Patricia Seybold's

UNIX IN THE OFFICE

COMMERCIAL APPLICATIONS • TOOLS • TRENDS

Sun's OpenWindows

The Workgroup Macintosh?

By Michael D. Millikin

FOR MANY NOT directly involved with the Unix community, the jousting between the Open Software Foundation (OSF) Motif and Sun/AT&T OPEN LOOK camps can appear as just another example of partisan politics or as something to while away the dead time until the quadrennial silly season of presidential election campaigns cycles back. For observers involved in the PC industry, the Motif/OPEN LOOK (and, more abstractly, the OSF/Sun) contest gives them material over which they can shake their heads and wonder *(continued on page 3)*

We are at a juncture in the history of computer technology when users and vendors alike are looking beyond the operating system to issues such as interoperability between systems. However, it is important not to lose sight of some of the changes in operating system dynamics that could affect the foundation technology for the coming decade.

It is a time of decision. Will our future be determined by the combined work of the best minds in the industry, or will it be a return to domination by one or two vendors and a handful of developers? Clearly, the industry rebelled against the potential domination by AT&T and Sun Microsystems, but how will it react to domination by Microsoft?

Microsoft is also at a difficult juncture of its development. DOS, the source of its original strength, is beginning to die a very slow death. At the same time, the OS/2 world is still in chaos. Its parents—IBM and Microsoft—though not divorced, are separated. Microsoft has made a defensive move by pushing Microsoft Windows 3.0 to center stage—until developers need the full power of OS/2. Will developers be ready with OS/2 applications when users realize they are stymied by Windows' limitations? Will Microsoft slip OS/2 into Windows?

And what about portable OS/2? Will a portable OS/2 available on a variety of hardware platforms knock Unix off its mark? Now that control of OS/2 on 386 and 486 platforms has shifted from Microsoft to IBM, Microsoft will change its focus to a portable version of OS/2. If portable OS/2 can be implemented quickly and successfully (in less than two years and without major debilitating bugs), it could be available on a variety of other hardware platforms (foremost, RISC). Once OS/2 is available on RISC platforms (we suspect that Microsoft would start with the i860), it suddenly becomes a scalable operating system that could be used on a large-scale server as well as on LANs. The scenario that our friend Bill Gates might be dreaming

The Power of the Cooperative Model

Can the Consortium Stand the Test of Time?

By Judith S. Hurwitz

of would have Microsoft control the client environment with Windows 3.0, and the scalable server market with portable OS/2. Now, if Microsoft teamed up with Sun Microsystems with a port to SPARC, the computer industry might just be turned on its side.

While such a scenario would be good news for Microsoft and its chosen partners, it would be a disaster for the Unix and open systems market. It would also make a statement about the ability of players in the Unix market to work in unison for the benefit of users and vendors. In such a scenario, Microsoft developers would feel free to determine the way the operating system would be developed.

This would be a great loss to an industry that is just beginning to understand the power of the consortium to get the job done. Industry consortia have the potential to take the best pieces from lots of different places and quickly create powerful solutions. Two cases in point are the work of the Open Software Foundation's (OSF's) various requests for technology (RFTs) and the new road map announced by AT&T's Unix Software Laboratory (USL).

In essence, AT&T is taking the best component technology from its licensees and adding it to System V.4. As a result, System V.4 should mature into a much stronger operating system. Likewise, the RFT process from OSF has clearly demonstrated that companies are willing to share their best technology in exchange for recognition and faster time to market.

We believe that the cooperative model works best for the industry. This is why the work of USL, UI, and OSF are so important. If these competing organizations can cooperate to bring Unix into the '90s as a compelling and highly competent technology, then it is possible that the industry will be able to give real meaning to the term *open systems*. ◖

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(continued from page 1) if Unix really will blow it, giving OS/2 another lease on life. Even some within the Unix world are a bit bewildered by the choices. Aren't both solutions, after all, based on the same set of standards? (Well, as we'll see below, sort of.)

But the competition between the two graphical user environments really gets to the heart of two different strategies for promoting Unix as a widespread solution, particularly in the commercial world.

The OSF/Motif camp has standardized on an environment designed to promote maximum support in a heterogeneous environment. The look-and-feel maps closely to Presentation Manager (PM) and Windows 3.0 (especially after the latter was retrofitted, or "Motif-ed," by the addition of features such as a 3-D bezel). This "closeness" to IBM is a source of great comfort for the commercial side, which now sees a way to slide Unix systems right into corporate information systems and networks. It also helps that some of the bigger Motif supporters (such as IBM and Hewlett-Packard) are major influences on both the non-Unix and Unix commercial systems markets. As a result, OSF/Motif is currently available on more than 100 hardware platforms and 42 operating systems from 42 hardware suppliers.

The Sun/AT&T camp, on the other hand, was driven by a different rationale, seeking to provide what they thought was a better-designed user interface environment: OPEN LOOK. Some of the design decisions were made in a conscious attempt to deliver on Unix the same type of consistent, easy-to-use environment offered on the Macintosh. Or, put another way, Sun looked at the two most likely choices for mainstream graphical user interfaces (GUIs)—the Macintosh and the Presentation Manager—and decided that, of the two, it would rather be like the Macintosh.

Recognizing that, Sun knew that several tasks were ahead of it:

* Promoting an inexpensive standard platform upon which this new GUI and resulting applications could run

* Enticing key applications developers to write for the environment

* Enticing corporate in-house application developers to write for the environment

* Making sure that the resulting systems could use emerging standards and could become part of the emerging distributed computing environments

Sun's "All our wood behind one arrow" slogan basically embodies that recognition. (See Illustration 1.) Sun's focus is on providing one set of cost-effective, high-performance, advanced technologies with enough of a market share to make it a magnet for the application developers that ultimately determine the fate of a system. This is basically a blend of the standards-based strategy that catapulted Sun to its current position and the "We have a better idea" approach taken by Apple with the Macintosh.

A key element in the success of the strategy is OpenWindows, Sun's GUI application and development environment. Unless it can migrate its current base of 2,800 SunView applications over to the new windowing system and can attract and keep third-party developers, Sun will have a difficult time maintaining its market share and leadership position. OpenWindows is fundamental to that migration and expansion. (As a way to encourage migration, OpenWindows supports SunView binaries. Thus, you can have SunView, X, and NeWS windows all open on screen at the same time.)

The SPARC component of the strategy seems to be working. Last quarter, Sun shipped 28,000 SPARCstations, and expects to hit a shipment rate of 15,000 workstations per month later this year—an annualized rate of 180,000 units per year. In Unix workstation terms, that's a big market. (Almost big enough for Microsoft to sit up and take notice.)

Goldman Sachs has released estimates of workstation shipments for this calendar year. The results are shown in Illustration 2. Sun clearly has the lion's share. Even if the other three vendors are added together as delivering Motif interfaces, that still gives Sun alone a 62 percent margin over the Motif group: 170,000 workstations to 105,000. Then factor in the information that those three aren't yet all shipping Motif, and that, when they do, there will be possibly be some variations in implementation, and the Sun lead becomes even stronger.

Our early comment about Microsoft was not all in jest. Independent software vendors (ISVs) are driven by unit volume, not abstract notions of excellence. The more nodes out in the market, the more likely it is that major ISVs will write applications for those platforms. That, in turn, creates more demand for the
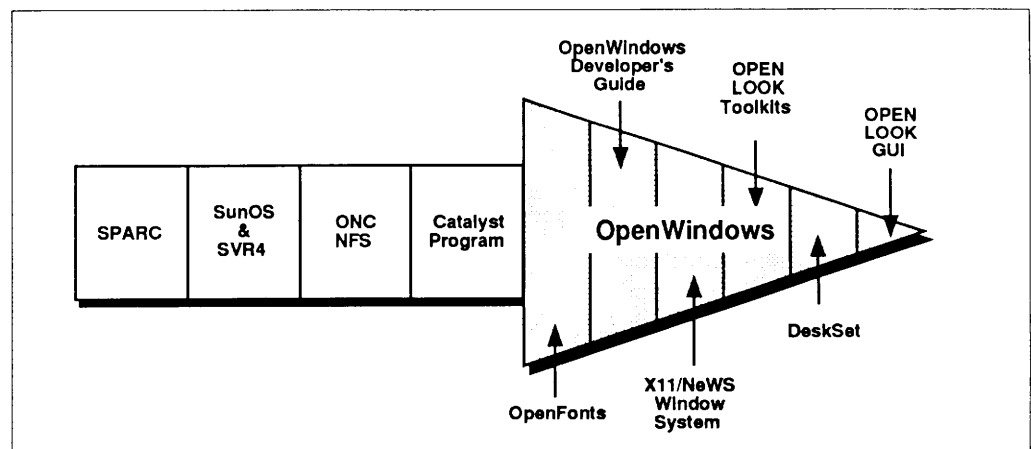

Illustration 1. One view of the notorious Arrow. We're not sure if Sun has a variety of arrowheads to fit onto the shaft. However, having OpenWindows as the point is quite appropriate.
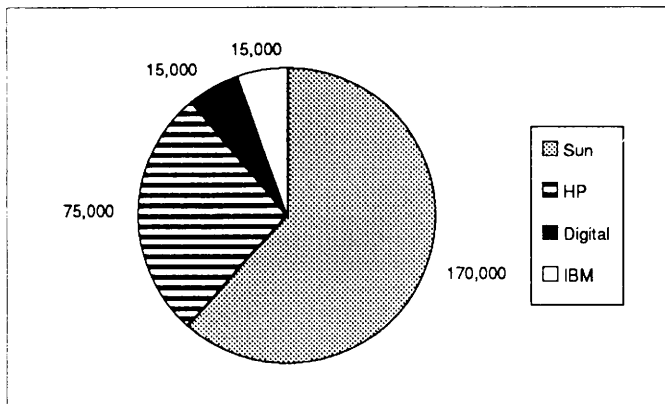
Illustration 2. Estimated number of workstation shipments for this calendar year (Goldman Sachs).

platforms, and so the spiral goes. (Unit volume is not the *only* factor at work, however. Other factors include standardization policies of large corporations and reasonable expectations of market growth.)

Not surprisingly, given the unit volume, the OPEN LOOK approach seems to be gaining steam, too. Sun has shipped 10,000 developer's kits for its OpenWindows environment. In the July announcement of its new Inter-Process Communication (IPC) workstation, Sun released a guide listing some 100 OPEN LOOK applications ready or close to shipment. The company expects 300 third-party applications to be available by the end of the year. Importantly for Sun, many of those so lured are the heavyweight PC developers such as Lotus, Ashton-Tate, and AutoCAD.

Personal Workstation magazine does a monthly survey of the number of applications that are actually shipping in the new GUI environments. For September, OPEN LOOK applications led the pack with 55 in the channels, compared to 23 NextStep applications, 22 OS/2 PM applications, and 17 Motif applications.

OpenWindows Version 2

OpenWindows Version 2 is the first general purpose release of the environment and is intended for end users as well as developers. OpenWindows consists of an X Window development environment that adheres to OPEN LOOK, the GUI itself, and a set of graphics-oriented personal productivity tools, the DeskSet tools (see Illustration 3).

As we'll explore below, OpenWindows offers a choice of three toolkits: one to support SunView migration over to X Window; another for pure X Window development; and the third for the development of NeWS applications. (These three are all part of the SunView Release 4 (SVR4) release package: two toolkits based on X, one based on the X Intrinsics and one based on NeWS.)

Sun released OpenWindows Version 2 in late July. This version uses the new 3-D version of the OPEN LOOK graphical user interface, contains 3-D DeskSet tools, and also incorporates

a new release of the X11/NeWS server that boosts performance by up to five times.

Determined to encourage adoption and migration, Sun is bundling OpenWindows in all diskful SPARCstations at no cost. Furthermore, Sun is not charging a licensing fee for developers who order OpenWindows.

OpenWindows Version 2 now uses the Xlib of X11 Release 4. Although source-level compatibility should require no porting, applications designed for OpenWindows 1.1 will need to be relinked with the new libraries.

Currently, SunView binaries can run unmodified on OpenWindows. In other words, an OpenWindows screen can contain SunView, X, and NeWS windows simultaneously. There are a few irregularities. SunView windows always obscure X11 and NeWS windows, for example.

However, as noted above, beginning with the SVR4, Sun will no longer support the SunView development environment. Users can continue to run existing SunView applications under the binary compatibility mode, but will not be able to compile new SunView applications on that and future OS releases. By fiat, OpenWindows becomes the default window system.

The other major piece is Sun's Developer's Guide (Graphical User Interface Design Environment), a graphical interface builder.

OPEN LOOK 2.0. The second release of OPEN LOOK includes performance enhancements and reduced system memory requirements in addition to providing for the 3-D look of the interface.

In addition to the X toolkit with the OPEN LOOK widget set, OPEN LOOK provides a set of X clients:

- Workspace Manager controls all desktop properties, such as color, mouse button, and keyboard assignments. It functions as a session manager, controlling program execution, end and resume functions, and clipboard functions.

- The OPEN LOOK Window Manager controls the appearance and placement of windows on screen and supports the use of icons.

- File Manager enables users to view and manipulate files in a graphical manner. This is the point of implementing the "drag-and-drop" protocol that provides a level of direct manipulation of icons representing directories, data files, and applications in the system.

Sun and AT&T have done some interesting things with the File Manager. For example, in addition to the direct manipulation of the icons for procedures such as printing, copying, and so on, the File Manager lets you launch an application simply by dragging the icon onto the workspace—the blank part of the screen. (We really like this feature. It beats double-clicking, and it certainly beats going through a workspace menu.)

What actually happens is that in moving an icon outside the border of the File Manager base window, you create an operating system link to the application. When you release the Select button, the application launches.

To load a file into an application, you can drag the data file from File Manager and drop it onto an application window or icon.

Sun views (no pun intended) drag-and-drop as one of its key advantages over the Motif environment as it comes out on the OSF tapes. Now the various Motif implementers need to provide this type of functionality on their own (which HP, for example, is doing with its VUE environment for its Unix workstations). That opens up the question of consistency for developers across different Motif implementations.

Currently, the drag-and-drop protocol is what Sun calls "first level." Developers are working on more robust implementations for the future. For example, what does it mean when you drag-and-drop an icon that actually lives on a file server 4,000 miles away?

OpenWindows supports drag-and-drop for copying data into other applications only between two XView applications or between two OPEN LOOK Intrinsics Toolkit (OLIT)—pure X Window—applications. In the future, Sun plans to provide drag-and-drop integration among the three OPEN LOOK toolkits.

- XTerm terminal emulator provides the character terminal emulator for access to character-based applications. (Sun prefers to use the shell tool and the command tool for terminal emulation. The command tool provides mouse support for editing, keeps a history log of command entered, and so on.)

DESKSET TOOLS. The concept of the DeskSet tools is not unique to Sun. Digital Equipment Corporation provided something similar with its DECwindows environment. Sun's tools provide user support for some of the features of the OpenWindows environment, however, such as the ability to associate applications and data files with icons. The DeskSet tools include the following:

- File Manager provides a visual representation of the hierarchical Unix file structure.

- Calendar Manager provides a scheduling tool. The tool works across groups as well, allowing users to check other users' calendars and to make appointments in those calendars, as long as the permission to do so exists. (The phrase "As long as...." is one that is going to haunt users for the next few years, we're afraid.)

- Print tool supports the dragging and dropping of an icon to invoke printing.

- Tape tool provides an easy way to read, write, or list data from a local or remote tape drive (no more *tar*).

- Calculator.

- Mail tool.

- Binder allows users to associate actions and applications to color-coded icons, also taking advantage of drag-and-drop.

- Snapshot tool captures all or a portion of the screen.

- Text editor is a mouse-driven tool enabling interactive text editing.

- Icon editor supports the creation and revision of icons and cursor images.

- Performance meters give a graphical view of system performance.

- A clock displays time and date.

X11/NEWS WINDOW SYSTEM. Sun was an early innovator in delivering graphical user interface systems. Sun's first windowing system—SunView 1.0—was proprietary (although open and licensable) and successful.

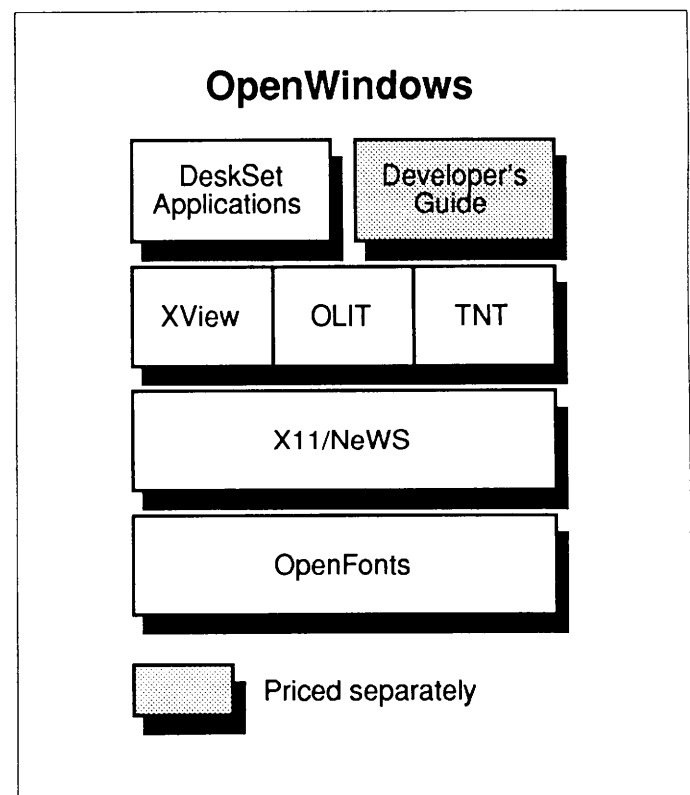Since standards and open systems had fueled Sun's success,

Illustration 3. OpenWindows architecture.

however, the company wanted to replicate that openness in all areas. It wanted a network-based windowing system that was as hardware independent as was the successful Network File System (NFS). SunView, by contrast, is kernel-based.

Sun's first attempt at providing a more functional and portable successor to SunView was NeWS: the Network/extensible Window System. Sun hoped to turn NeWS into the next de facto network standard.

NeWS, although it was not built on top of X, uses a client/server model for the network. NeWS uses PostScript as its foundation, for many of the same reasons that Digital had when it later opted to use Display PostScript as an extension to X.

NeWS enhanced PostScript to provide, for example, input and window-handling. From a desire to maintain compatibility with a standard, NeWS currently supports the full set of Red Book operators, according to Sun. (The "Red Book" is the *PostScript Language Reference Manual* published by Addison-Wesley.) Sun even figured out how to emulate those operators of the Red Book that wouldn't normally be required for a window system.

PostScript eliminates the need for caching bit maps, for example, by defining the outline of the font for scaling and then filling it in. NeWS implemented some primitives, but didn't do the on-the-fly conversion to bit maps. It relies upon some caching. (As we'll discuss below, Sun licensed the Folio font technology to provide the foundation for its OpenFonts component of OpenWindows.)
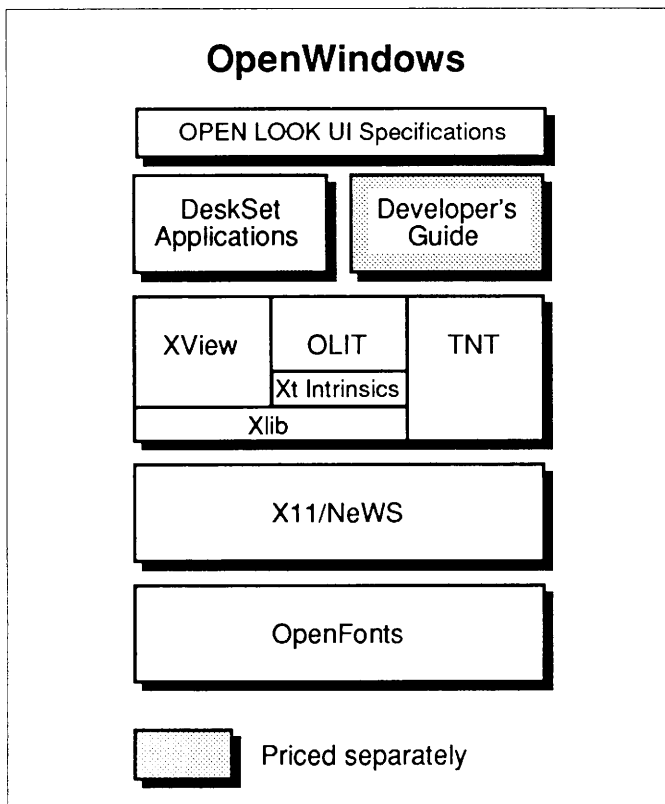
With the AT&T and Sun decision to merge SunOS with System V came a need for Sun to support X. It also obviously had to provide support for SunView. The result is the X11/NeWS merged window server.

X11/NeWS fully supports both windowing platforms without the use of emulators. A single application can access both NeWS and X11 concurrently. X11/NeWS is a unified server, not the layering of one windowing system atop another. (Sun had earlier been tinkering with delivering an X emulator riding atop NeWS).

The merged server provides one window tree for the management of windows and a single event queue for event synchronization. The queue dispatches events to both NeWS and X11 clients. Clients express their requests in native protocols, which the server translates using a layer of protocol interpretation (see Illustration 4).

Say "interpreter" and wary developers immediately look for some performance hit. According to Sun, degradation on the X11 side is hardly noticeable. While there can be some performance hits on the NeWS side, developers can use the structure of PostScript itself to ameliorate the situation through such techniques as downloading modules of code to await a triggering event (such as a mouse event) to begin processing, rather than carrying on a conversation across the wire.

The newest release used with OpenWindows Version 2 enhances performance up to five times that of its predecessor. Additional enhancements include:

- Easier installation.

- Improved server security using MIT's "magic cookie" mechanism.

- A new default window manager, the OPEN LOOK Window Manager (OLWM), which is built directly on the Xlib layer. OLWM is faster and more compact than its predecessor.

- Multiscreen support.

- National language keyboard support for European languages (Latin 1).

- A change in default visual from StaticColor to PseudoColor to make OpenWindows more compatible with other X11 environments.

- Support for the XGL graphics library, which gives developers access to fast 3-D and 2-D graphics within their applications.

     The X11/NeWS server supports three Sun toolkits:

- XView
- The NeWS Toolkit (TNT)
- OPEN LOOK Intrinsics Toolkit (OLIT)

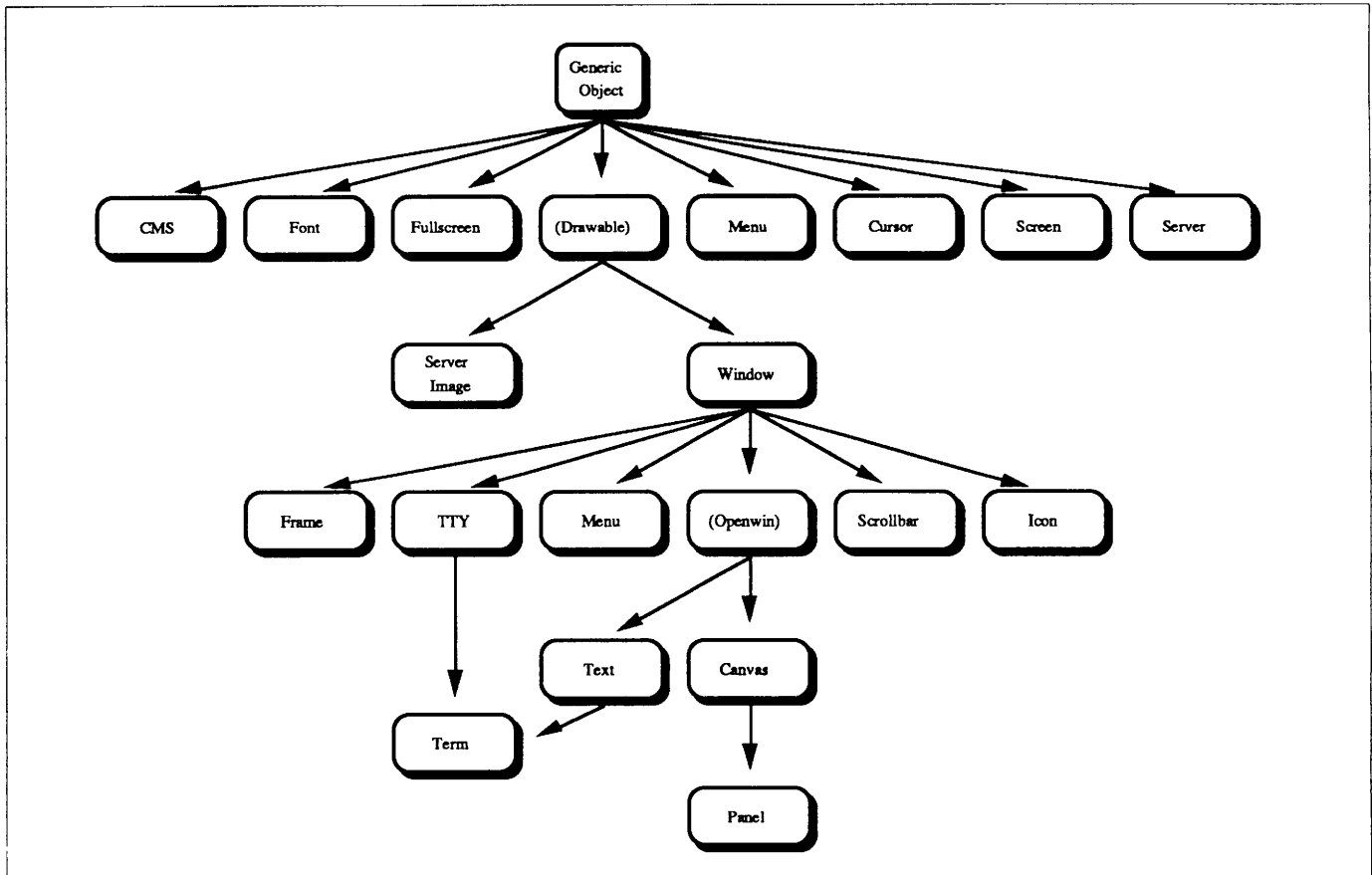All three toolkits implement the OPEN LOOK look and feel.

Illustration 4. The X11/NeWS unified server uses a layer of protocol interpretation to translate native client requests.

Illustration 5. The XView class hierarchy.

XVIEW. Sun faced a challenge in its shift to X: the preservation of the large and popular base of SunView applications. Its solution was the XView toolkit.

The XView toolkit implements OPEN LOOK on X11 while providing a migration path for existing SunView applications. Sun managed to redesign and extend the toolkit so that it supports X while still maintaining the flavor of SunView and—more importantly—much of the API set.

For example, SunView uses the Pixwin interface over the Pixrect library to provide imaging facilities. The Pixrect library supports concepts such as screen coordinates, pixels, bit maps, raster operations, vectors, and text drawing. XView, however, uses the Xlib library of graphical operations. To ease the transition between the two windowing systems, Sun maintained the Pixwin interface of SunView, but replaced the Pixrect library with the X11 graphical operations.

The Object Model. SunView used an object-oriented system model in its text, panel, and menu packages. With XView, Sun extended the object-oriented model to almost all of the window system packages (through the use of C's *varargs* to support attribute-value lists).

XView is an object-oriented system with static subclassing. All XView objects share common functions and retain SunView's

support for variable length attribute lists. Sun mostly implements XView's classes as static leaf classes. Subclasses inherit attributes from the superclass. With the exception of the TERM shell subwindow, which is subclassed from both the Tty and text subwindow classes, XView offers single inheritance only. All classes are subclasses of the Generic Object class. (See Illustration 5.)

Of the window objects, a few are worth particular mention. The Canvas subwindow object is the area into which developers can "draw" their programs. (See Illustration 6.) The Canvas object allows applications to draw on an area that is larger than the visible window where the drawing appears. SunView's solution for this is to implement the drawing surface as a Pixwin region. XView, however, treats the drawing surface as a separate window that is clipped atop the viewing window. The view window and the the scrollbars (if implemented) appear in the actual Canvas subwindow. The only visible part of the drawing (paint) window is that which is on top of the view window.

Panels and Menus. SunView panels and menus offer little consistency in function or appearance. As part of its effort to deliver a "Mac-like" environment, Sun made XView control panels and menus visually identical. XView implements panels and menus as windows, while the individual panel and menu
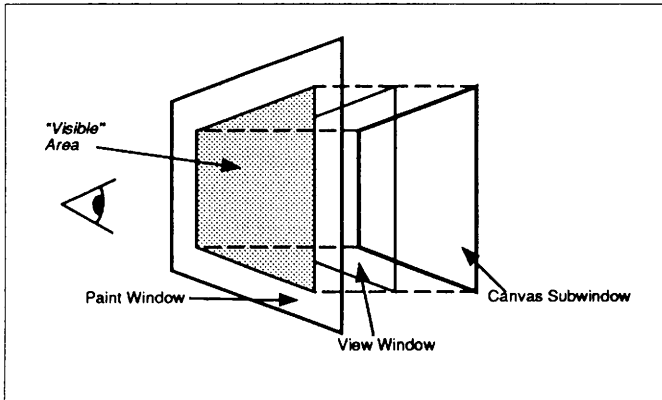
Illustration 6. The XView Canvas model.

items are not. As did Digital with its work on gadgets, Sun recognized that the sparing use of windows would enhance the performance of complex menus and panels.

There are quite a few other variations between SunView and XView in areas such as cursor implementation, icon handling, and nonvisual objects.

Imaging. As noted above, XView retains the Pixwin imaging interface but makes uses of the Xlib graphical operations.

In SunView, all images are Pixrects, which are manipulated as data structures in memory or as device files. When a Pixrect is displayed, the bits representing the image already reside on the same machine.

Such a configuration cannot be assumed in the X environment, however. XView provides server image objects in an X11 Pixmap represented on the client side as a Pixrect. Thus, server images can continue to be treated as memory Pixrects, thereby maintaining SunView compatibility.
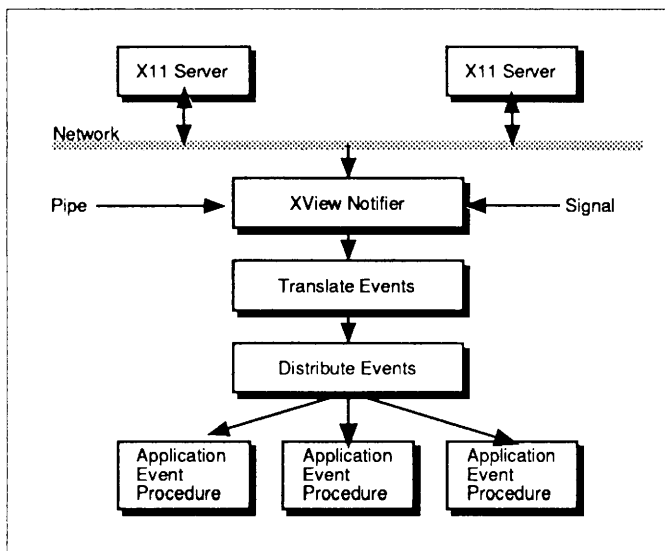

Illustration 7. XView Notifier with multiple X11 Servers and input from pipes and signals.

However, XView doesn't *require* Pixrects. The Sun implementation uses the Pixrect library for SunView compatibility. Because XView is not bound to Pixrects (which is a proprietary Sun library), it can easily be ported over to other hardware platforms. Sun is offering Ultrix, AIX, and HP-UX ports of XView done by Unipress. Other implementations not directly available from Sun include a VMS port of XView (from TGV Incorporated), XView for A/UX (from Integrated Computer Solutions), and XView for DOS (!) from Quarterdeck (which is also offering a Motif version of X).

The XView Notifier. Sun brought over the SunView notifier facility with little visible outward sign of change. Essentially, Sun managed to disconnect Notifier from the kernel and re-implement it with a connection to the X11 input stream without greatly disturbing the basic implementation.

Every SunView window is represented as a file descriptor; in XView, a single file descriptor connects to the server. SunView registers its windows with the Notifier, which, in turn, waits for input on the file descriptor for each window and then sends the input to the appropriate package.

XView also registers its windows with the Notifier. Here, however, the Notifier waits for input on the file descriptor connected to the server. The system then translates X11 input events to XView semantic events, and sends them to the appropriate Notifier client.

The XView Notifier waits for input on the socket connected to the X11 server. Should an application produce displays on more than one machine, the Notifier waits for input on more than one socket. The Notifier can register other file descriptors (such as a pipe) or certain signals as well, as can SunView. (See Illustration 7.)

Notifier multiplexes all the available input events into a single, ordered event stream, eliminating the need for applications to poll separate streams from the different devices.

Internationalization. Sun recently announced a Kanji version of OpenWindows, and will follow this release up with Korean and Chinese versions. (Japan is a major emerging market for Sun, which does some 13 percent of its total business in that country.) Sun doesn't yet have full double-byte support for localization of Asian languages in OpenWindows. For the current released version, it took what it expects will become the mechanism for supporting the double-byte character set in X11R5—the X Input Method (XIM)—and implemented it with the expectation that it will have a solution close to what the standard will become. Furthermore, Sun plans to donate its Japanese OPEN LOOK toolkit to MIT. The X Consortium then will offer Japanese XView for free. (We should point out that XIM is not a standard yet, but it is a vendor's best guess at what the standard will become.)

Full NLS support will come in the next release of OpenWindows (OW 3.0, in 1991).

Motif, by contrast, uses the User Interface Language (UIL) from Digital, which fully supports double byte and compound

strings, including all the character sets standardized by the X Consortium.

OLIT. The OPEN LOOK Intrinsics Toolkit (OLIT) is the OPEN LOOK (formerly Xt+) toolkit from Unix Software Labs (USL, formerly part of AT&T), which Sun has ported to its platform. OLIT is based on the Xt Intrinsics from the X Consortium. Xt, like other toolkits, provides a set of functionality to create, deploy, and destroy user interface components for the X environment with no enforcement of a user interface policy. The OLIT includes MIT X11R4 Intrinsics and the AT&T OPEN LOOK widget set. OLIT will run on any vendor's X11 server. Xt is a common foundation for multiple toolkits, and the API for one Xt widget set is the same as the API for another.

This common factor can make porting applications between different X implementations, such as OPEN LOOK and Motif, *relatively* straightforward. Sun has tested porting applications back and forth and offers up a port time of one to two weeks to move a complex application from one of those environments to the other. Some, if not much, of the work could be automated.

However, as OPEN LOOK offers some different capability and visual metaphors than Motif, there is no easy application portability solution outside of some recoding or acceptance of common denominator functionality.

A few third parties have, however, stepped up to the challenge. (More on this below.)

To recap: Although both XView and OLIT are based on Xlib, only OLIT is based on the Xt Intrinsics.

TNT. The NeWS Toolkit (TNT, the successor to the "Light" toolkit, or NeWS 1.1) is a toolkit for the merged X11/ NeWS server that supports the development of NeWS-based applications. (See Illustration 8.)

The current version of TNT shipping with Open-Windows is only demo code, according to Sun. It is there for developer comment and feedback but isn't recommended as a full development environment at this time. Sun will provide a fully supported version of TNT in early 1991, and will implement it with 3-D OPEN LOOK under OpenWindows Version 2.

The NeWS server is a PostScript interpreter with extensions to support a windowing system. Application developers can modify the

PostScript modules that constitute the server by writing some PostScript code. By contrast, extensions to X must be compiled (usually in C) into the server.

As does X, the NeWS environment consists of a client and a server, each fulfilling roles comparable to those of their X counterparts. As in X, the client/server terminology refers to the opposite of what many people expect. Servers are the displays. Clients are the applications that use the displays.

Client and server offer a layered set of interfaces from which developers can choose.

Client Side. There are five client-side interfaces:

- Server Communication Layer, which handles the communication between client and server. NeWS uses the PostScript language for client/server communication. (X Window uses the X protocol.)

- A TNT Substrate, which distributes events and handles communication between user interface objects on screen and the client interfaces. This substrate is the foundation for the higher-level interfaces.

- User Interface Components, which provide a set of services corresponding to OPEN LOOK components. This layer is comparable to a toolkit layer.

- Basic toolkit components, which include such building blocks as basic text and graphic objects.
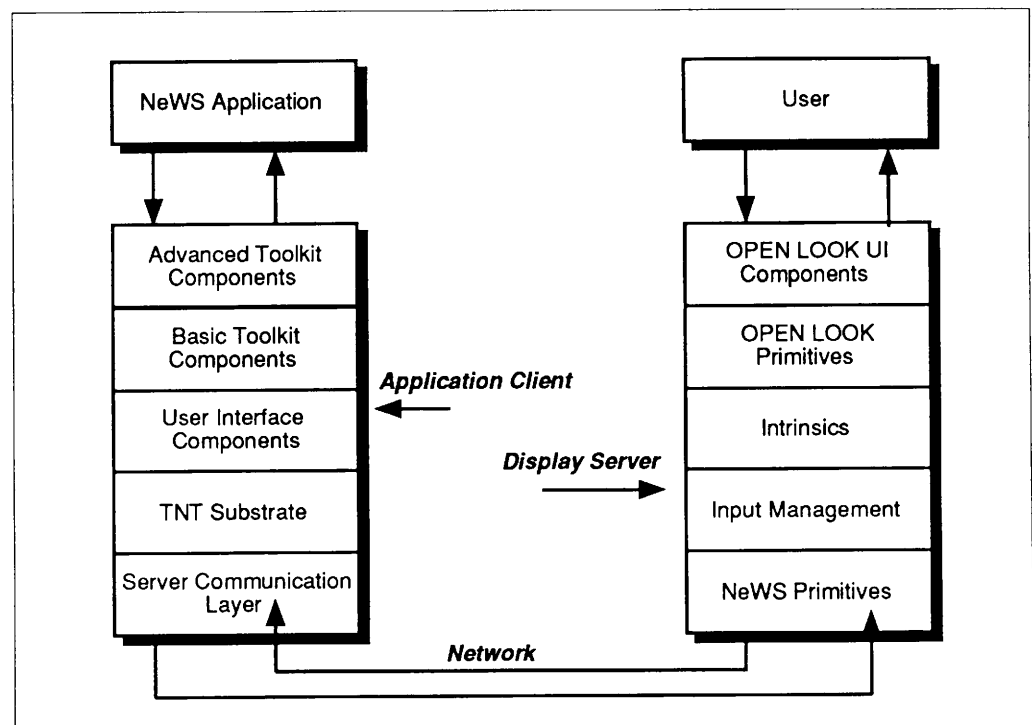

Illustration 8. The NeWS Toolkit Architecture. Notice that there is not a one-to-one mapping of the layered components in client and server.

• Advanced toolkit components, which present a full object-oriented programming environment for the creation of reusable, complex objects. At this level, developers should write in C++, or in C with the use of the toolkit preprocessor to support the object model.

With the use of TNT comes client-side access to a hardware-independent imaging model. The "stencil-paint" image model uses a path (an arbitrary sequence of points, lines, and curves) to describe a shape or an outline. The path can be "stroked" (traced by a single line) or it can be filled. To draw something, you build the path and then apply color through the resulting stencil; hence, "stencil-paint."

Once defined, a path can easily be manipulated (rotated, translated, or scaled). This imaging model uses an arbitrary coordinate system that can be mapped to a variety of displays. Any improvements in the underlying graphics foundation are automatically gained by the application.

This is quite different from the traditional device-specific raster image model used in X Window, where there is a one-for-one mapping between video or raster memory and the display device. The hardware-independent imaging model is one of the clear benefits of a PostScript foundation. (See Illustration 9.)

Server Side. The server-side architectural layers include:

• Primitives and input management facilities that extend PostScript to support a full window system.

• The intrinsics, providing a generic set of common objects (menus, scrollbars) with no particular look or feel. These are quickly customized.

• OPEN LOOK Primitives and OPEN LOOK Components. Components such as names, menus, and button stacks consist of collections of primitives (such as buttons, resize corners, and pushpins). These components and primitives are fully compliant with the OPEN LOOK specs.

Most TNT components (with the exception of the text package and the wire service protocol) reside in the server, unlike X, where widgets and intrinsics live on the client. This has some interesting implications for application design. For example, the NeWS solution enables minimal client memory usage, as no client memory is used to store or to execute the user interface components. Also, because the user interface components are executing in the server, user actions and application responses are more tightly coupled, giving better interactive graphics performance. This is important in a variety of applications, including electronic publishing. (Frame is using TNT to implement FrameMaker under OpenWindows.)

Furthermore, because the server can be extended with application-specific objects through the use of PostScript, a developer can tune an application to minimize communication between client and server portions. This opens up the possibility of using low-bandwidth networks for network-based windowing—something not very attractive in the X Window environment because of the message traffic generated. (A few years back, Sun actually did some testing on a NeWS server implemented on the Atari ST with 2400-baud communications, and pronounced that the result reflected "surprisingly good performance.")

OPENFONTS. Fonts, as you may have noticed during the past year or so, have become a focus of major controversy for the industry. Sun is embroiled in this as well.

Recognizing the need for a scalable outline font solution in its workstations, Sun initially tried to make a deal
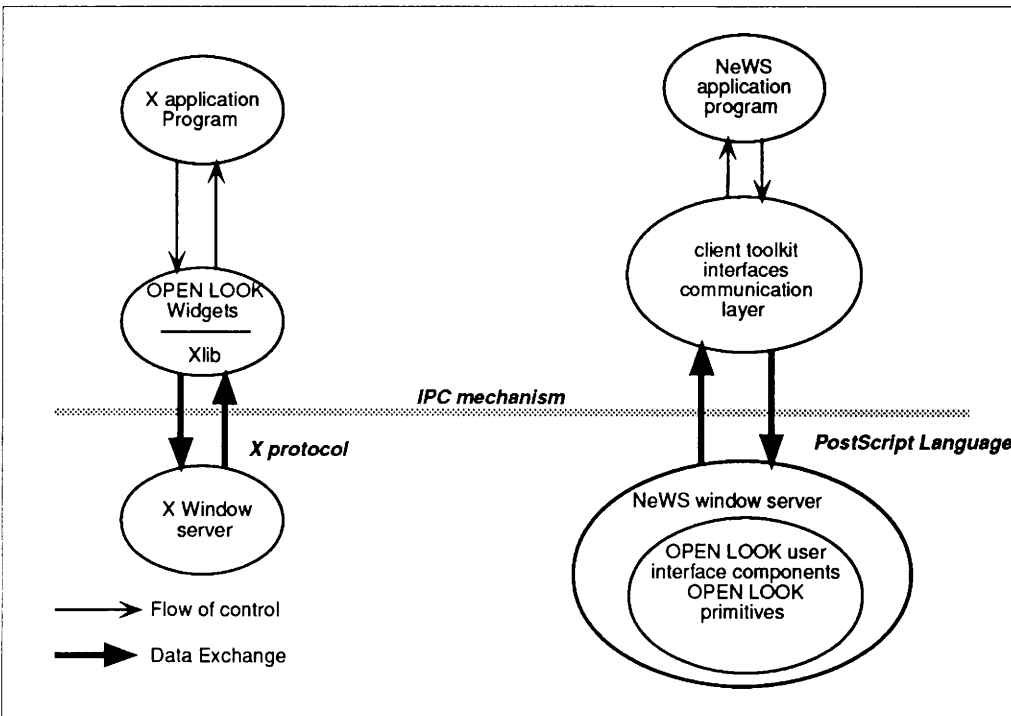

Illustration 9. Although the NeWS and X Window models are similar in many ways, they differ in some basic architectural points. These differences will affect and be affected by network traffic, memory available to the window server, and the computing resources of the clients. Basically, it takes a bit more computational juice to handle NeWS. However, you tend to get what you pay for.

with Adobe. When that failed, Sun acquired Folio and the Folio scalable font technology in 1988.

The Folio technology became the foundation for what Sun calls OpenFonts. OpenFonts is a font-scaling module that works independently of the imaging model and consists of three pieces of licensed software:

- F3, an intelligent outline format.

- TypeMaker, a tool enabling type vendors to create outline fonts in F3 format quickly and inexpensively.

- TypeScaler, which generates bit maps in any orientation, point size, or resolution for both the screen and the printer. The current release of TypeScaler generates bit maps 30 percent faster than its predecessor. Additionally, the code size overhead is smaller.

TypeScaler software and F3 fonts will compete with Adobe's Type Manager and Type 1 fonts, and with the Apple/Microsoft Truetype fonts and scaling technology.

Sun licenses OpenFonts to individual font suppliers. Linotype, Monotype, Bigelow & Holmes, and Berthold are converting their outline libraries to OpenFont format. Currently, there are 627 F3 format fonts available. Sun provides 57 fonts with OpenWindows.

OpenFont technology is part of the converged Sun/AT&T Unix V.4 released this past fall. This raises some interesting aspects not only to the scrapping over font technology, but to the utilization of X Window as well.

Publishers have, in general, seemed a bit dismayed by the swing over to X Window during the past few years. X's loose coupling between an application and the screen, and especially its provision for only fixed-size, bit-map fonts, make it ill-suited for some application purposes.

The inclusion of OpenFont provides a workaround. The application may request any size of font that it likes; Typescaler prepares a bit map for that size and hands the bit map to the X server so that the server can always carry out the request. (The X Consortium is working on extensions to the X command set to deal with issues such as providing a list of installed font bit maps.)

NeWS, which is resolution independent, supports scalable fonts directly. X is resolution dependent, so the Folio TypeScaler software prepares scaled character bit maps on demand and passes them to X for display on the screen. X thinks it is getting prestored bit-mapped characters.

(As an interesting sidenote, Adobe has licensed ATM to Agfa Compugraphic for use in a future X11/NeWS driver.)

PERFORMANCE. Performance of any windowing system, but X Window in particular, is a tough problem. Performance concerns generally fall into two areas: memory requirements and screen performance. With OpenWindows Version 2, Sun has managed improvements in both areas.

The server working-set size (the amount of memory used when a set of applications is being run) has decreased. Although the working-set size varies with the types of applications being run, Sun ran a comparison using the same applications against OpenWindows 1.0 and 2.0, and MIT X11R4 off the tape. OpenWindows 2 weighed in at 948 KB, against OpenWindows 1.0's 1,724 KB. MIT X11R4 had a working set size of 684 KB for the same applications. This 264 KB delta also includes the presence of the OpenFonts technology and support for NeWS.

Sun is basically insisting that an 8MB desktop machine would be fine for OpenWindows (especially in a general purpose computing environment that tends to be more cost conscious).

OpenWindows has also made some impressive performance gains from Release 1 to Release 2. Sun used the x11perf benchmark (released by Digital through MIT) to measure the speed of graphics operations of OpenWindows 1 and 2 and X11R4 on two 16 MB SPARCstation 1+s, one with a graphics accelerator, one in a color configuration.

Performance enhancements are not the sole property of Sun, of course. OSF has been working away on Motif (which suffered problems similar to those of OpenWindows 1.0). Motif 1.1 now offers gadget-caching and shared library support for a reduction in memory consumption by about 50 percent and an acceleration in performance of about 30 percent.

Developer's Guide

GUIs may be great for users, but, as we've often pointed out in this publication, they're giving developers a tough time. The programming models are vastly different, and the GUIs are much more complex. The bulk of a developer's time is spent in fiddling with the interface rather than with the meat of the application. Sun can't afford to wait. It needs applications if it is to realize its vision of delivering a Mac-like environment in Unix.

For that reason, Sun has created an interface builder called OpenWindows Developer's Guide (Dev Guide). While the functionality of the package is quite good, it is the pricing and distribution that we'd like to discuss first.

Sun plans to offer Dev Guide for $250. Although it is not part of the OS, a package priced at that level is nearly irresistible. Sun isn't seeking a direct revenue stream from Dev Guide (as are companies whose sole business is developing such application tools). Rather, it is trying to create a large third-party and in-house application set.

> *GUIs may be great for users, but, as we've often pointed out in this publication, they're giving developers a tough time.*

When it is released, Dev Guide will also be in synch with the current OpenWindows release. In other words, there is no lag time between the release of a GUI upgrade and the ability of a third party to provide a builder tool that can exploit the new functionality. OpenWindows and Dev Guide march out shoulder to shoulder.

FUNCTIONALITY. With Dev Guide, developers select and position objects on the screen to create an application interface. Dev Guide has two basic operational modes: Build and Test. In Build mode, developers add, move, and delete interface objects and edit their properties. Developers can select and drag interface object icons with the mouse and drop them in the desired spot. Dev Guide offers a palette of icons representing various objects such as control functions, scrollbars, and menus.

Controls and control functions available to the developer include:

- A File menu, which contains items used to load, close, and save interfaces and portions of interfaces.

- A View menu, which opens up previously dismissed pop-up windows.

- An Edit menu, which contains items used to cut, copy, and paste elements within and between different interfaces.

- A Properties menu, which contains a list of property windows for editing the properties of individual elements within a user interface. The property sheets allow the customization of the object types. Developers using Dev Guide can create applications that exploit the drag-and-drop function offered by the File Manager. Dev Guide automatically handles the appropriate code generation for drag-and-drop based on the simple setting of one item in a properties list. The simplicity of access reportedly has won enthusiastic support from developers.

- A toggle between Build and Test modes. In Test mode, the developers can run the application interface to check its operation. Testing can occur before any code generation and compilation occur.

The interface elements Dev Guide offers are:

- The Base element glyph, which places a base window on the workspace when you drag it there

- The Pop-up glyph, which places a pop-up window on the workspace

- The Controls glyph, which places a control area in an interface when placed in a base or pop-up window

- The Canvas glyph, which places a canvas pane in an interface when placed in a base or pop-up window

- The Term glyph, which places a terminal pane in a window

- The Text pane, which places a text pane in a window

- The Button glyph, which places a button in an interface when placed in a control area

- The Message glyph, which places a message in a control area

- The Setting glyph, which places a setting in a control area

- The Text Field glyph, which places a text field in a control area

- The Slider glyph, which places a slider in a control area

- The Gauge glyph, which places a gauge in a control area

- The List glyph, which places a scrolling list in a control area.

To oversimplify, creating an interface consists of dragging out a base window, adding a control area, and then filling in the various components.

After saving the interface, the developer must run a companion program, Gxv, to generate source code for the user interface. Gxv generates five files:

- A _ui.c file, which includes statements and an initialization function and creation function for each element in the window. This file is the primary source code file.

- A _ui.h file, which contains C externs for each initialization and creation function in the _ui.c file and a typedef for the base window.

- A _stubs.c file, which contains function templates for each of the handlers set for each element of the base window. The Notify handler specifies the name of a routine that is called when the user clicks Select. Gxv puts the Notify handler name in the _stubs.c file. Filling in the Event handler field generates the drag-and-drop code as well. For example, entering "dragproc" into the Event handler field in a property list for an interface file named "dianna" generates the set of code shown in Illustration 10 in the _stubs.c file.

- An info file, which contains help text for each element (all developer added).

- Makefile, which contains information to control the compile.

Currently, Dev Guide generates code for XView in standard C (Kernigan and Ritchie), ANSI C, or C++. Dev Guide stores user interfaces in GIL, the Graphical Intermediate Language. GIL stores an interface without reference to a specific windowing system or programming language. All you need is a source code generator that can read the GIL file and generate source code for

```
/*
* Event callback function for 'textpanel'
*/
Notify_value
dragproc (win, event, arg, type)
      XV-window           win;
      Event               *event;
      Notify_arg          arg;
      Notify_event_type   type;
{
      dianna_window1_objects *ip= (dianna_window1_objects *) xv_get
(win, XV_KEY fprintf (stderr, "dianna: dragproc: event percentd\n",
event_id(event));
          if (event_action (event) == ACTION_DRAG_LOAD) {
                  char name[MAXPATHLEN];

                  if (gdd_get_drag_name(win, name) != -1) {
                          xv_set (win, TEXTSW_FILE, name, 0);
                          return NOTIFY_DONE;
                  }
          }
          return notify_next_event_func(win, (Notify_event) event, arg, type);
}
```

Illustration 10. Part of a stubs.c file generated by Gxv.

Comments

"Wall-of-death" style posturing is, of course, not really in good taste among members of the "Open Systems" community. Nevertheless, we have detected some satisfaction among segments of OSF membership companies over Motif's rapid acceptance at the expense of OPENLOOK. And truly, for a vendor such as IBM or HP, with a commitment to more than Unix, a consistent interface foundation makes a great deal of sense.

But acceptance is one thing, and implementation is another. It appears that new OPEN LOOK applications are well outpacing Motif applications. Combining those applications with the growing number of SPARCstation sales as well as the promised advent of third-party SPARC imple-

a particular environment. In the future, Dev Guide will support OLIT and TNT. In other words, the same builder front end will define the interface code for the three OPEN LOOK toolkits.

Sun is making GIL available, so third parties can write their own code generator to port programs into different languages and windowing environments. The gotcha is that the environment must support OPEN LOOK.

Of course, since XView is now part of SVR4, and since Dev Guide will soon be generating OLIT (or Xt+) code, Sun and Dev Guide become excellent platforms for generating applications running in an SVR4 environment.

True, Dev Guide isn't as functional as, say, NeXT's Interface Builder. Nor does it currently support such obvious wish items as the graphical linking of interface to code. But it does, as we mentioned above, make it easy for developers to create applications that are integrated into the DeskSet environment and that have access to features such as drag-and-drop. And, considering the price and the potential for consistency of generated interfaces across the various OPEN LOOK platforms, we think that Dev Guide is going to do exactly what Sun hopes it will: promote more applications development (especially in-house).

Internationalization. Sun also recently announced a Kanji version of Dev Guide. Kanji Dev Guide will enable application developers to write applications specifically for the Japanese market. As with Kanji OpenWindows, Sun will follow suit with the release of Korean and Chinese versions of Dev Guide.

mentations, Sun could indeed become an entrenched major force in the advanced desktop market.

Although the comparison is not an exact one, let's think for a moment about the Macintosh/Windows 3.0 situation. The highly publicized release of Windows 3.0 did send some momentary shivers up Mac user spines. On the surface of it, Windows offered a great deal—support for the huge hardware base, an open systems environment, and so on.

Now that the hype has died down, however, the general consensus seems to be that the Mac is still a better platform, with more consistency and better performance. (It must have been the positive articles reviewing Windows 3.0 that started out by noting that the system "only" crashed a few times that first tipped off the Mac community to the actual state of affairs.) Because it is designed to span a large number of hardware environments, Windows is running into some severe compatibility problems. Windows 3.0 software is pushing "compatible" systems past the point of compatibility. Rather than girding themselves for the end of an era, the Mac community is actually expecting an increase in available application opportunities, as some developers turn their sights on the Mac as well as on Windows 3.0. (Now if Apple management can just keep from shooting itself in its collective foot...)

What Sun is able to offer with OpenWindows is that great consistency that makes the Macintosh such a usable system. With SPARC, Sun is able to offer a growing hardware base that will run those applications.

And, cheekily trying to wrest back some of the ground from

Motif, Sun Microsystems and UniPress Software Incorporated of Edison, New Jersey, have agreed to offer Sun's XView toolkit on Digital, IBM, and Hewlett-Packard Unix workstations.

(Two can play that game, of course, and Motif will appear on SPARCstations. Count on it.)

To answer the multivendor issue further, Sun and others are porting OPEN LOOK toolkits to 35 different systems. Integrated Computer Solutions of Cambridge, Massachusetts, is offering XView for A/UX, for example.

On the technical front, OpenWindows raises some interesting challenges and solutions. SVR4 offers the combined X Window/NeWS server along with the Folio font technology. OSF currently doesn't have a consistent solution in that area, leaving it up to implementers.

Some X partisans have proposed substantial extensions that would include, among other things, the incorporation of Display PostScript. X would look more like NeWS. But then, we would hit the same font technology issue that has bedeviled the PC industry.

Since X and NeWS are present on every SVR4 system, an increasing number of software developers may quietly slip over to NeWS. For markets without a commitment to X (such as

office applications or publishing), such a defection could make a great deal of sense and could further fuel the adoption of Sun as a desktop platform.

To summarize:

- Sun's own SPARC sales are creating a sizable base to attract developers.

- A number of PC and/or Mac applications (such as Informix's WingZ) are appearing using OpenWindows.

- Sun's strategy of promoting consistent use and easy development within OpenWindows appears to be working.

For those who wish it, there are solutions from third parties that allow the generation of Motif or OPEN LOOK code (Exocode, for example), as there are desktops that span multiple windowing environments (such as Looking Glass).

But Sun appears to be delivering on its strategy of a single, consistent, desktop-style environment. Bottom line: We don't think that the interface issue is as dead as some OSF-ers would like it to be. ●

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NEWS

PRODUCTS • TRENDS • ISSUES • ANALYSIS

ANALYSIS

• S Y S T E M   V. 4 •

The New Extensions

When AT&T released System V.4, the company made no mention of any plans for enhancement. Instead, V.4 was presented as the definitive Unix operating system—a combination of System V and SunOS. Now, suddenly, AT&T's Unix System Labs (USL) has announced a whole slew of extensions for V.4 that will advance the system considerably. USL announced technologies such as symmetric multiprocessing, security, high-availability file systems, and distributed computing for System V.4. It's all a rather dramatic move, no?

Obviously, Unix International (UI) is behind these new developments. UI workgroups have been delving into these areas for some time now, and, earlier this year, UI issued a roadmap for System V.4 that detailed the industry's Unix requirements. With its new announcements, USL is attempting to answer those requirements.

THE PARTNERSHIPS. But USL is not going solo here. And neither is it seeking help solely from Sun, as it has in the past. Instead, USL has adopted a strategy of partnerships to get its products out the door fast. Several UI members are contributing technology. For instance, USL has teamed up with Sequent, which has had a multiprocessing version of Unix for online transaction processing (OLTP) for some time.

These partnerships are not only pragmatic; they will also bring a more thorough system to market. Technologies from a variety of sources—all of which add their specific strengths to System V.4—can only help the resulting system.

SECURITY. System V has always had a few security features. Unix passwords are protected with an encryption mechanism, and users have always been able to set permissions (user, group, global) and access rights (read, write, execute).

Security extensions will be a two-part endeavor for USL. The lab is partnering with Amdahl and Motorola. The first extension—System V/MLS (Multi-Level Security)—is slated for Q1 '91 and promises to enhance System V security to the B1 level of the National Computer Security Center's infamous "Orange Book." The second extension—System V.4 Enhanced Security (SV4ES)—is scheduled by the fall of 1991, and it will enable customers to configure their systems at different levels of security, ranging from the C2 level (at the low end) to the B3 level (at the high end).

Okay, okay, what do these levels buy me? At the B2 level, the highest government-assured rating that the USL is offering, you can expect:

• A mechanism for identification and verification (or authentication)

• Authorization

• Access control

• Administrative audit and reporting

• Documentation

The SV4ES offering will be fully compatible and interoperable with System V.4. USL has given the product a modular design—a plug-and-play implementation, if you will.

FILE SYSTEM. USL is calling its file system a "high-availability" file system—one that will encourage customers to use Unix for mission-critical business applications (read "transaction processing"). The lab is partnering with Veritas, a disk- and product file-management vendor located in Santa Clara, California. USL plans to incorporate file system extensions that improve performance, enhance data integrity, and simplify administration of online

information systems.

The first product will be the Veritas Volume Manager (VxVM), to be released by the end of this year. VxVM allows the System V file systems to span multiple disks and supports disk-mirroring for data protection. It also allows online movement and expansion of file systems and data to different disks, as well as online disk-storage reorganization, and striping.

This, incidentally, is the same thing that IBM and Digital have done to the AIX and Ultrix file system. The technology isn't really new, but, fortunately, it seems to be becoming part of mainstream Unix.

MULTIPROCESSING. Symmetrical multiprocessing may be the most important of the USL announcements. No doubt, the technology was spawned by the UI multiprocessing workgroup headed by Gerald Popek (which, incidentally, included members from both UI and OSF). As with security, multiprocessing will be a twofold implementation.

USL will introduce multiprocessing capabilities with System V.4 MultiProcessing (SVR4 MP) in the first half of 1991. USL is partnering with Intel, Olivetti, NCR, Oki Electric, Unisys, and Motorola. Its key features include:

- A multithreaded operating system, scalable up to 16 processors. Although SVR4 MP is *not* a microkernel, USL is changing the kernel signficantly. Portions of it are written in C++. Furthermore, it will be more modular. Utilities, memory management, streams, I/O, NFS, TCP/IP, libraries—these will all be multithreaded, which will substantially cut down on processing time and bottlenecks.

- A copy of the operating system on each processor, rather than a distributed operating system across the processors, which will ensure reliability.

- An enhanced, upwardly compatible

device driver/kernel programming interface, to make it easier for third parties to develop device driver hardware.

- Processor binding, which specifies a process to be locked onto a particular processor. This improves control over system performance—especially in real-time applications.

Phase 2. SVR4 MP is the first phase in implementing multiprocessing. The full implementation won't happen until 1992, when SV4 ES/MP is released. For this, USL is joining forces primarily with Sequent, although it has additional smaller partners, including Fujitsu, ICL, Intel, Motorola, and Pyramid.

Among the key features of ES/MP are:

- Scalability to symmetric shared memory architectures and support for up to 30 processors

- Enhanced security based on SV4ES

- User-level multiprocessing capabilities, enabling developers to access multiprocessing from within an application

- Library-supported threads

- "Gang" scheduling, a higher level of scheduling for more sophisticated applications, where a number of threads can be run concurrently

- Debugger extensions

Future Directions. Ultimately, USL would like to introduce some tools for rewriting applications for multiprocessors. Existing applications may certainly get a performance boost from multiprocessors, but they don't use the system to its full potential. In essence, they don't know they're running on multiprocessors. We would see signficant performance advantages, however, in applications specifically

written for multiprocessor architectures.

DISTRIBUTED COMPUTING. USL will be implementing a network computing infrastructure called Open Distributed Computing (ODC). Most of this is already in place. System V already includes transport independence, streams, Sun's RPC, NFS/RFS, TCP/IP, and the Tuxedo transaction manager. In addition, USL has begun to implement many short-term technologies, including the Kerberos authentication mechanism (which was also adopted by the Open Software Foundation for its Distributed Computing Environment) and the network timing protocol (NTP). These enhancements will be available from Unix International early next year.

In the long term, USL plans to improve the remote procedure call (RPC) by developing a high-level API that would interface to different RPC mechanisms. Furthermore, USL announced earlier this year an Open Systems Interconnect (OSI) application and tools suite to help customers migrate from TCP/IP networks to the Open Systems Interconnect (OSI) model. Applications include X.400 mail, X.500 directory service, and file transfer and virtual terminal services, as well as the migration tools.

Lastly, USL said it would provide Enhanced Administration and Networking Facilities for remote operations and administration in 1991.

CONCLUSIONS. Despite our preference for an end to the Unix wars (and, specifically, the RPC wars), we're encouraged by USL's undertaking, especially because it brings System V.4—the most accepted of the many Unix offerings—into closer alignment with OSF and Sun. Many of USL's ODC plans mimic those of OSF with its DCE and Sun with its ONC. In some respects, the upgrades are an answer to the latest developments of OSF—its DCE selections and adoption of the Mach operating system.

Actually, USL had no choice but to

upgrade. Other Unix technologies already have a headstart with sophisticated features such as these; AT&T could hardly rest on its laurels. However, USL's partnership approach was a wise one, because it will speed product delivery. And timing, after all, is everything.   — *L. Rowan*

• NEWWAVE UPDATE •

On Schedule; Enhancements

Hewlett-Packard (HP) continues to take advantage of its headstart in the Unix integrated office system market. NewWave Office for HP's Unix platform (HP-UX) has been available since June, making HP the first major computer systems vendor to have its own integrated office system on Unix. (See the April issue, Vol. 5, No. 4, for a full review of NewWave Office). IBM and Digital Equipment still do not have Unix office offerings other than third-party products such as Uniplex.

HP recently made some new announcements to enhance NewWave capabilities and clarified time frames for future products. The company also emphasizes the fact that its NewWave products are consistently shipping on time.

UNIX/386 SERVER. HP has added Unix/386 to its list of NewWave Office server platforms. HP has always intended to port OpenMail to Unix/386 (see "OpenMail" below) and will now expand its offering on this platform to a full-blown version of NewWave Office by mid-1991. In addition to mail, this will include shared resources (available now through LAN Manager/X and NewWave for DOS), network object-sharing, networked PC management, and some form of Information Access.

The company sees tremendous de-

mand for the 386 Unix platform, certainly more than for OS/2. One major benefit will be a scalable solution for Unix starting at the 386 level up through the HP9000/800 series. HP anticipates that NewWave Office for Unix/386 will be available through its dealer channel as well as directly from HP.

THE NEWWAVE DESKTOP. The NewWave desktop software is the front-end client software for NewWave Office that provides the iconic/graphical user interface, Object Management Facility (OMF), and the Agent facility. This still runs only on DOS. The developer's kits for the NewWave desktop environment on Unix (OSF/ Motif) and OS/2 (Presentation Manager) will ship in the first quarter of 1991. We would expect to see the end-user NewWave software on these platforms six to nine months later. These will be the distributed versions of NewWave, using the Apollo Network Computing System (NCS) remote procedure call as the core technology. HP will implement a full distributed solution on Unix; OS/2 will involve a phased approach, with at least some distributed components initially and the infrastructure to fully support distributed objects in the future.

HP expects the development of NewWave applications on both Unix and OS/2 to ramp up much faster than it did on DOS. One reason is the excellent acceptance of NewWave on DOS and the fact that HP will not have to spend as much time and energy educating developers on the benefits of NewWave. Committing to NewWave on DOS also required a commitment to Microsoft Windows. Until the introduction of Windows 3.0, some of the larger DOS software vendors were torn between Windows and OS/2, and were reluctant to commit to Windows. Developing for NewWave on Unix and OS/2 does not entail the same gut-wrenching decision since Motif and Presentation Manager are pretty much givens on those platforms.

NewWave AdvanceLink. Advance-Link is HP's terminal emulator for accessing host applications. A NewWave version of AdvanceLink (on DOS only, initially) will be available for both Unix and MPE servers in the first quarter of next year. In addition to the terminal emulation capability AdvanceLink has always provided, this graphical user interface will add the following capabilities:

• The ability to include host applications in Agent tasks

• Cut-and-paste data transfer between host applications and other applications on the NewWave desktop

• The ability to execute a file transfer to the host simply by picking up an object on the desktop and dropping it on the terminal emulator icon

NewWave AdvanceLink will also have a more robust command language for developing programs that involve host applications. HP sees the system administrator using this to write terminal emulation programs and deploying them to end users. The bottom line here is additional support from HP to link existing applications into the NewWave environment without having to rewrite these applications.

Information Access. HP's promised NewWave Information Access client will be delivered by the end of this year. Currently, Information Access is an encapsulated application on the NewWave desktop. One significant benefit of the NewWave version will be the ability to use Agent tasks to store repetitive queries and to integrate query results with reports, spreadsheets, etc.

OPENMAIL. HP is continuing its efforts with Uniplex to port its OpenMail to other Unix platforms. The objective is to make OpenMail the de facto Unix mail system. OpenMail will be available on IBM's AIX, Apollo Domain, SCO Unix/386, and Xenix/386 by the

end of this year. Targeted for implementation in 1991 are Sun 3, Bull xps, Digital Ultrix, Pyramid 3X, AT&T, MIPS 120, NCR Tower, Altos 2000, and Convergent Technologies.

NewWave Mail. NewWave Mail, which provides a full graphical NewWave user interface to the electronic mail system, is currently available for the MPE NewWave Office server, connecting to the DeskManager mail transport. HP has also announced that the NewWave Mail client will be available for the Unix OpenMail server as well. This is in beta test now.

NETWORK PC MANAGEMENT. Currently, all NewWave Office client components (e.g., the NewWave environment and NewWave Mail) can be transparently installed from the server by the system administrator. The next enhancement will be to enable the administrator to transparently install third-party client software on the network. The administrator will package up the software, store it on the server, and indicate who and/or how many users can access the software. End users will then be able to access the Workstation Manager and see what third-party software they have access to. When a user picks a third-party program, NewWave Office will download the software to the user's workstation and configure it as appropriate. It will also keep track in a database of the number of copies in use and limit the number of users to that authorized by the administrator.

Transparent network installation of third-party software will be available on Unix and MPE servers by March 1991. It will also be implemented on the Unix/386 and OS/2 servers. The Workstation Manager is designed by HP to be server independent (as is network object storage), enabling the company to easily move it to other operating platforms.

The Workstation Manager will not initially use the HP/Apollo Network License Service (NLS) since NLS is currently only available on Unix and doesn't handle the downloading of soft-

ware to the PC. Merging the Workstation Manager with NLS is the next step, and it will most likely occur late next year.

IMAGE ARRIVES. HP's first NewWave document service, Advanced Image Management System (AIMS), is now available on HP-UX. HP AIMS is a toolkit for creating image-capable applications that includes a 4GL and a user-interface builder. Currently, the front end runs on DOS and the server on the HP9000 (HP-UX), with support for SCO Unix/386 coming. The client software is encapsulated and will be a full NewWave application in the future.

HP states that 10 VARs, including Arthur Andersen, have already signed up for AIMS development, and that 12 customers have systems installed.

Future enhancements to AIMS (by the end of this year) include:

- Software decompression. Images are sent across the network in compressed form to reduce the load on the LAN, and compression/decompression is currently handled by a hardware board in the PC workstation. With software decompression, a PC without the board will be able to view the image as well as convert it to a format that the PC can manipulate, such as Tagged Image File Format (TIFF). The only limitation will be that a PC without the board cannot send the image back through the network since the board is required for recompression.

- SCO Unix/386 support.

- Fax support (through HP OfficeFax; see "Fax Gateway" below).

- HP ScanJet and LaserJet support (for input/output) with the addition of new drivers.

- OCR support through a third-party card (Calera).

- Support for HP's new rewritable

optical disk, providing large storage capacity for images.

FAX GATEWAY. HP OfficeFax is a new facsimile server that provides access to fax services for any mail user on the network. The fax server consists of a board (Gammafax CPT fax card) and the HP OfficeFax software installed on a dedicated PC (minimum is an AT compatible). The server can connect to either OpenMail on HP-UX or DeskManager on MPE. To the mail transport, the fax server looks just like another remote user to whom mail is routed.

There are two benefits here. One is the ability to get network fax services through a single fax gateway. Another major benefit is the fact that any mail user on the network—including those on terminals and Macs—can access this fax server.

Electronic outbound fax material (text and graphics) can be sent directly to the server by any user on the network. Incoming faxes are converted to TIFF and can be automatically stored, printed (on LaserJet or DeskJet for high quality output), or routed to the administrator for further handling/routing. Faxes then routed to a PC user can be viewed, printed, or converted to an ASCII format if the user has software that handles TIFF files. The administrator must handle all incoming faxes for terminal users (i.e., print and distribute, or route the fax to the user's printer).

Additional features include the ability to send any outgoing documents to both facsimile machines and HP mail addresses simultaneously, the ability to specify a time for sending the fax, automatic addition of a cover sheet, redial capabilities for busy phone lines, and confirmation of successful and unsuccessful fax transmissions. HP also provides administrative functions and a full tracking system for fax traffic sent through the server.

As soon as OpenMail is available on platforms other than HP-UX, the HP OfficeFax server can be connected as well. The HP OfficeFax software costs $6,000; both the board and software are available now.

PORTABLE NETWARE. In the first quarter of 1991, NewWave Office will support Novell's Portable NetWare on both its Unix and MPE servers. This will allow a Novell PC LAN to plug directly into an HP3000/MPE or HP9000/HP-UX NewWave Office server without a bridge. The advantage here is access to more powerful servers (especially for large database applications) and portability (using the Novell APIs means support for multiple servers without having to change the client software). HP states that there are a number of VARs who want to write Novell server applications on the Unix platform to accomplish one or both of these objectives.

MAC CONNECTION. Terminal emulation access to NewWave Office for Apple's Macintosh is already shipping. Coming by the end of this year will be file-sharing and print-sharing via Pacer for Macs connected to HP Unix servers. The Pacer software will make the HP-UX server look like an AppleTalk server to the Mac.

OS/2 ENHANCEMENTS. HP has recently committed to implementing networked PC management on its OS/2 server platform. This was the one missing piece on OS/2 in the original NewWave Office announcement. NewWave Office for OS/2 will now be fully equivalent to NewWave Office for MPE and Unix, with all the same office services. The full OS/2 version will be available by mid-1991. Components that will be available earlier on OS/2 include network object-sharing (available now through LAN Manager and NewWave on DOS) and Information Access (targeted for November). Information Access will work initially with DOS and OS/2 database products such as dBase and R:base.

LAN MANAGER FOR MPE. HP will implement HP LAN Manager/XL (Named Pipes) on its MPE platform by the end of March 1991. The benefit here is use of the LAN Manager APIs. HP intends to rewrite all of its *trans-*

port code for client/server applications for Named Pipes, including Information Access and NewWave Mail. By developing one strategic implementation on Pipes, HP reduces its development effort in deploying the applications on multiple server platforms.

NEW DEVELOPERS. HP states that 16 additional VARs (for a total of 24) and 18 new ISVs (for a total of 119) have now committed to developing NewWave applications. New customer accounts include Spalding Sports, Rich's Department Stores, Hughes Aircraft, and Hercules Incorporated.

HP has developed an approach to piloting NewWave in customer accounts that focuses on two major steps: identifying a business problem for a group of 20 people or less, and developing a set of metrics to measure NewWave's success over a period of three months. HP then sends a team in to assist in the pilot process. A major objective is to end up with information that enables the customer to cost-justify the implementation of NewWave. HP is finding this approach very successful.

SUMMARY. HP is rolling out a comprehensive product line to implement its NewWave office strategy. The key advantage here is the fact that enough of the products are available today to allow customers to seriously experiment with solving real business problems. Although some necessary pieces are still missing—such as distributed object management, NewWave client software on Unix and OS/2, and workgroup applications like calendar/scheduling services—all are on the docket for future implementation. And developer support, while not yet overwhelming, is growing steadily. All of this points to a solid foundation on which HP can continue to build and gain experience. And we all know the value of experience in developing a true understanding of user requirements and tailoring products to provide appropriate solutions.   *— J. Davis*

A New and Improved Motif

The Open Software Foundation (OSF) has issued a new version of Motif—1.1. The toolkit has been stuffed with 40 new features and enhancements. OSF has been working on the new release for a year, and its enhancements—particularly in performance—are significant.

IMPROVED PERFORMANCE. Motif now has gadget-caching and support for shared libraries. (A gadget, incidentally, is a high-performance user interface object such as a label, push button, or toggle. Gadgets are similar to widgets—special windows with I/O capabilities—but they use less memory because they don't require a window.) OSF claims that these enhancements improve performance by as much 30 percent, depending on the application. The improved performance is nothing to sneeze at; X is definitely sluggish, and any software performance solutions are welcome developments.

Based on X 11.4. Motif's new-found support for the latest release of the X Window system also gives it a performance lift. Last winter, MIT released X 11.4, which provided a major overhaul of the X server, restructuring the internals to improve speed.

The X Consortium also pumped a little security into X 11.4 by implementing a user-level authorization library for X terminals. Perhaps most importantly, however, MIT completed its Inter-Client Communication Conventions Manual (ICCCM). ICCCM is MIT's standard for client communication, and it guarantees continuity and compatibility among various X applications.

Since Motif is now based on X 11.4 intrinsics, the toolkit gives developers further compliancy with X-based

applications and systems. (Intrinsics are low-level X development tools—the basic building blocks that make up the X library.) Developers need only one intrinsics library, which is helpful when they are working with shared libraries.

EASIER DEVELOPMENT. Motif 1.1 has a number of features to ease application development, including enhancements to User Interface Language (UIL), a Motif tool for interface design and prototyping. UIL is a layout description language. It creates ASCII interface resource files that can be modified or reused by other applications. To make UIL easier to use, OSF has developed mechanisms to simplify programming forms, to ease the transition between widgets and gadgets, and to support applications that use multiple UIL files better.

However, UIL is still much more complex than the Motif-based user interface management systems (UIMSs) that have been emerging from third parties (e.g., UIMX from Visual Edge Software or TeleUse from TeleSoft). A UIMS generally includes an interactive screen layout editor, so developers can actually paint a screen and have the UIMS automatically bang out the layout description code as they go. Any X-based UIMS worth its salt will have a UIL-like layout description component for interface modification.

Aside from its work with UIL, OSF has made several extensions to Motif, including:

- Virtual key bindings, which enable applications to behave consistently with different keyboards from different vendors

- Improved keyboard traversal, which provides the same functionality for keyboard users and mouse users and adds flexibility for information input

- A gapped text buffer, which provides dramatic improvement in performance when dealing with large amounts of text

- The XmProcessTraversal function, which provides direct programmer support for focus management

- The XmTrackingLocate function, which establishes support in the toolkit for context-specific help

- An enhanced window manager, which manages multiple screens more effectively and coexists with other window managers and X applications

- Compilation, which uses the portable C compiler (pcc), ANSI C, and C++

- NLS support, which includes Asian languages (consistent with the X/Open XPG3 Portability Guide)

CONCLUSION. All in all, OSF has put together a solid upgrade of Motif. Users should appreciate the performance enhancements, and programmers should appreciate the richer set of developer extensions. The pricing structure hasn't changed, though. Source licenses are still available for $1,000 per unit. Binary licenses range from $40 to $10, depending on volume.

— L. Rowan

Topics covered in Patricia Seybold's Computer Industry Reports in 1990:
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