The Standards Wars

The Fighting Is Sure to Continue, But It Won't Be as Bloody

The computer industry has been criticized for dragging its feet on standardization. Some blame it on IBM. Others blame it on the inherent complexity of computer communications and the difficulty in porting applications between machines. Still others point to incompetency within the standards organizations.

But the fact is that computers from a variety of vendors *are* starting to communicate and software *is* becoming more portable. In a scenario that begs comparisons to the end of the Cold War and represents just how much progress has been made, arch rivals IBM and Digital Equipment Corp. now belong to the same standards organization — the Open Software Foundation (OSF). Representatives from both companies regularly sit down together to discuss how they can open their systems to one another!

DE FACTO PUNCH

Interestingly, the core standards making communications possible — UNIX, TCP/IP, NFS, and Ethernet — came not from the standards organizations, but from groups working on their own. UNIX, which sort of snuck out of AT&T's think tank Bell Labs to permeate educational and research institutions, has proved the hub around which much of this activity has taken place. Largely due to the wide availability of UNIX and the programming language C, an entire generation of programmers is now versed in the nuts and bolts of computer communications and the development of portable software.

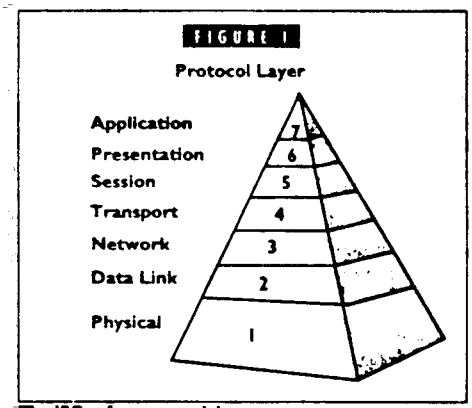
The Transmission Control Protocol/Internet Protocol (TCP/IP) was originally developed under a contract with the Defense Advanced Research Projects Agency (DARPA), a major UNIX user. The File Transport Protocol (FTP) and Telnet remote log-in capability also grew out of this work.

The Network File System (NFS) was developed by Sun Microsystems and put into the public domain, rapidly establishing it as a de facto standard because of the widespread need for UNIX-based systems to share files.

Ethernet was originally developed at Xerox, but due to the support it received, primarily from 3Com and Digital, and because companies such as SynOptics have worked hard to extend the range of media on which it may be implemented, the standard has proved unstoppable for interconnection at the Physical and Data Link layers.

RELAY RACE

But now the official standards organizations are picking up where chance occurrence and "the right technology at the right time" have left off.



The ISO reference model

As a standard for applications portability, UNIX is gradually giving way to POSIX, an operating system extension specified by IEEE. POSIX also is being implemented on non-UNIX systems, such as Digital's VMS. In addition, UNIX is finding a handful of "standard" implementations, such as AT&T's UNIX System V, the University of California at Berkeley's Berkeley Software Distribution (BSD), and OSF's OSF/1.

The Internet Activities Board (IAB) is now coordinating all research and development efforts in the TCP/IP community, and adding important capabilities to existing TCP/IP networks, such as Simple Network Management Protocol (SNMP). Significantly, most members of the IAB will acknowledge that what they're really doing is providing a migration path for TCP/IP users to the International Organization for Standards' (ISO's) Open Systems Interconnection (OSI) protocols.

NFS is being incorporated into AFS, the file system specified as part of OSF's Distributed Computing Environment (DCE) and being made available by Transarc. DCE is supported by the majority of the computer industry's dollars since Digital, Hewlett-Packard, and IBM are members of the organization. But NFS and the other services available in Sun's Open Network Computing (ONC) services are backed by AT&T and the UNIX International (UI) organization, and have been included in UNIX System V version 4.0, ensuring that NFS will be around for a long time. Furthermore, companies such as Epoch Systems, Auspex, Omni Solutions and Legato have developed products expressly designed to take advantage of NFS.

Ethernet has been specified by IEEE and is available on both thick and thin coaxial cable plus twisted pair. But FDDI, as specified by ANSI and available from companies such as CMC, SynOptics, and Chipcom, is beginning to encroach on its marketshare. SynOptics and Chipcom have even developed FDDI to run on twisted pair, giving 10 times the Ethernet throughput on the same medium.

THE BIG GUYS

Everyone has a theory about how IBM, DEC, and HP are responding to user demands for standards. The paranoid detect a plot, and are sure that OSF was established exclusively to stand in the way of System V, Sun, and the drive to standards while, at the same time, appearing to support the effort. Others applaud the efforts already made, especially by Hewlett-Packard. The truth, of course, lies somewhere in between.

Sun was the first company to implement open systems, but not due to altruism. Sun built systems on UNIX, TCP/IP, and off-the-shelf hardware because this was the least expensive way to make workstations. NFS and ONC were more a response to success in the establishment of a product base than a coherent effort aimed at building industry standards.

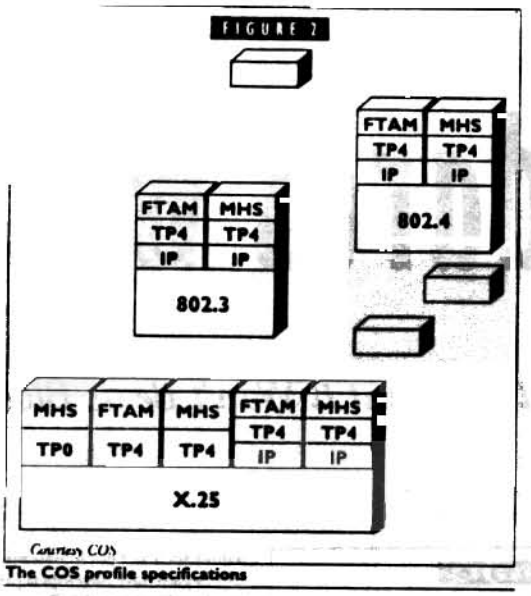
With HP-UX, Hewlett-Packard also made the decision early in the game to build future products on UNIX and other widely implemented technologies. Digital followed along, reluctantly, a few years later, building on a small and neglected handful of products including its UNIX derivative, ULTRIX. IBM has only recently joined the open systems rally with its RS/6000 series of workstations and servers and a commitment to TCP/IP.

IBM also recently announced that SNMP, TCP/IP, and tools to migrate to OSI will soon be available for all of its systems, though the exact relation these products will have to IBM's System Application Architecture (SAA) is unclear at this time. For its part, Digital is rapidly introducing products that unite its proprietary VAX/VMS environment with its industry-standard RISC/ULTRIX product line (and therefore all other UNIX-based systems). Digital also is migrating its DECnet communications software to OSI while simultaneously supporting the TCP/IP and DECnet protocol stacks. Furthermore, the next version of VMS will be POSIX 1003.1 compliant. ULTRIX is already POSIX-compliant.

The move to worldwide, industry-wide adoption of networking and other standards is, however, just getting underway.

BY BRADFORD T. HARRISON

FIGURE 2



Courtesy COS

The COS profile specifications

European and Japanese standards organizations, such as ISO, ECMA, CCITT, SPAG, POSI, and Sigma, are just now beginning to have a lasting impact on American computer companies, adding to the slow but steady momentum already established by ANSI, NIST, and IEEE. Especially important is the GOSIP specification used by the U.S. government to ensure adherence to OSI in government procurements, but even here skeptics are minimizing the wider impact GOSIP will have apart from government contract bidding and fulfillment.

While OSI specifies in detail the standards at all layers of the ISO reference model (shown in Figure 1), de facto standards TCP/IP and Ethernet have been getting most systems communicating at layers 1 to 4. Few industry observers, however, expect this to remain the case since OSI includes support for a variety of subnetworks and transport protocols, including Ethernet and TP4, which is remarkably similar to TCP. DECnet Phase V includes full support for OSI, and UC Berkeley is building a complete implementation of OSI into the next version of BSD UNIX, traditionally recognized for its support of TCP/IP.

The Corporation for Open Systems (COS) has taken it upon itself to certify product compliance with OSI. It performs this service for its members, who include computer, communication, finance, manufacturing and engineering companies worldwide, as well as a variety of government agencies.

In addition, COS certifies products for compliance with the Integrated Services Digital Network (ISDN), which occupies the same position in the telecommunications world that OSI does in the computer communications world. ISDN is the recognized standard for integrated voice, data, and video transmission, and its triumph in local and global communications is as inevitable as the triumph of OSI in computer communications.

OSI/ISDN conformance tesung and certification is formalized within COS by the COS Mark program. This program ensures that products adhere to formal specifications as defined by COS profiles. Conformance tests currently exist for TP0 and TP4, IP, the OSI File Transfer and Access Method (FTAM) protocols and Message Handling System (MHS), as well as Token Ring and Ethernet subnetworks (IEEE 802.3 and 802.4) and CCITT X.25 communications (see Figure 2).

X/OPEN

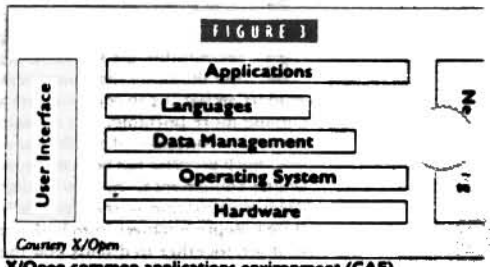
X/Open Company Ltd., also on behalf of its members, is working toward open systems from the other direction: application portability at layer 7.

X/Open has developed its X/Open Portability Guide, currently in version 3.0 (XPG3), which specifies the operating system function calls that may be used by an application to ensure that it's portable between systems. X/Open "brands" applications as XPG compliant only if they use the specified interfaces to the operating syste The verification suite is known as V and is available on license through the world.

X/Open has found its greatest succ in Europe, where many commercial, government organizations requ branding by X/Open before they p chase applications. Furthermore, XPG POSIX 1003.1 compliant. Both OSF UI belong to X/Open.

But X/Open has much bigger am tions. As shown in Figure 3, the X/Op Common Applications Environme (CAE) specifies a complete environm for application support and portabil XPG3, in fact, is comprised of seven umes. In addition to function calls, XP includes specifications for the C p gramming language, data manageme the X Window System, and a transp layer interface (X/Open Transport terface — XTI) that defines a simple of interfaces to networking services layer 4. XPG4 will also include specifi tions for SQL and X.400/X.500, as well for internetworking with PCs and ma frames.

FIGURE 3



Courtesy X/Open

X/Open common applications environment (CAE)

WILL THE REAL STANDARD PLEASE STAND UP?

There is a great deal of confusion and misinformation in the market today about the data communications and open systems capabilities of OSI and TCP/IP. While many industry analysts would have you believe that the two are squaring off against each other in a bloody battle of wills, this is only moderately true.

Both are popularly perceived as the standard for open system connectivity. TCP/IP was developed on the DARPA-NET, which was based on Berkeley UNIX. OSI was launched as a set of proposed standards by the International Standards Organization (ISO).

While OSI does contain a protocol set (much of it still under development), its notoriety was gained as an excellent generic model for open systems. Networking vendors around the globe commonly grade their products across one or more of the seven layers of this model (see Figure 1).

Most experts in the networking industry believe that the OSI protocol set will eventually become instituted as the standard for data communications. But products conforming to actual OSI specifications have been slow in implementation because much of the protocol set is still under development.

In the meantime, most vendors are reacting to the slow OSI progress by continuing to produce TCP/IP-compliant products. These vendors admit that they could easily implement the OSI protocols, but there is not yet the demand for them.

Among major vendors, IBM's SAA, Digital's DECnet, and Novell's NetWare networking schemes are establishing compliance with the OSI model. In July, however, IBM announced that it will be supporting TCP/IP with a number of new CPUs and networking products.

The ISO has set a goal for a comprehensive base of OSI-standard protocols, but few of them are well-tested or well-supported. (If you see acronyms such as FTAM or VTP, these are OSI protocols.) However, with its strong European roots, OSI is widely agreed to be the worldwide communications standard of the future.

For now, the OSI protocols must compete and coexist with TCP/IP, which has gained huge momentum as the enterprise interconnect of most UNIX networks.

TCP/IP's advantage is in its existing product base. The fastest-growing area of connectivity is the industry-standard UNIX environment. Besides TCP/IP, this environment includes the rest of the ARPA product set, including Telnet, SNMP, X Windows and the NFS.

According to Bob Nerz, the software product line director at Racal-Interlan, a company that has invested a great deal in TCP/IP connectivity, "Real world products are more important to network managers than some standards body setting a goal."

OSI is too complex and too expensive, explains Nerz, adding that TCP/IP is expanding more quickly to meet market needs. He points out that TCP/IP is being molded by fast-growing industry-standard ARPA protocol sets. "Ninety percent of people are using X on TCP/IP, not OSI," estimates Nerz.

Nerz and others acknowledge that the final OSI protocol set will be far more complete and sophisticated than TCP/IP.

"TCP/IP doesn't have the openness. Nerz said. He explained that Raca Interlan offered OSI software protocol in the past and dropped them due to lack of interest, but could easily add them again in the future.

OSI already seems to have a place in international communications. The ISO's OSI-compliant X.25 and X.400 wide-area protocols are rapidly accruing followers. Additionally, the U.S. government is requiring OSI compliance for pending federal contracts.

The most significant OSI announcement in history is due this fall when Digital Equipment Corp. announces its DECnet Phase V networking software which is an OSI-based system.

Like Digital, smart companies with sophisticated networking systems should support the full spectrum of environments and not be drawn in by the lure of one specific standard. TCP/IP and OSI protocols in multivendor networks will coexist throughout this decade.

— Evan

Not all official standards bodies have specific vendor and end-user memberships. This ensures that they remain entirely objective. Best known among these groups is the IEEE POSIX committee.

Like XPG3, the POSIX standards are primarily concerned with application portability and layer 7 functionality. Many different standards organizations are providing input to the IEEE POSIX standards effort. POSIX standards are IEEE standards (1003.x).

ROOTS

POSIX has its roots firmly in the UNIX community. The first POSIX development work came out of the /usr/group, now known as UniForum. XPG1 was heavily influenced by early work done by /usr/group. Today, there are about a dozen POSIX standards, ranging from a standard for a shell and tools (IEEE 1003.2) to system administration (1003.7) and security extensions (1003.6). The primary POSIX standard is 1003.1, which defines the functions that are implemented as system calls directly into the kernel or as library functions. VMS, through the use of libraries that map POSIX calls to VMS kernel calls, is the first non-UNIX operating system to implement POSIX. Nearly all major versions of UNIX now support POSIX.

Applications that support POSIX are classified as strictly conforming, conforming, or conforming with extensions. A strictly conforming POSIX application makes only POSIX-compliant function calls, so it's entirely portable across any systems that support POSIX. A conforming application also may make function calls that are defined by some other official specification, such as the ANSI C standard. Support by the operating systems for the additional standard(s) is required for portability of these applications. Lastly, an application that conforms with extensions may make proprietary or non-standard calls, and usually is portable across a very limited range of operating systems.

OSF AND UI

The battles go on between OSF and UI over which standards are the most "open" and the most useful. The standards, however, need to be defined by an official standards organization before final acceptance by customers. As Jim Isaak, chairman of the IEEE POSIX committee, warns, "Avoid organizations that claim to have *the* standards — the standards process is dynamic, culminating in an ANSI, IEEE, or ISO specification."

UI is primarily concerned with promoting System V version 4.0, which is X/Open and ONC compliant. X/Open based much of its early work on System V. Sun is partially owned by AT&T, so UI is certainly concerned with promoting and enlarging the already established base of ONC technology, especially NFS.

Though UI claims many substantial members, including Intel, Sun, MIPS, and Motorola, it's OSF that represents the largest American computer manufacturers — Hewlett-Packard, Digital, and IBM. There is, however, some overlap between the two organizations — most notably, Motorola.

Some users are becoming irritated with the feuding between UI and OSF, and are developing their own end-user groups for the selection and promotion of standards. The best known among these are the Houston 30, which is a consortium of 30 U.S. manufacturing firms; the International Public Sector Information Technology Group (IPSIT), which represents a variety of international government computer procurement organizations; and the Petrotechnical Open Systems Corporation (POSC), which represents the oil industry.

Vendors aren't entirely happy with the situation, either. Motorola (Cupertino, Calif.) is hedging its bets by belonging to both organizations. Wayne Sennett, vice president and general manager for the computer systems division at Motorola, points out that, parallel with the growth in informal standards from the two organizations, is a growth in computer power, main memory and disk capacities. "If we have to, we can support it all and maintain system performance," explained Sennett. "But things are starting to settle down. I can point to many standards that everyone's supporting like X.25, X.400, X.500, and TCP/IP."

The fighting is sure to continue, but it won't be as bloody. Standards are here to stay. It's just taking a while to determine the best way for the standards process to operate in such a robust and competitive industry. ■