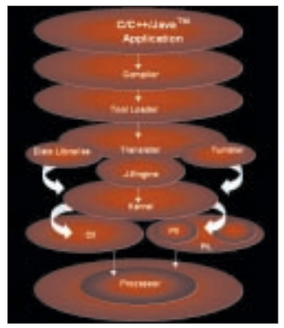
FutureOS

Elate

Amiga Corp.'s OS partner Tao Group has a range of interconnecting products. The core of the range is Elate, which is a Real Time microkernel Operating System - sometimes. Elate's unique trick is a translation technology which can be so useful that people often want to use it on other OSes. Tao's Java technology, which is said to be the best implementation of a Java machine available by quite a margin, is much admired. Bloat factors are claimed to be half those of the nearest competitors, speeds five times or better, and it's very compact into the bargain. Obviously this means that Tao's J-Engine is a tempting JVM for anyone. Not a problem - the Elate system can run as a run-time engine hosted in another OS, the slimmed-down version necessary taking up a mere 300k of additional space, barely noticeable when you consider how small the JVM is anyway.

Elate's structure is highly unusual. The kernel is a highly compact microkernel that can be scaled to meet the needs of the application - minimum versions of the kernel are as small as 12k. It uses a system of dynamic binding which allows the loading (from local storage or across a network) of code modules, called tools, only when they are called for by an application or the OS. Like the AmigaOS library system, this makes the Elate OS a highly memory efficient system. It is heterogenously multi-processing (I'll talk more about that later) and, most unusually of all, it retains cross platform binary compatibility.



Above: The structure of Elate. (illustration © Tao Group).

Virtual Processing

Let me explain this last point more fully. Elate assumes a "virtual processor," a 32 bit, little-endian RISC processor which exists in software only. The kernel and all OS and application functions happen above this layer. A hardware abstraction layer below that consists of contains a CPU Isolation Interface (CII) and Platform Isolation Layer (PIL) containing hardware drivers, and is the only part of the whole that needs to be coded for the specific hardware. This is not a major task - Tao Group claim that the translator for a new platform takes only around 12 man weeks of work. As well as having run-time engines for Dos, Linux, Windows and OS9, Elate runs natively on ARM, StrongARM, MIPS, PPC, x86, Hitachi SH, Patriot PCS1000, Motorola M-Core, and NEC V850 processors. A piece of software written for Elate in C++, Java, or the Virtual Processor machine code will run, without recompiling, on any of these hardware platforms. Translation takes place at runtime, meaning that there is little or no speed penalty for this binary compatibility.

Elate treats everything as objects. Executable modules are tool objects, which are inherited by program objects that pass message objects between each other. The object structure is highly parallel in nature, and is networkable. Elate's multiprocessing system allows objects to be processes and pass messages across multiple devices - and because of the binary compatibility, these devices don't even need to have the same CPU.

More than an OS

Although Elate is the core part of Tao Group's technology, there are other things that may or may not make their way into the Amiga product line. First and most certain of these is the J-Engine, which I have already discussed. Interestingly, QNX have licensed this for their QNX4 OS. Tumbler, a cryptography system based on the NRTU public key cipher system, is fast enough to allow transparent encrypting of networked messages, which is likely to be a key part of a successful (read: secure) Digital Convergence solution. The AVE (Audio Visual Environment) audio and windowing toolkit, and most recently the intent multimedia engines and toolkits, offers multi-platform multimedia-oriented interfaces.

"...minimum versions of the kernel are as small as 12k"

More about Elate

For more information on Tao Group and their technologies, reach the Tao Group web site at www.tao-group.com. This site contains a basic explanation of Elate, Tumbler, AVE and J-Engine. There are also downloadable PDFs and a couple of Powerpoint presentations.

Neutrino

A brief look at the technology behind the two Operating Systems battling for our hearts and minds.

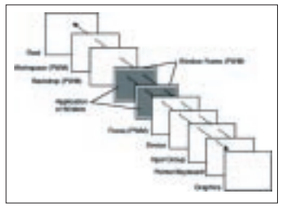
Neutrino, the OS that Amiga Inc. under Gateway originally specified for the next generation Amiga platform, is another Real-Time microkernel OS, if perhaps a slightly more conventional one than Elate. It differs from many other real-time Operating Systems in various respects. It is a small and scalable system which can run as a single binary image for small embedded applications, or it can run multiple processes in parallel from their own MMU protected memory space. OS services can thus be added at run time without compromising system integrity or requiring an Operating System reboot. Processes may also be run across a network of CPUs in SMP (Symmetrical Multi-Processing) mode.

Although Neutrino does not offer Elate's binary compatibility, it is largely source compatible across a wide range of CPUs. Neutrino is currently developed for x86, PowerPC, Mips and variants. It's apparently not a major project to get it running on new CPUs, and platform specific versions (i.e. making the PPC version run on a phase 5 G4 card or an iMac, for example) is relatively straightforward. Device drivers are source compatible, so hardware support that exists for one hardware platform can be easily adapted to another.

POSIX not Unix

Neutrino is a fully POSIX complaint microkernel, supporting the POSIX 1003.1 standards, including real-time operation and threading. From a practical standpoint, this offers API compatibility with other POSIX systems such as Linux and other UNIX derivatives. This will mean a very shallow learning curve for developers familiar with the POSIX system, and it will make applications very easy to port between Operating Systems. A principle aim of the Neutrino OS is to provide a fully embeddable POSIX system, but it should be noted that Neutrino is by no means a UNIX clone itself. The Neutrino kernel is in some ways as far from Unix as you can get, but as it is capable of providing the same set of services, it can be made to provide the same POSIX API.

As OS services are treated by the kernel in exactly the same way as user processes, and operate on an open API, the Neutrino OS is massively configurable. Code modules that would be an integral part of a monolithic kernel can be exchanged for user-supplied modules, or even hotswapped. This will allow a Neutrino system to be even more configurable than Amiga OS, and without resorting to all those hacks. It will also allow application specific OS extensions or replacements to be loaded at runtime.



More about Neutrino

For more information on Neutrino and the Photon GUI system, check out the QNX web site: www.qnx.com, and take a look at the special Amiga section at www.qnx.com/amiga. Several introductory documents are available to download, and a fairly in-depth guide to Neutrino and Photon can be read on-line.

Neutrino is a multitasking Operating System with pre-emptable inter-process message passing. The kernel hands this inter-process communication not just to pass messages across processes, but to keep track of process status, and handle scheduling appropriately. Multiple instances of the Neutrino kernel, as across a network of devices running the Neutrino OS, can use this process to talk to any thread on the network, thus sharing all resources with other computers on the same network.

"Photon contains all you would hope to expect from a traditional GUI..."

Fire Photon torpedoes!

As with the kernel, the accompanying Photon microGUI consists of a central process manager with various external processes supplying UI services. Thus, like the kernel, it is not only a very scaleable system, but a very flexible, 'hackable' system. It can be made appropriate to something as simple as a mobile phone or industrial machinery interface or as complex as any desktop OS dares to be.

Photon contains all you would hope to expect from a traditional GUI. It boasts a large set of highly configurable gadget types (hardcore MUI jockeys should be reasonably pleased) professional quality font engine and localisation, including simultaneous multi-language support.

One rather clever aspect of Photon is that it treats GUI calls transparently across a network. Thus you can control your desktop from another computer in a manner similar to Siamese, or pop the user interface of one application over a network to another computer desktop. Thus a Photon powered computer could open the GUI of any Photon powered domestic appliance (digital TV, webpad, mobile phone, PDA etc.) on its own desktop. Every application becomes, in effect, thin client capable, and if you are having trouble with a program, you can let the person on the other end of the support line fix the problem on your computer across the Internet. If you trust them not to do something stupid, that is!

Andrew Korn A

Far left: The Photon windowing system uses a beam of light paradigm for layering graphical elements - hence the name!
Left: Tao's J-Engine now runs on QNX 4.

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For more information, please get in touch via e-mail, phone or fax:

Email: info@amigactive.com
Phone: +44 (0)1202 296293
Fax: +44 (0)1202 296294

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