Will The Tools Work Together?

As OSI and TCP/IP break new ground, the two may be destined to become open systems partners.

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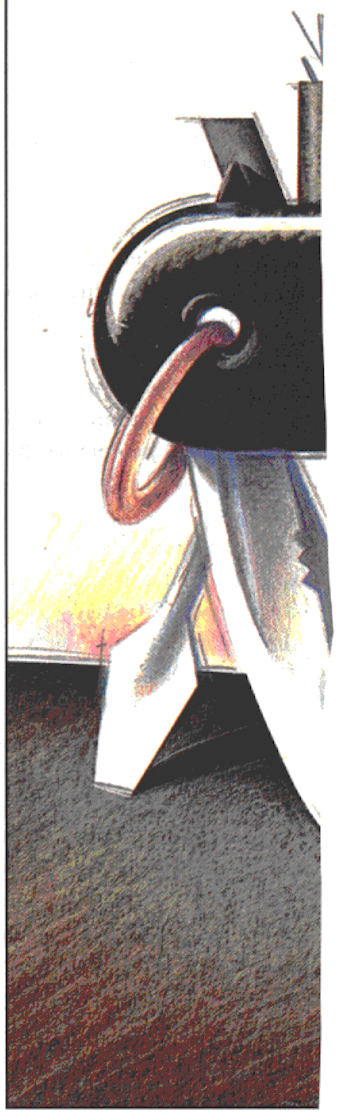
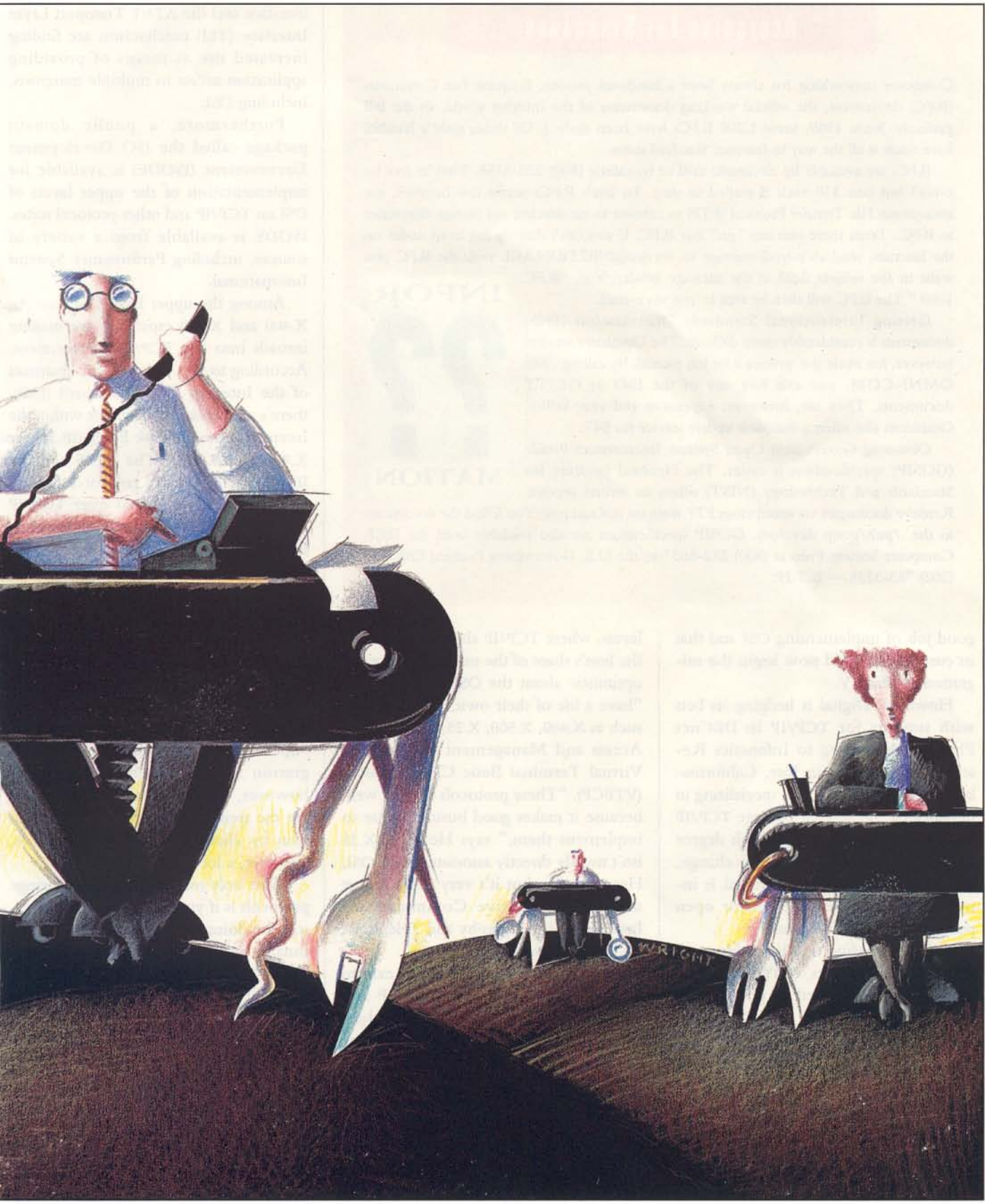
"OSI IS ON THE VERGE of exponential growth," states Cindy Jung, manager of OSI technology at 3Com. "The general interest level and need to know are reaching critical levels," she maintains.

"Rather than producing massive amounts of products, OSI has succeeded in producing massive amounts of paper," counters Marshall Rose, a key member of the Internet Engineering Task Force (IETF) and chair of the IETF Simple Network Management Protocol (SNMP) working group. "Much as the OSI types would like to view TCP/IP as an interim step toward OSI, the fact is that OSI offers little that you can't get in the TCP/IP world," he insists.

The great difference in opinion regarding the potential widespread impact of Open Systems Interconnect (OSI) has been the hallmark of OSI activity for more than a decade. The OSI versus Transport Control Protocol/Internet Protocol (TCP/IP) issue is of particular importance to Digital sites, since Digital is clearly on the OSI side of the fence, though it's responding rapidly to customer demand for TCP/IP.

DECnet Phase V, or DECnet/OSI, as it's also called, represents the industry's most comprehensive implementation of OSI. Though DECnet Phase V is appearing in bits and pieces, the industry consensus is that Digital has done a

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Accessing The Standards

Computer networking has always been a hands-on process. Request For Comments (RFC) documents, the official working documents of the Internet world, fit the bill perfectly. Since 1969, some 1,200 RFCs have been drafted. Of these, only a handful have made it all the way to Internet Standard status.

RFCs are available by electronic mail or by calling (800) 235-3155. They're free by e-mail but cost $10 each if mailed to you. To fetch RFCs across the Internet, use anonymous File Transfer Protocol (FTP) to connect to nic.ddn.mil and change directories to RFC:. From there you can "get" any RFC. If you can't directly log in to nodes on the Internet, send an e-mail message to Service@NIC.DDN.MIL with the RFC you want in the subject field of the message header, e.g., "RFC 1000." The RFC will then be sent to you via e-mail.

Getting International Standards Organization (ISO) documents is considerably more difficult. The Omnicom service, however, has made the process a lot less painful. By calling (800) OMNI-COM, you can buy any of the ISO or CCITT documents. They are, however, expensive and very bulky. Omnicom also offers a standards update service for $47.

Obtaining Government Open Systems Interconnect Profile (GOSIP) specifications is easier. The National Institute for Standards and Technology (NIST) offers an online service. Retrieve documents via anonymous FTP from osi.ncsl.nist.gov. You'll find the documents in the ./pub/gosip directory. GOSIP specifications are also available from the IEEE Computer Society Press at (800) 272-6657 or the U.S. Government Printing Office at (202) 783-3238.— *B.T.H.*

good job of implementing OSI and that its customers should now begin the migration to Phase V.

However, Digital is hedging its bets with support for TCP/IP in DECnet Phase V. According to Infonetics Research Institute, a San Jose, California-based market research firm specializing in networking, 60 percent of large TCP/IP sites also run DECnet. This high degree of coexistence isn't expected to change, regardless of the fact that Digital is introducing OSI, the other major open protocol, into DECnet Phase V.

In fact, according to Michael Howard, president of Infonetics, OSI's impact will pretty much be limited to government use in the U.S. and the European Community. "OSI is going to be another significant protocol, but it will gain momentum very slowly. The largest providers of OSI will be government suppliers who are forced to support OSI," he says.

Howard predicts that OSI will have a tough time at the transport and network layers, where TCP/IP already commands the lion's share of the market. He's more optimistic about the OSI protocols that "have a life of their own," as he puts it, such as X.400, X.500, X.25, File Transfer Access and Management (FTAM) and Virtual Terminal Basic Class Protocol (VTBCP). "These protocols will do well, because it makes good business sense to implement them," says Howard. X.25 isn't usually directly associated with OSI, Howard adds, but it's very much a part of OSI/Consultative Committee for International Telegraphy and Telephone (CCITT) activity.

Several important mechanisms exist to provide coexistence for TCP/IP and upper layer OSI services that are exhibiting this "life of their own." Most important among these is Request For Comments (RFC) 1006, titled "ISO Transport Services on Top of the TCP." RFC 1006 is supported by TGV and The Wollongong Group, two suppliers of TCP/IP for the VAX. In addition, the X/Open Transport Independent (XTI) interface and the AT&T Transport Layer Interface (TLI) mechanisms are finding increased use as means of providing application access to multiple transports, including OSI.

Furthermore, a public domain package called the ISO Development Environment (ISODE) is available for implementation of the upper layers of OSI on TCP/IP and other protocol suites. ISODE is available from a variety of sources, including Performance Systems International.

Among the upper layer OSI services, X.400 and X.500 especially are making inroads into the TCP/IP environment. According to Dr. Vinton Cerf, chairman of the Internet Activities Board (IAB), there's a renaissance of interest within the Internet Research Task Force (IRTF) for X.400 and X.500. (The IRTF and the IETF are the two key task forces within the IAB.) In fact, X.500 over TCP/IP using RFC 1006 is a more common configuration than X.500 over the OSI TP transport PROTOCOLS. According to Rose, X.500 over TCP/IP is the most widespread implementation of OSI technology at work in the field.

Protocol Change?

There's a widespread belief among network managers that they must move to "open" networks, which involves migration to TCP or OSI. The fact is, however, that multiprotocol networks are the trend, and there's often little to gain by changing protocols. There is, however, a lot to lose.

"The only reason you want to change protocols is if you have a very good reason for doing so," says Cerf, "and this usually involves an application." Cerf, one of the original designers of the TCP protocol suite, has witnessed many protocol conversions, and all of them have proved difficult. "They're a real pain," says Cerf. "If you must change, do so carefully, and always leave a path by which you can back out if something happens.

"Of course I'd be the first to recommend the TCP protocol suite," he continues, "but it flies in the face of good

sense to switch protocols without a good reason. It's not a trivial experience. Any path you take must be very strongly dictated by your application or new applications you intend to bring online."

Though he was a pioneer of "open systems," Cerf doesn't recommend moving to open systems just to gain the advantage of participation in the multivendor environment. Even if your dominant protocol is Novell's IPX/SPX, your application should dictate your protocol selections and possible transitions. "Fortunately," says Cerf, "a lot of vendors let you operate in parallel protocol environments. This allows you to ease into a new suite while continuing to use the old, or to use several protocols for a variety of applications."

THERE ARE MANY complex technical issues involved in coexistence.

Wedding Bells

Joyce Reynolds, who manages the RFC documentation process for the IAB, summarizes current TCP/IP and OSI activity with an interesting metaphor. "For a long time, TCP and OSI have been dating," says Reynolds. "Now they're thinking about getting married."

The trend is clearly toward using a combination of TCP/IP and OSI at all network layers. These protocols are being combined with other protocol suites, including DECnet, though Digital is providing parallel support for OSI, DECnet and TCP/IP in DECnet Phase V. There are, however, many complex technical issues involved in coexistence — particularly in interoperability. Most complexities are dealt with by simultaneously using two separate standards, one from each suite, at the same layer. This will probably be the case for routing protocols, while packet addressing is handled by both stacks with the same OSI-based scheme.

A competition is raging between the OSI Intermediate System-Intermediate System (IS-IS) protocol, as defined in the Draft International Standard (DIS) 10589, and the Internet-standard Open Shortest Path First (OSPF) protocol, as defined in RFC 1131. Both are mature, fully specified standards for intermediate system routing. Cisco Systems and 3Com have announced parallel support for both protocols in their router products.

However, the Dual IS-IS camp (RFC 1195) would like to extend IS-IS to handle both OSI and IP packet types. According to Rose, there's no problem with coexistence here, and either Dual IS-IS or parallel coexistence of IS-IS and OSPF will win out. The Internet backbone can handle both IP and the OSI Connectionless Network Protocol (CLNP) packet types, but this technology is in use primarily for Internet connectivity with European sites. CLNP is the OSI version of IP, as defined in ISO 8473.

IS-IS and OSPF are used for intradomain routing. For interdomain routing, or routing among domains in very large networks, other standards are competing in a similar manner. The TCP Border Gateway Protocol (BGP), as defined by RFC 1105, is pitted against the ANSI X3S3.3-specified Inter-Domain Routing Protocol (IDRP) and Inter-Domain Policy Routing (IDPR) protocol. The ANSI X3S3.3 committee is the key group in the U.S. working to develop specifications allowing a degree of interoperability between the OSI and TCP worlds.

The strongest force driving the marriage of TCP and OSI, however, is the limited amount of Internet address space. Because TCP addresses are just 32 bits long, Internet addresses are going quickly. OSI addresses are 20 bytes long, allowing for a virtually unlimited number of addresses. According to Rose, by the end of the decade no TCP address space will remain. The transition of address space, adds Rose, is a difficult task, and organizations such as the National Science Foundation, operators of NFSnet, are desperately seeking a solution.

The IRTF is the organization most likely to resolve the address transition problem by providing an agreed-upon addressing migration path for Internet networks. According to Cerf, the addressing space problem and network security and privacy issues are at the top of the IRTF's agenda. The IRTF is also expending much effort on specifying high-speed networking capabilities in the gigabit range for the Internet and is very concerned with the routing standards issues.

The clearest example of the marriage of TCP/IP and OSI is the use of X.500 with the TCP stack. According to Rose, the Internet provides no technology that competes with X.500. X.500 technology

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is approaching exponential growth, with companies such as Performance Systems, which is Rose's employer, already providing sophisticated distributed X.500 systems with full directory search capability spanning the entire system. Digital can't claim this with DECdns, though the company is promising to provide a migration path from DECdns to X.500.

Joining TCP/IP and OSI by using application gateways, the favored method for combining the two at the application layer, is more like cohabitation than marriage. Application gateways specified by, for example, the National Institute of Standards and Technology (NIST), such as the RFC 822-to-X.400 and File Transfer Protocol-File Transfer Access and Management (FTP-FTAM) gateways, are finding their way onto the market but are of limited utility. "Gateways provide the lowest level of commonality," says Rose. "They are only as good as the worst of the two protocols being combined."

NIST worked with Network Research, another supplier of TCP for the VAX, to develop its gateway products. UNIX 4.4BSD, expected soon, is using this technology to combine OSI services with the TCP already built into UNIX 4BSD. ISODE also includes gateways based on this technology, and Network Research plans to incorporate the technology into its next release of Fusion.

Digital provides an X.400 gateway to the DEC MAILbus, and other companies are jumping on the X.400 bandwagon with similar products. The X.400 Application Program Interface Association (XAPIA) is the standards body driving X.400 specification and implementation, but the Internet world continues to improve upon RFCs 821 and 822, which specify the Simple Mail Transfer Protocol (SMTP) and the format of Internet text messages.

SNMP And CMIP

The biggest controversy in the Internet and OSI worlds revolves around network management. The Internet-standard SNMP and its Management Information Base (MIB) is locked in a deadly battle with the OSI Common Management Information Protocol (CMIP) and its Structure of Management Information (SMI) database.

For a while it appeared that CMIP Over TCP/IP (CMOT), as defined in RFCs 1095 and 1189 by Unni Warrier, president of NetLabs, would be the answer, but the widespread success of SNMP for TCP/IP-based networks has buried CMOT. "Actually," says Rose, "CMOT was never alive. It was a corpse at birth. Have you ever seen any CMOT products?"

It appears that CMOT has seen its last days. A spokesperson for NetLabs says that the company is still selling CMOT, though there have been few inquiries. However, inquiries about CMIP remain strong, especially from Europe. "SNMP is based on polling," says the spokesperson, "while CMIP uses alarms. Also, SMI is superior to the SNMP MIB because it's

object-oriented." The spokesperson also points to the OSI/Network Management Forum (NMF) activity as proof that CMIP continues to gain support.

Rose claims that CMIP supporters have pretty much acknowledged that SNMP is the de facto industry standard and are now focusing on SNMP's primary weakness, which is network management among multiple SNMP Network Management Stations (NMS). He claims, however, that the SNMP working group within the IETF will soon put this one CMIP strength to rest with new RFCs aimed at a broader network management approach.

With its Enterprise Management System (EMS), Digital is clearly in favor of CMIP, though the company is covering its bases with an SNMP Access Module (AM). Cerf endorses Digital's approach, claiming that network management, as in the transport protocol world, is a multiprotocol activity, and that products need to support multiple protocols in parallel.

While everyone agrees that TCP/IP and SNMP are currently winning the day, it's more difficult to find consensus about TCP's future. Some regard TCP/IP and the Internet phenomenon as a fluke that got its start because some students at the University of California, Berkeley, included TCP/IP, originally developed under a government contract, in UNIX 4BSD, which was then implemented by many companies, including Sun Microsystems.

These critics include NetLabs President Unni Warrier, Ki Research President Jim Corrigan, and others who recognize that technologies such as CMIP and LAT, though they may not have the installed base, are certainly competitive with, if not better than, their TCP/IP counterparts. Corrigan claims that the TCP world is as proprietary as the Digital world, since the Internet technology specification process essentially operates around a closed group of people. It isn't necessarily as democratic as it appears.

On the other hand, critics of OSI, such as Rose, point out that the attempt to achieve widespread consensus does little more than produce documents representing the input of too many people and, therefore, the implementation of the OSI specifications is proving unworkable in the real world.

But OSI continues to gain steam. Organizations such as the Corporation for Open Systems (COS), NIST and the User Alliance for Open Systems continue to develop test and acceptance procedures for OSI technology. How far these efforts will extend beyond government work remains to be seen, but a huge potential clearly exists, ready to be tapped if things work out that way. 3Com's Jung could in fact be correct — OSI may just now be starting up the steep exponential ramp to industrywide success.

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