

I use my Mac for solving gun crimes

Christopher Phin – MacFormat, 1 March 2010 - 12:00am

Every now and then, we interview someone for our 'I use my Mac for...' section whose story is so interesting that it's a particular pain having to edit what they say down into the finite space we have in the magazine. So it was with Mike Barrett, so we're happy to share his interview, which also appears in issue 219 of MacFormat, here in full.

What does ALIAS do?

ALIAS (Advanced ballistics Analysis System) from Pyramidal Technologies Ltd represents the next generation in ballistics analysis. ALIAS enables firearms examiners and technicians to analyse cartridge data faster and with greater accuracy. The net result is that law enforcement agencies can identify, apprehend and convict more violent criminals more often than with existing systems.

ALIAS features Apple's thoroughly modern Mac Pro computer architecture. ALIAS offers 3D imaging, correlation, visualisation and confirmation systems that deliver an exponential increase in cartridge data available for investigation.

The ALIAS interferometer scans the surface of expended cartridge cases at the incredibly high resolution of 2 microns (one fiftieth the diameter of the average human hair) and stores these 'images', along with associated demographic data, in a relational database on the Mac Pro. These scans are filtered based on characteristics, such as firing pin type and firearm type, and then a series of sophisticated correlation algorithms weed out all but the most likely matching cartridge case candidates within the database.

The ALIAS system is powerful enough to allow a ballistics expert to make high quality determinations based on correlating images using ALIAS' innovative visualization techniques alone, without the need of a comparison microscope, a technology approaching its ninth decade of use.

Describe the process a forensic examiner would go through.

First, an examiner has to comply with typical evidence handling requirements, such as labelling and identifying the cartridge exhibit (via case number, exhibit number, signature and date) to enter into ALIAS. The examiner then inputs all specific demographic data of the exhibit – caliber, manufacturer, and more – into the ALIAS system, and places the expended cartridge case into one of six slots in the six-pac cartridge case holder, then loads the six-pac into the ALIAS interferometer. Next, the examiner initiates a scan. The ALIAS interferometer, independent of examiner input and ambient lighting, scans the entire surface of the cartridge case head (the area where the firing pin strikes) and after a

series of post-acquisition data filters, stores the resulting scan along with its associated demographic data in ALIAS' relational database.

Once in memory, the examiner can initiate a correlation, whereby the expended cartridge case in question is compared to all expended cartridge cases of similar class in the database. When the correlation is complete, the examiner is presented with a series of likely matching candidates, each of which has an absolute score showing the indication and likelihood of a match. The examiner can select any one of the proposed candidates for a high-resolution side-by-side comparison, using an advanced set of ALIAS visualization tools and the superior graphics capabilities of the Mac Pro and Apple's 30-inch Cinema HD Display.

How does ALIAS help law enforcement agencies?

Any solution that more rapidly places relevant information in the hands of an investigator is likely to result in a higher crime conviction rate. Because 'career criminals' commit a large proportion of murders and vicious assaults, increasing gun violence continues if these criminals are not apprehended. Apprehending criminals who commit gun crimes faster – before more crimes are committed – saves more lives.

Why build this system to run on the Mac?

Only the best available combination of computing and operating system architecture can offer what is needed for ALIAS to perform as expected.

Through the experience of bringing ALIAS to market, I've learned from my Chief Technology Officer, Ardavan Tajbakhsh, that Unix is an extremely capable, scalable, efficient, and secure operating system providing remarkable availability and reliability on an enterprise scale for decades. Apple Unix, in particular, is engineered to enable plug-n-play operations (important for ALIAS R&D efforts to create a bespoke interferometer and integrate it with the computing architecture). Also, using Apple Unix did not require 'Unix skills' to manage one or many systems, which is important as ALIAS clients are offered tiered service options.

The file system for OS X is flexible, supporting both local storage and external Storage Area Network connectivity, which may be an important future consideration as ALIAS deals with larger data sets (tens of millions, or more, of 3D coordinates defining each cartridge case scanned by the interferometer). The Mac Pro's memory management model is also high performance.

Before the Pyramidal Technologies team even wrote the first line of code, the plan was to ensure that all of the heavy computation of ALIAS would run on Graphical Processing Units (GPUs) using OpenCL and Apple's high performance multi-core Central Processing Units. Early in ALIAS' conception, Ardavan had the opportunity to liaise with researchers at an Apple World Wide Developers Conference (WWDC) who were working on animation, genetics as well as high energy particle physics, all requiring

heavy computation. The latter especially as it deals with petabytes of data. These researchers had all selected the Mac Pro as their platform of choice.

Since portability, integration and flexibility are part of what will future-proof ALIAS, Snow Leopard was chosen as it can not only compile and run existing Unix code (which might be needed during future R&D) but it can also be deployed in environments that demand full conformance, along with hooks to maintain compatibility with existing software. Also, PostgreSQL, the world's most advanced, fully open source database, made the Mac's OS X foundation a compelling choice, compared to the proprietary nature of Windows.

Finally, in addition to the Mac Pro's superior ability to handle the technicalities detailed above, the Pyramidal team also wanted a computing platform that is quite simply beautiful in both its visual and internal design. Up until the creation of ALIAS, forensics firearms examiners and technicians envied the equipment used in other forensics disciplines. ALIAS is visually pleasing – the user interface, fonts, themes, colours, and icons have all been carefully crafted and are a joy to use. Every detail in this visionary system was executed to provide forensics ballistics personnel the best and most accessible analysis system out there and to enable law enforcement agencies worldwide to achieve more convictions, faster, and to save more lives.

Mike Barrett is a former Royal Canadian Mounted Police (RCMP) officer and expert forensics examiner with over 25 years' experience in forensic firearms identification. He is President and CEO of Pyramidal Technologies, creator of ALIAS.
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