Interoperability: A Key Criterion for Open Systems

Computer users are the catalysts behind fundamental change occurring in the computer industry. They are demanding a greater return on the strategic investments they have made in computer hardware and software.

Computer users realize that computers and communications are integral to the success of their organizations. They want to take advantage of all of their computing resources, to access information wherever it is stored on the network and use it where it is needed. Consequently, they are demanding that the systems they have purchased from different vendors, with their diverse operating systems and applications software, work cooperatively, or *interoperate*.

The computer industry is responding to this powerful constituency.

BREAKING THE TIES TO PROPRIETARY SYSTEMS

For four decades, computer vendors have produced mutually incompatible systems that have bound users to proprietary architectures and operating systems. This product strategy has made it difficult, and in some cases impossible, to interconnect systems from different vendors, to move applications from one platform to another, or to host a software environment on several systems of different sizes with different capabilities. As a result, in many networks, systems from one vendor merely co-exist with those of another; they are incapable of working together.

Some users have tried to solve the problem themselves. Yet, despite the diversion of resources from mission-critical projects, their efforts have been unsuccessful. Their computing investments cannot work together.

Not surprisingly, users have lost patience with the restrictions imposed by proprietary architectures. As a result, they are demanding "open systems," computers that cooperate, despite their differences.

UNLEASHING THE POWER OF THE NETWORK

Users want the freedom to choose the appropriate computing solution for the job at hand. To do so, they need to mix and match hardware and software from various vendors, easily access and protect the data stored in their networks, and apply a common management scheme to an array of diverse systems.

In other words, users want networks of heterogeneous systems that can work together securely and successfully. Their requirements include

Systems that can be networked to communicate and cooperate with very dissimilar ones — Significant improvements have been made in network connectivity. Communication between dissimilar machines using standardized protocols has improved in bandwidth and throughput. End users, however, are not satisfied with the limited ability this affords. They want to do more than send and receive electronic mail. They want to take advantage of all the resources on the network, including files, printers, databases of strategic information, and compute power.

The ability to exploit the potential of their networked resources — Today end users tap only a small percentage of the power available in their networks. They know, however, that the systems they painstakingly interconnected are capable of working synergistically, producing far more in combination than individually. End users want the means to increase the effectiveness of their networks, to see a sizable return on their investments in hardware, software, and training.

Protection of investments in hardware and software, applications, and training — End users are rebelling against the high cost of migrating to new technology. In the world of proprietary systems, the cost of switching from the product line of one vendor to another, or from a vendor's older line to a newer one, tends to be exorbitant, and often prohibitive. Such conversion can result in high migration costs, make software and training investments obsolete, and require unexpected expenditures to update both applications and user training. Users want to know that the systems they purchase today are based on standards that ensure a growth path that protects the time and money they have invested in hardware, software, applications and training.

More cost-effective, less complex means of managing heterogeneous networks — To maintain a diverse computing environment, system administrators and users can no longer count on their familiarity with a few administrative approaches. They must try to deal efficiently with several management methods. For that reason, they need one consistent scheme for managing a variety of interconnected systems.

The problem is not a lack of functionality. Networks do, in fact, hold rich potential. Incorporating PCs, workstations, minicomputers, mainframes, and peripherals from various vendors, they represent vast computing capability. Unfortunately, the differences between those machines also set up several obstacles that prevent users from tapping more than a small portion of the potential those resources offer.

The major obstacle is the incompatible hardware and software. In addition, training and applications are not easily transferred between systems. The inherent diversity of computing networks also makes application development difficult. Without distributed applications, users cannot take advantage of more than a fraction of the capabilities their computers promise.

OSF TECHNOLOGY PERMITS INTEROPERABILITY

Working with the worldwide computer industry, the Open Software Foundation (OSF) is spearheading the open systems movement. OSF has created an open computing environment that addresses the demand for interoperability among diverse systems as well as portability of applications. This paper outlines how OSF's offerings allow systems from different vendors to move beyond co-existence to achieve interoperability.

OSF is a not-for-profit R&D organization that provides "enabling technologies," software that allows system and software suppliers, as well as programmers in end user organizations, to create, use, and maintain products that work cooperatively. Its membership — computer hardware and software vendors, end users, and university and research organizations — works together to further the industry's movement toward open systems.

OSF solicits proposals for open systems software technology, then evaluates and licenses the "best of breed" for incorporation in the OSF open computing environment. That environment is a portfolio of technologies that provides for interoperability of diverse systems as well as application portability. It includes

- the OSF/1™ operating system
- the OSF/Motif® graphical user interface
- the OSF Distributed Computing Environment (DCE)
- the OSF Distributed Management Environment (DME)
- the OSF Architecture-Neutral Distribution Format (ANDF).

These technologies provide a reliable foundation on which system vendors and software developers can add innovative technologies. For end users, they lift the constraints posed by proprietary product lines, offering users a range of purchasing options.

OSF provides source code, which developers use to create products for end users. By masking the differences between systems from multiple vendors, OSF technologies make those systems easier to use — by end users as well as application developers. OSF provides a solid base of technologies that comply with industry standards and evolve in a steady, predictable manner. In this way, OSF aims to enable the computer industry to provide new technologies on a base that will meet current and future needs.

INTEROPERABILITY THROUGH THE OSF DCE

Through a Request for Technology, OSF solicited distributed computing technologies from the entire computer industry. The result, the OSF Distributed Computing Environment (DCE), took the computer industry beyond the mere connection of equipment to networks. OSF brought the computer industry to a new level — allowing diverse systems to interoperate. The DCE is an integrated software environment that makes a network of systems from a variety of vendors appear as a consistent, unified system. It masks the technical complexities of the network, giving users transparent access to diverse network resources — such as files, printers, and compute power. With the DCE, users can access information and applications freely from anywhere in the network while protecting data from unauthorized access through effective security.

The DCE will preserve existing investments in computer hardware, software, and networks, and make future product and technology purchases more valuable. It has been endorsed by the computer industry as an important step toward bridging open and proprietary systems in a multi-vendor network. With the DCE as a solid foundation, OSF will add new interoperability technologies to its open computing environment.

THE OSF DISTRIBUTED MANAGEMENT ENVIRONMENT

The advent of the open systems movement is changing the way people think about the management of computers and computer networks. Until recently, proprietary systems predominated, and system administrators took for granted the sophisticated management facilities those systems provide. PC users did not rely on support from system administrators; they could perform many simple maintenance tasks themselves.

As organizations assembled multi-vendor environments, system management changed. Today, system administrators and users can no longer count on their familiarity with a few administrative approaches to maintain a diverse computing environment. Instead, they must contend with inconsistent management schemes resulting from the lack of a common approach based on standards.

The task of managing stand-alone systems from multiple vendors as well as a growing number of distributed systems has led to unpredictable and complicated system management procedures that result in costly training and other expenditures. To remedy this situation, OSF has selected several technologies for its Distributed Management Environment (DME). Through the RFT process, OSF has identified a uniform framework for the efficient, cost-effective management of open systems. Linking system administration and network management, that framework supports a wide range of diverse systems, from stand-alone to distributed.

The OSF Distributed Management Environment will provide the functionality that system administrators need while serving as a solid foundation for the development of management applications. With the technology selected, OSF thus fulfills a critical requirement of open systems: a reduction in the cost and complexity of managing systems in a multi-vendor environment.

CONCLUSION

Computer users are demanding solutions that rectify the problem of wasted computer resources, duplication of resources and effort, unnecessary spending, and the need to retrain users and system administrators. They want their diverse systems to work together cooperatively — to interoperate. They want nothing less than a virtually seamless environment that exploits the strategic value of their computing investments. OSF is listening to this important computing constituency and providing the enabling technologies that make interoperability possible.

The benefits of interoperability are far-reaching. OSF's enabling technologies provide a base that protects user investment in hardware, software, training, and applications while allowing system and software suppliers to add innovative enhancements that set their products apart. The effect of OSF's interoperability technologies on computer users will be profound. They will free users to select the systems and software applications that best meet their current needs and that anticipate their future needs.

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