of either Linux or Mac OS X desktop computers. All of the visualisation tools the Centre has developed locally can be compiled for both platforms, a significant efficiency given the time consuming nature of software development.

Many visualisation problems can benefit from stereoscopic projection, that is, the independent presentation of images from a left and right eye perspective to the corresponding human eye. This gives a strong sense of depth that assists in the understanding of three-dimensional relationships in a way that cannot be obtained with a single perspective view.

The Centre has a long history of using stereoscopic techniques, and the vast majority of the visualisation software developed locally can operate in that mode on any Macintosh equipped with a dual display graphics card. These applications can be employed to explore data in stereo3D in our stereoscopic enabled lecture theatre driven by a high end G5 tower. Thanks to Mac OS X, the same applications run on the midrange machines staff may have on their desktops, and on laptops when researchers are presenting their work externally.

Mac OS X's suitability as a platform on which to conduct scientific research is seeing it become the platform of choice in many science disciplines, including those that rely heavily upon visualisation. This is in addition to Mac OS X's other advantages, such as providing a single solution for commercial applications as well as research based software.

With regard to visualisation applications, there are still some challenges for Apple – in particular, support for more powerful graphics cards. The current highest end support is for the Radeon cards, which are in the middle of the overall performance range. There are, additionally, some unexpected differences between the X11 and OpenGL implementations on Mac OS X compared to other UNIX platforms. It is expected that the suitability of the Mac OS X platform for visualisation and scientific research will improve as Apple continues to pursue the high performance market in the future.