X TECHNICAL BIBLIOGRAPHY

please send updates to:
Ken Lee, DEC WSL, 335 Bryant St., Palo Alto, CA 94301
Internet: klee@pa.dec.com, UUCP: uunet!decwrl!klee
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Adobe Systems Inc., *Programming the Display PostScript System with X*, Addison-Wesley, 1992. To be published in December, 1992. A tutorial on the DPS extension to X, by its developers. Not yet reviewed.

Angebranndt, Susan and et al, ‘‘Integrating Audio and Telephony in a Distributed Workstation Environment,’’ in *Proceedings of the Summer*, *1991 USENIX Conference*, pp. 419-435. Describes a client-server audio toolkit whose architecture is very similar to that of the X Window System.

Angebranndt, Susan, Raymond Drewry, Philip Karlton, Todd Newman, Bob Scheifler, and Keith Packard, *Definition of the Porting Layer for the X v11 Sample Server*, 1988-1991. A detailed reference to the modules of the sample server. This is a companion to "Strategies for Porting the X v11 Sample Server" by the same authors. Both are included in the MIT X11R5 distribution (X11R5/mit/doc/Server).

Angebranndt, Susan, Raymond Drewry, Philip Karlton, Todd Newman, Bob Scheifler, and Keith Packard, *Strategies for Porting the X v11 Sample Server*, 1988-1991. A guide to strategies for porting the sample server. This is a companion to "Definition of the Porting Layer for the X v11 Sample Server" by the same authors. Both are included in the MIT X11R5 distribution (X11R5/mit/doc/Server).

Angebranndt, Susan, Phil Karlton, Raymond Drewry, and Todd Newman, ‘‘Writing Tailorable Software: The X11 Sample Server,’’ *Software Practice and Experience*, vol. 20, no. S2, October, 1990. Portability was a major goal for the X11 sample server. This article discusses design and implementation issues that helped achieve portability.

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Asente, Paul J. and Ralph R. Swick, *X Window System Toolkit*, Digital Press, 1990. ISBN 1-55558-051-3. The X Toolkit bible, a companion to Sheifler & Gettys book on Xlib and the X protocol. It includes both a tutorial on programming with the X Toolkit and a formal specification of the toolkit. The tutorial, which covers both using and writing widgets, is comprehensive and excellent. The specification is an enhancement of the MIT Xt intrinsics manual, by the same authors.

Baldwin, Howard, ‘‘What Gives An X Terminal X Appeal?,’’ *UNIX World*, vol. 8, no. 5, pp. 89-94, May, 1991. A look at the popular features of X terminals.

Barkakati, Nabajyoti, *X Window System Programming*, SAMS, 1991. ISBN 0-672-22750-9. Another tutorial on X programming. The Xlib section is not as good as Jones' book. There's a short section at the end on mixing Xlib with the X Toolkit, but the programming style used there is poor.

Barkakati, Nabajyoti, *UNIX Desktop Guide to X/MOTIF*, Hayden Books, 1992. ISBN 0-672-22836. Not yet reviewed.

Bartlett, Joel F., ‘‘Don't Fidget with Widgets, Draw!,’’ DEC Western Research Laboratory Research Report 91/6, May, 1991. Describes EZD, a high-level graphics server that simplifies the development of interactive graphical user interfaces. EZD is based on X. For information on obtaining free copies of this report, send electronic mail to ‘‘wrl-techreports@decwrl.dec.com’’. Your message should contain the single word ‘‘help’’.

Bass, Len, Erik Hardy, Reed Little, and Robert Seacord, ‘‘Serpent Overview,’’ CMU/SEI-89-UG-2, Software Engineering Institute, Carnegie Mellon University, Pittsburgh, PA.. An overview and tutorial of the Serpent User Interface Management System. Serpent is a UIMS implemented on top of several X toolkits. This paper, as well as the Serpent source code, is included in the MIT X11R4 distribution.

Bass, Len and et al, ‘‘Serpent: A User Interface Management System,’’ in *Proceedings of the Winter, 1990 USENIX Conference*, pp. 245-258. An introduction to the Serpent UIMS from Carnegie Mellon University.

Berlage, Thomas, *OSF/Motif: Concepts and Programming*, Addison-Wesley, 1991. ISBN 0-201-55792-4. A good tutorial on Motif programming. It doesn't include lots of toy examples like some of the other books, but there are good practical examples and the descriptions of the widget functionality (especially the constraint widgets) are excellent. The section on subclassing Motif (mostly XmPrimitive) widget classes is not real complete, but still is far better than those in other Motif books. There is an introductory section on UIL, which is easier to understand, though not as complete as the section in the Motif programmer's guide. This book does not contain a tutorial on the X Toolkit intrinsics, so you will probably want Asente & Swick's book for that.

Blewett, Doug, ‘‘X Widget Based Software Tools for UNIX,’’ in *Proceedings of the Winter, 1992 USENIX Conference*, pp. 111-123. Describes small language and IPC protocol for creating small X-based software utilities and filters.

Borenstein, Nathaniel S., *Multimedia Applications Development with the Andrew Toolkit*, Prentice Hall, 1990. ISBN 0-13-036633-1. A tutorial and reference manual for the Andrew toolkit. Andrew is an applications toolkit implemented on several window systems, including X. It is included in the MIT X11R4 distribution.

Bourne, Philip E. and Lawrence S. Shapiro, ‘‘Developing with DECwindows,’’ *DEC Professional*, vol. 9, no. 2, pp. 36-44, February, 1990. A description of DECwindows programming, focusing on the User Interface Language (UIL). UIL is used by both DECwindows and OSF/Motif.

Braca, Mike, ‘‘X Display Management,’’ *UNIX World*, vol. 8, no. 4, pp. 107-112, April, 1991. An introduction to the X Display Manager Control Protocol (XDMCP).

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Brunhoff, Todd, ‘‘Pleasing The Eye,’’ *UNIX Review*, vol. 7, no. 10, pp. 64-72. An introduction to VEX, a proposed (and since withdrawn) video extensions to X.

Burgard, Mike, ‘‘Serving Up X From a PC,’’ *UNIX World*, vol. 8, no. 11, pp. 99-108, November, 1991. A review of three products that allow you to run X under Microsoft Windows on IBM PCs.

Calder, Paul R. and Mark Linton, ‘‘Glyphs: Flyweight Objects for User Interfaces,’’ in *Proceedings of the ACM SIGGRAPH Symposium on User Interface Software and Technology*, October, 1990. Some new user interface objects for InterViews, a C++ based toolkit for X.

Champine, George, Bob Scheifler, Jim Gettys, Georges Grinstein, and Bertram Herzog, ‘‘Panel discussion on the X Window System,’’ in *SIGGRAPH'88 Panel Proceedings*, August, 1988. This is the transcript of an interesting panel discussion on X. George Champine was moderator. Panelists were Bob Scheifler, Jim Gettys, Georges Grinstein, and Bertram Herzog. The panelists discussed the history of X and current work at/on the X Consortium, PEX, and national and international standards for X. This was followed by a lively question and answer session on the present and future of X.

Champine, George, *MIT Project Athena: A Model for Distributed Campus Computing*, Digital Press, 1991. A review of Project Athena, which generated lots of fun toys, including the X Window System.

Clifford, William, John McConnell, and Jeffrey Friedberg, ‘‘The Development of PEX, A Three-dimensional Graphics Extension to X11,’’ in *Proceedings of Eurographics’88*, September, 1988. An overview PEX, an extension to the X protocol to support PHIGS+.

Dardailler, D., ‘‘Tips for Writing Motif-based Graphical Applications,’’ in *Xhibition’92 Conference Proceedings*, pp. 207-216. Some Motif programming hints, mostly for the drawing area and scrolled window widgets.

Davison, Allan, Kieron Drake, William Roberts, and Mel Slater, *Distributed Window Systems: A Practical Guide to X11 and Open Windows*, Addison-Wesley, 1992. To be published in December, 1992. An introduction to X and Open Windows. Not yet reviewed.

Dolan, Michael A. and Larry Hare, ‘‘X Window System Servers in Embedded Systems,’’ in *Proceedings of COMPCON Spring 1990*, pp. 314-319, February, 1990. A discussion of X server architectures for embedded systems, such as accelerator boards and stand-alone terminals.

Droms, Ralph and Wayne Dyksen, ‘‘Performance Measurements of the X Window System Protocol,’’ *Software Practice and Experience*, vol. 20, no. S2, October, 1990 A analysis of the performance of the X protocol over TCP/IP networks..

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Gettys, Jim, ‘‘Network Windowing using the X Window System,’’ *Dr. Dobb’s Journal*, pp. 42-53, March, 1989. A discussion on the importance of networking for window systems.

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Good, Michael, ‘‘User Interface Consistency in the DECwindows Program,’’ in *Proceedings of the Human Factors Society, Vol. 1*, 1988. A discussion of user interface design techniques used in developing the DECwindows toolkit.

Greenwood, Stephen, ‘‘The DECwindows User Interface Language,’’ *Digital Technical Journal*, vol. 2, no. 3, pp. 34-43, Summer, 1990. An overview of the DECwindows user interface language (UIL). UIL allows programmers to specify and configure the X Toolkit widget hierarchy at run-time. This is very useful for rapid prototyping and internationalization. UIL is used by both DECwindows and Motif.

Gregory, K. D., *Programming with Motif,* O’Reilly & Associates, 1992. ISBN 0-387-97877-1. A basic tutorial on using Motif widgets. Not yet reviewed.

Hayes, Frank, ‘‘X Terminals vs. Diskless Workstations,’’ *UNIX World*, vol. 7, no. 10, pp. 83-86, October, 1990. A look at some of the tradeoffs between using X terminals and diskless workstations.

Heller, Dan, ‘‘The XView Toolkit (2 parts),’’ *UNIX World*, vol. 7, no. 6-7, June-July, 1990. A two part tutorial on XView, based on Volume 7 of the O’Reilly series. XView, from Sun, is a user interface toolkit for X. It is similar to, but not compatible with (at either the end-user or the programmer levels), MIT’s X Toolkit. It supports Open Look, but not Motif.

Heller, Dan, ‘‘Handling UNIX Signals in X Applications,’’ *The X Journal*, vol. 1, no. 4, pp. 17-22, March, 1991. A tutorial on safely using UNIX signals within X clients. This article has been somewhat controversial. See the letters to the editor in the next issue of this magazine before trying any of these techniques.

Heller, Dan, ‘‘Multimedia Applications Under the X Window System,’’ *The X Journal,* vol. 2, no. 1, pp. 12-19, September, 1992. A look at possible combinations of multimedia and X.

Hesketh, Richard, ‘‘Perly --- UNIX with Buttons,’’ *Software Practice and Experience*, vol. 21, no. 11, November, 1991. Another buttons toolkit for UNIX and X. See also the Robertson paper.

Holzgang, David A., *Display PostScript Programming,* Addison-Wesley, 1990. ISBN 0-201-51814-7. A tutorial on Display PostScript. Many commercial X implementations include DPS as an extension to the core X protocol. DPS can be used in conjunction with or instead of the core X graphics requests.

Hopgood, F. R. A., *Methodology of Window Management*, Springer-Verlag, New York, 1986. ISBN 0-387-16116-3. The proceedings of the important 1985 Alvey Workshop on Window Management. It includes interesting material on problems with UNIX window systems and proposed solutions. It also includes descriptions of early versions of current UNIX window systems, such as X and Sun’s NeWS.

Israel, Elias and Erik Fortune, *The X Window System Server,* Digital Press, 1992. ISBN 1-55558-096-3. A technical reference on the internals of the X11R5 sample server, including the core architecture, porting and tuning techniques, and extension techniques. This is the only publically available book on the X server.

Johnson, Eric and Kevin Reichard, *Advanced X Window Applications Programming,* MIS: Press, 1990. ISBN 1-55828-016-2. An "advanced" version of the authors’ previous book.

Johnson, Eric and Kevin Reichard, *Power Programming with Motif,* MIS: Press, 1991. ISBN 1-55828-059-6. Another tutorial on Motif application programming. It does not cover subclassing widgets or using the UIL interface. Coverage is generally poorer than similar books, especially Berlage’s book.

Johnson, Eric and Kevin Reichard, *X Window Applications Programming, second edition,* MIS: Press, 1992. ISBN 1-55828-178-9. The first edition of this book had several significant flaws. The second edition is supposedly improved, but has not yet been reviewed.

Jones, Oliver, *Introduction to the X Window System,* Prentice-Hall, 1989. ISBN 0-13-499997-5. An excellent introduction to programming with Xlib. Written with the serious programmer in mind, this book includes many practical tips that are not found anywhere else. While the others simply regurgitate that material in the MIT manuals, this book explains key Xlib concepts much more clearly and gives examples of using X to solve real world problems. The seventh printing is updated to X11R4.

Kataoka, Yutaka and et al, ‘‘A Model for Input and Output of Multilingual Text in a Windowing Environment,’’ in *Proceedings of the ACM SIGGRAPH Symposium on User Interface Software and Technology*, pp. 175-183, November, 1991.

Keller, Brian J., *A Practical Guide to X Window Programming*, CRC Press, 1990. ISBN 0-8493-7406-5. Another tutorial on X application writing. This one claims to use the X Toolkit and Motif, though the Motif material is not very good.

Kent, Christopher, ‘‘XDPS: A Display PostScript System Extension for DECwindows,’’ *Digital Technical Journal*, vol. 2, no. 3, pp. 64-73, Summer, 1990. An overview of Display PostScript, an extension to the X protocol allowing PostScript graphics in X windows.

Kimball, Paul, *The X Toolkit Cookbook*, Prentice-Hall, 1991. Not yet reviewed. Reportedly a practical guide to X Toolkit programming, including use of the Motif, Open Look, and Athena widget sets.

Kobara, Shiz, *Visual Design With OSF/Motif*, Addison-Wesley, 1991. ISBN 0-201-56320-7. A guide to using Motif to create visually appealing and consistent user interfaces, by one of the user interface designers who helped create the Motif look.

Labs, UNIX System, *Open Look Release 4 Graphical User Interface: Programmer’s Guide*, Prentice-Hall, 1991. A programmer’s guide for the Open Look Intrinsics Toolkit (OLIT). OLIT is a widget set for the X Toolkit intrinsics. OLIT is not compatible with XView.

LaStrange, Tom E., ‘‘swm: An X Window Manager Shell,’’ in *Proceedings of the Summer, 1990 USENIX Conference*, pp. 299-306. Describes the swm window manager, supporting a configurable user interface and a virtual root window.

Lee, Kenton, ‘‘Behind Curtain X,’’ *UNIX Review*, vol. 9, no. 6, pp. 22-28, June, 1991. Despite the title, this article really describes (most of) the most common X programming errors and ways to avoid them.

Lee, Kenton, ‘‘Twenty Quesions with Paul Asente,’’ *The X Journal*, vol. 1, no. 2, pp. 12-17, November, 1991. An interview with one of the X Toolkit’s designers. He discusses its history and his vision for its future.

Lee, Kenton, ‘‘Graphics Effects by X Colormap Manipulation,’’ *The X Journal*, vol. 1, no. 5, May, 1992. Most X applications generate graphics through X raster drawing functions. This paper discusses some powerful techniques for generating graphics by manipulating the colormap in addition to or in place of raster drawing. Detailed examples include overlay planes and double buffer animation.

Leffler, Samuel J., ‘‘A Window On The Future?,’’ *UNIX Review*, vol. 6, no. 6, pp. 62-69. This article compares Sun’s NeWS with other window systems, such as X, and concludes that, despite its problems, NeWS is the window system of the future. See Robin Schaufler’s paper for a more technical comparison of the X and NeWS.

Lemke, David and David S. H. Rosenthal, ‘‘Visualizing X11 Clients,’’ in *Proceedings of the Summer, 1988 USENIX Conference*, pp. 125-138. A tutorial on ‘‘visuals’’, the X abstraction of display hardware capabilities. Proper use of visuals is necessary for an X client to work with and take advantage of a variety of different display devices. An updated version is included in the MIT X11R5 distribution (X11R5/mit/doc/tutorials/visuals).

Levitt, Jason, ‘‘Spotlight on Serial X Terminals,’’ *UNIX Today*, pp. 46-52, May 13, 1991. A review of some X terminals that support serial protocols. This type of terminal can be used with a modem over a telephone line.

Levitt, Jason, ‘‘Windows, X Servers Collide,’’ *Open Systems Today*, March 2, 1992. A comparison of the functionality and performance of six X servers for PCs running Microsoft Windows.

Linton, Mark and Paul Calder, ‘‘The Design and Implementation of InterViews,’’ in *Proceedings of the 1987 USENIX C++ Workshop*, 1987. Describes the InterViews user interface toolkit, written in C++ and based on the X Window System. Even if you don’t plan to use InterViews as a toolkit, it provides a good C++ binding to the X protocol.

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Mansfield, Niall, *The X Window System: A User's Guide*, Addison-Wesley, Amsterdam A tutorial on X for end-users, not programmers. The second edition is based on X11R4., 1991.

Mayer, Niels P., ''The WINTERP Widget INTERpreter,'' *LISP Pointers*, vol. 4, no. 1, pp. 45-60, July, 1990. Discusses WINTERP, a Lisp prototyping environment for Motif applications.

McCormack, Joel and Paul Asente, ''Using the X Toolkit or How to Write a Widget,'' in *Proceedings of the Summer, 1988 USENIX Conference*, pp. 1-13. An excellent tutorial on writing basic X Toolkit widgets. Potential widget writers (and maybe users, too) should probably start by reading this paper. Unfortunately, it's based on X11R2, so some of it is out of date.

McCormack, Joel and Paul Asente, ''An Overview of the X Toolkit,'' in *Proceedings of the ACM SIGGRAPH Symposium on User Interface Software*, pp. 46-55, October, 1988. An excellent architectural overview of the X Toolkit, including its goals, how it accomplished them, and possible future directions.

McCormack, Joel, ''Writing Fast X Servers for Dumb Color Frame Buffers,'' DEC Western Research Laboratory Research Report 91/1, February, 1991. Describes the implementation of one of the best X servers currently available, that of the color DECstation 3100. Algorithms as well as performance measurements are discussed. For information on obtaining free copies of this report, send electronic mail to ''wrl-techreports@decwrl.dec.com''. Your message should contain the single word ''help''. Note that this paper supersedes DECWRL TN-9. This paper also appears in the Software Practice and Experience Volume 20, Special Issue S2.

McGregor, Scott, ''An Overview of the DECwindows Architecture,'' *Digital Technical Journal*, vol. 2, no. 3, pp. 9-15, Summer, 1990. An overview of DECwindows, a superset of X for DEC workstations.

McLoughlin, Lee, ''A Simple Guide to Porting the X Window System,'' in *Proceedings of EUUG Spring 1989*, pp. 283-291, Brussels, April 3-7, 1989. A brief, but good, discussion of the interface between the X server and the underlying operating system. The EUUG conference is sponsored by the European Unix Users' Group.

McMinds, Donald L., *Mastering OSF/Motif Widgets, Second Edition,* Addison-Wesley, 1992. ISBN 0-201-63335-3. A tutorial on using existing Motif widgets. The second edition is much improved from the first and covers Motif 1.2.

McNutt, Dinah, ''Administering X Sites,'' *UNIX Review*, vol. 10, no. 7, pp. 45-48, July, 1992. A review of some X configuration and administration issues.

Mehta, Sunil, ''User Interfaces and the IEEE P1201 Committee,'' *UNIX Review*, vol. 8, no. 1, pp. 14-20. A review of the activities of the IEEE P1201 standards committee, by its chairman. P1201 is trying to develop international standards for the X Window System client side (Xlib and above). Lower levels of X (servers and protocol) are being standardized by ANSI Task Group X3H3.6.

Mikes, Steve, ''Fast Track To Motif Applications,'' *UNIX World*, vol. 8, no. 3, pp. 101-106, March, 1991. This article reviews a couple of products that help programmers to quickly port dumb terminal applications to X and Motif. Some would call this approach a hack, but it is easy and does provide some functionality beyond dumb terminal emulators.

Mikes, Steven, *X Window System Technical Reference*, Addison-Wesley, 1990. ISBN 0-201-52370-1. A quick reference manual for X11R3, including Xlib, Xt, fonts, bitmaps, keysyms, Motif, and OPEN LOOK.

Mikes, Steven, ''New Ways to Program in Object-Oriented X,'' *UNIX World*, vol. 8, no. 8, pp. 103-108, August, 1991. Reviews the Saber and Solbourne object-oriented user interface toolkits. Both are based on C++ and support X.

Mikes, Steven, *X Window System Program Design and Development,* Addison-Wesley, 1992. ISBN 0-201-55077-6. Not yet reviewed.

Miller, John David, *An OPEN LOOK at UNIX: A Developer's Guide to X,* M&T Books, 1990. ISBN 1-55-851057-5. A tutorial on the Open Look widget set from AT&T. Contact M&T Books at 1-800-533-4372.

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Myers, Brad A., ‘‘Window Interfaces: A Taxonomy of Window Manager User Interfaces,’’ *IEEE Computer Graphics & Applications*, vol. 8, no. 5, pp. 65-84, September, 1988. A taxonomy of current window system user interfaces, including the UWM window manager for X. Discusses and compares the features of each user interface. Contrast this with Rob Pike’s window system user interface guidelines. Myers is a well known user interface researcher.

Nadeau, David R., ‘‘High-Performance 3-D Graphics In A Window Environment,’’ *Computer Technology Review*, pp. 89-93, Fall, 1988. A discussion on integrating Megatek’s high-performance 3D graphics hardware/software with X.

Newmarch, Jan, *X Windows and Motif: A Fast Track Approach*, Addison-Wesley, 1992. To be published in November, 1992. An overview of X and Motif. Not yet reviewed.

Nye, Adrian, ‘‘The X Window System Protocol,’’ *UNIX World*, vol. 6, no. 9, pp. 105-113, September, 1989. An introduction to the X protocol. This is a short version of Nye’s introduction to Volume 0 of O’Reilly’s X series.

O’Reilly and Associates, *Definitive Guides to the X Window System*, O’Reilly and Associates, 1988-1992. There are three main types of books in this series: "programmers manuals" (programmer tutorials), "reference manuals" (man pages), and "user guides" (end-user tutorisls). The volumes in this series are: *Vol. 0: X Protocol Reference Manual, Vol. 1: Xlib Programming Manual, Vol. 2: Xlib Reference Manual, Vol. 3: X Window System User’s Guide, Vol. 3M: X Window System User’s Guide (Motif Edition), Vol. 4: X Toolkit Intrinsics Programmers Manual, Vol. 4M: X Toolkit Intrinsics Programmers Manual (Motif Edition), Vol. 5: X Toolkit Intrinsics Reference Manual, Vol. 6: Motif Programming Manual, Vol. 7: XView Programming Manual, Vol. 7 Companion: XView Reference Manual, Vol. 8: X Window System Administrator’s Guide*, and *Vol. R5 Update: Programmer’s Supplement for X11R5*. Some like these books’ broad coverage: most interfaces are covered, usually with examples. Others dislike the sometimes shallow coverage of complex subjects. Some of the material is biased towards the programming styles of authors, though this is apparently changing. These books are quickly updated to cover new MIT releases and recent editions are much improved over older ones.

O’Reilly and Associates, *The X Window System in a Nutshell*, O’Reilly and Associates, 1992. ISBN ISBN 1-56592-017-1. A quick reference guide to Xlib and Xt and some associated configuration files. It has separate sections on events, data structures, and other frequently needed material. It leaves out a lot of detail in order to achieve a small, convenient size. The second edition, based on X11R5, is much improved over the first edition.

Open Software Foundation, *OSF/Motif Series (5 volumes)*, Prentice Hall, 1992. Motif is a popular user interface programming environment for X. It was designed and developed by members of the Open Software Foundation, including DEC, HP, and IBM. These companies have committed to using Motif as their standard user interface. The volumes in this series include the Motif *Style Guide*, *Programmer’s Guide*, *Programmer’s Reference*, *User’s Guide*, and *Application Environment Specification (AES) User Environment Volume*. The latest editions of these books are for Motif Release 1.2. The original 1.0 versions of some of these left something to be desired, but they were significantly improved for 1.1 and again for 1.2.

Ousterhout, John K., ‘‘An X11 Toolkit Based on the Tcl Language,’’ in *Proceedings of the Winter, 1991 USENIX Conference*, pp. 105-115. Describes a high level toolkit based on the Tcl programming language. Since Tcl is interpreted, this toolkit allows for some interesting run-time dynamics. Unfortunately, it is not compatible with the X Toolkit and popular widget sets.

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Pedneault, Michel, ‘‘A High-Level User Interface Toolkit for the X Window System and Character Terminals,’’ in *Proceedings of the Summer, 1990 USENIX Conference*, pp. 307-313. Describes the NTUI toolkit, which supports a single programming interface for both graphical (using the X Toolkit) and character user interfaces.

Peterson, C. and S. S. Chang, ‘‘Improving the Performance of X Applications,’’ in *Xhibition’92 Conference Proceedings*, pp. 93-100. Some programming techniques to improve client performance.

Pike, Rob, ‘‘Window Systems Should Be Transparent,’’ *USENIX Computing Systems*, vol. 1, no. 3, pp. 279-296, Summer, 1988. Some window system user interface guidelines, based on MUX window system for the BLIT terminal, with some comparisons to X. Contrast this to Myers’ paper. Pike is the developer of the BLIT.

Pike, Rob, ‘‘A Concurrent Window System,’’ *USENIX Computing Systems*, vol. 2, no. 2, pp. 133-153, Spring, 1989. A description of a multi-threaded window system written using a concurrent programming language. The design is shown to be simpler than the single threaded design of X.

Probst, Richard, ‘‘OPEN LOOK Toolkits,’’ *SunTechnology*, vol. 1, no. 4, pp. 76-86, Autumn, 1988. OPEN LOOK is a user interface specification designed by AT&T and Sun. This paper discusses toolkits supporting OPEN LOOK including two for the X Window System.

Raney, Scott, ‘‘Pick a GUI, Any GUI,’’ *UNIX World*, vol. 8, no. 5, pp. 103-107, May, 1991. A review of the XVT product. XVT claims to provide a single API to generate user interfaces for Motif, Macintosh, Presentation Manager, Open Look, and ASCII terminals. This article says XVT is appropriate for in-house tools, but not for product quality applications.

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