The Department of Defense - OSI and TCP/IP

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Chapter 14 - Internetworking: Emergence 1985-1988

14.5 The Department of Defense - OSI and TCP/IP

The Department of Defense funded networking research as early as the mid 1960s, primarily through ARPA. The anecdote from 1966 (see Chapter 2.7, Planning the ARPANET), where ARPA-IPTO Director Robert Taylor had three different terminals on his desk to access three different incompatible computers, indicated a broader problem. ARPA's subsequent sponsorship of the Arpanet and other computer research aimed to solve this problem that market forces alone was not solving.

Between the 1960s and the 1980s, IPTO funding nurtured a community of expert users and network designers who, over time, spread knowledge of packet switching in universities, private companies, and start-ups. Nevertheless, the plague of incompatibility was unrelenting as ARPA and many other organizations designed and built new networks. ARPA sponsored Cerf and Kahn's development of TCP during the 1970s in order to interconnect diverse ARPA packet switched networks. One outcome was the division of TCP into TCP/IP. In the early 1980s, the DoD continued to support TCP/IP protocols by adopting them as DoD standards and by issuing contracts to BBN, MIT, Berkeley, UCLA, and Washington to code TCP/IP implementations for popular operating systems such as UNIX and IBM's various operating systems (see Chapter 9).

The cumulative effect of this patronage was to leapfrog market forces and push TCP/IP into operational use. Such a strategy proved far more efficient than battling with the likes of IBM, Xerox, Honeywell, and foreign governments and computer companies in national and international standards bodies. The singleness of purpose by behind TCP/IP by ARPA contrasted favorably with the invariably competing strategies of the organizations and corporations promoting OSI. Thus the DoD had accepted TCP/IP as military standards, whereas the NBS was still promoting the incompatible OSI protocols as standards. To resolve the impasse, in May 1983 the two agencies jointly asked the National Research Council (NRC) to compare TCP with TP-4, the OSI connectionless transport protocol. Nearly two years passed before the study was completed. The NRC interviewed Arpanet insiders such as Jon Postel and Vint Cerf who "gave testimony on behalf of TCP," as well as representatives from IBM, DEC, and the NBS who "gave a lot of testimony on behalf of OSI."[10]

The NRC's February 1985 report, "Transport Protocols for Department of Defense Data Networks," was a decisive contribution to the global consensus building around OSI. The report recommended that the DoD "immediately adopt" TP-4 as co-standard with TCP, "and

move ultimately toward exclusive use" of OSI protocols.11 Although the committee found few functional differences between TCP and TP-4, Assistant Secretary of Defense Donald C. Latham sent the report to the Director of the Defense Communication Agency (DCA) with a strategic observation that was unambiguous:

> Whenever international [OSI] standards are available and can be used to support military requirements, they will be implemented as rapidly as possible to obtain maximum economic and interoperability benefits.12

There was a catch: since the OSI protocols were "not available at this time" as a "commercial offering," Latham underscored the NRC's advice to "insure that industry is aware of DoD needs as TP is commercially implemented." He also recommended that the DCA send representatives to standards committees "that are currently refining TP under the auspices of the National Bureau of Standards," to ensure that the DCA prepare adequate testing facilities and transition plans for "when commercial implementations are available."13

The 1985 NRC report was one of many indications in the mid-1980s that TCP/IP would be subsumed by OSI. To this point, the growth of TCP/IP had not been a function of market forces, but rather of the continued sponsorship of the U.S. government. Such sponsorship had served TCP/IP's promoters well for the purposes of research and implementation. But as OSI gained support amongst vendors, standards committees, and large customers— including the very U.S. government agencies that sponsored TCP/IP—leaders in the TCP/IP community saw the need to improve and promote their protocols more aggressively if they were to survive.

The promotional strategies of the Internet Advisory Board (IAB) had two components: encourage more participation in TCP/IP standards development; and teach equipment vendors about the features and advantages of TCP/IP. 1986 was a crucial year for both efforts.14

In January, the IAB's Gateway Algorithms Task Force split into two new groups. The Internet Architecture Task Force (INARC) would focus on long-term architectural matters, and the Internet Engineering Task Force (IETF) on the Internet's short-term operational and protocol engineering problems. Mike Corrigan of the Defense Data Network chaired the first meeting of the IETF in January 1986, with 20 other attendees. The IETF met 3 more times in 1986 (with an average of 25 attendees per meeting), 4 times in 1987 (with an average of 70 attendees per meeting), and 3 times in 1988 (with an average of 103 attendees per meeting).15 The expansion of the Internet technical community bore immediate fruit, such as the May 1986 publication of RFC 985, "Requirements for Internet Gateways." This document, while not a standard, was a clear set of guidelines for TCP/IP gateway implementations that was a joint effort of the IAB, INARC, IETF, and the Gateway

Requirements Subcommittee of the National Science Foundation's Network Technical Advisory Group. The latter body guided the development of the NSFNET, a TCP/IP network that generated substantial political and technical support for the IAB.16

Dan Lynch's outreach campaign in 1986 would prove to be even more important than technical developments within the TCP/IP research community. Lynch, who was instrumental in managing the Arpanet's transition to TCP in 1983, was now a consultant. He worked with the IAB to plan a workshop in Monterrey, California and invited equipment vendors to learn about TCP/IP. Lynch saw the event as an attempt to get "the apostles of TCP to come out of their ivory towers" and provide some guidance for vendors implementing their protocols.17/a> Lynch recalls:

> The dozen or two dozen who actually built this stuff, I went to them and said: 'You guys have failed. You built this beautiful thing, and the world is starting to use it, and they're abusing it, and you have failed to communicate to them what its real potency is, where it's really headed, what problems it's really headed to solve. They're just using it for these little small things, and you've got to go awaken them.' And they did. They loved that. They said, 'sure.' …So I put together a conference [in Monterey in August of '86], invitation only… That was an outrageously successful conference.

In many respects, Lynch and his fellow TCP/IP supporters were playing PR – public relations - catch-up: OSI had already attracted support from the DoD and the NBS, prompting Data Communications to declare in November 1985 that OSI was "heading for full bloom."18

The leaders of the TCP/IP research community joined representatives from 65 vendors such as Ungermann-Bass and Excelan in attending the first "TCP/IP Vendors Workshop" on August 25-27, 1986. The meeting, while successful, did not settle the question of who would be responsible for ensuring that all TCP/IP-based products implemented the protocols in a consistent manner. Vendor representatives were disappointed that no certification and conformance testing process existed. Some, such as Judith Estrin at Bridge Communications, rejected Lynch's proposal to create a "Protocol Testing Institute" as "too grandiose." Estrin and others believed that Lynch or a new, informal group lacked the authority to declare any TCP/IP implementation as an industry standard.19 Moreover, Lynch's initiative would not bring stability to Internetworking markets. A marketing manager at Ungermann-Bass, Barton Burstein, summarized the problem in 1987:

> At the OSI side there's no product. At MAP, GM has funded a very large technical staff. COS [Corporation for Open Systems] has a tremendous budget. Then look at TCP/IP with its number of customers and vendors. It's five to six times more dense or populous than OSI, and you've got Dan Lynch and his answering machine.20

Lynch's belief in TCP/IP, experience as a consultant to Excelan, and entrepreneurial spirit pushed him along. He continued organizing vendor conferences to promote TCP, including the "TCP/IP Interoperability Conference" in Monterrey on March 16-19, 1987; the "2nd TCP/IP Interoperability Conference" in Arlington, Virginia on December 1-4, 1987; and the "TCP/IP Interoperability Exhibition and Solutions Showcase" in Santa Clara on September 28-30, 1988. Lynch debuted a new, catchier title for the 1988 conference: Interop.

Lynch also promoted TCP/IP through a newsletter, Connexions: The Interoperability Report, which he described as an "attempt to satisfy the need for information exchange between users, vendors, and the R&D community." His editorial advisory board contained four leaders of TCP/IP development: Vint Cerf, David Clark, David Mills, and Jon Postel. The premier issue in 1987 contained articles on Internet RFCs, an explanation of gateways (to "unravel the mysteries of what is at first glance a simple concept"), and listed over 140 vendors that were offering or developing TCP/IP products.[21]

All the while, officials in the NBS were working hard to provide nourishment for the American companies that would bring OSI products to market.