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The Role of Standards

> "Representatives and direct taxes shall be apportioned among the several States which may be included within this Union, according to their respective numbers, which shall be determined by adding to the whole number of free persons, including those bound to service for a term of years, and excluding Indians not taxed, three-fifths of all other persons. The actual enumeration shall be made within three years after the first meeting of the Congress of the United States, and within every subsequent term of ten years, in such manner as they shall by law direct…."
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> THE CONSTITUTION OF THE UNITED STATES OF AMERICA: ARTICLE I, SECTION 2, PARAGRAPH 3

Although some details have changed, the actual enumeration specified above is still carried out every decade. The country has grown a bit, however, requiring rather more effort than the framers may have envisaged. By 1890, it had become clear that strictly manual methods were not going to be sufficient. So, Herman Hollerith designed a new ("punched card") format for the primary data records, along with machines to punch and read the cards.

By making the cards in the same size (3.25 by 7.375 inches) as the currency of the day, the Census Bureau was able to take advantage of existing currency-handling apparatus. The precision of the available tabulating equipment limited the cards to 80 columns of 12 holes each. The bottom 10 holes in each column were used for the digits zero through nine. The top two holes were used for out-of-band ("zone") punches.

As time passed, the interpretation of the punches became more and more complex. Alphabetic and some special characters were added in the BCDIC (Binary Coded Decimal Interchange Code) format. Lowercase alphabetics and still more special characters were added in the Extended BCDIC (EBCDIC) format. The vagaries of the EBCDIC coding scheme became quite comprehensible (and quite interesting, as a design problem) when seen from this historic perspective.

Over time, the idea of punching physical cards became less attractive. Electronic terminals were developed, finding use in key entry and time-sharing systems. To retain compatibility with punched cards, however, most of these terminals used 80-column lines.

Today's bit-mapped screens are far more flexible than these early terminals, but the 80-column line is still a strong cultural standard. Email and Netnews postings, for instance, are typically formatted to fit within 80-column lines. Most text editors and terminal emulation programs also use 80 columns as the default line length.

In a related development, most cur-

rent terminal emulation and cursor-control programs, including `xterm` and `curses`, still support `vt100` mode, based on Digital Equipment Corp.'s VT100 terminal. I find it somewhat amusing to contemplate millions of computers busily generating and/or emulating the cursor-control sequences of a long-discontinued computer terminal. But I digress.

Some Standards Survive

The important lesson in all of this is that standards can survive long after their original design criteria (and designers!) have vanished into the mist. Paper tape and punched cards have vanished, but ASCII and EBCDIC will be around for a long time. Similarly, I would expect 80-column lines to be the default format for fixed-width applications for the foreseeable future.

On the other hand, many standards have disappeared, thus, adoption of a standard is no guarantee of permanence. Let's look at some of the winners and losers, to see what patterns emerge:

Winners	Losers
ASCII, EBCDIC	Paper tape, punched cards
C, etc.	Pascal, etc.
Ethernet	3BNet, Localtalk
Java, X Window	NeWS
NFS	RFS
RS-232	Current loop
SCSI	ST-506
TCP/IP	AppleTalk, XNS
Twisted-pair cable	Coaxial cable
UNIX	Apollo Domain, VMS
Windows	UNIX

In the cases of ASCII and EBCDIC, the encoding schemes were found to be useful long after the physical manifestations had been dropped. I expect the SCSI protocols to show similar resiliency. Similarly, the UNIX sets of commands, library functions and system calls have been adopted in circles extending far beyond licensed UNIX.

Some of the winners are technically superior to the losers. Coaxial cable can be more difficult (and expensive) than twisted pair to install, extend and debug. And once twisted-pair cable started to get installed, bright engineers could begin adding improvements such as switching hubs and cheap IP routers.

The design of some interfaces may be so closely tied to a given environment as to make them unsuitable for use in others. RFS, for example, offered features that were not available with NFS (for example, remote use of devices), but it did not work as well with other operating systems. Apollo Domain, which many users believed to be superior to UNIX, has disappeared due to a lack of portability.

Despite its technical superiority over X Window, NeWS got trounced in the UNIX window system wars.

Although some complaints can be made about NeWS' CPU-intensive nature, I submit that the primary reason for its demise was an overall industry disinterest in paying license fees (and giving up control) to Sun.

On the other hand, aversion to RPN-style programming languages and reluctance to let Sun "win" another standards coup may have been significant factors. (I find it both amusing and gratifying that James Gosling has been able to recast many of NeWS' attributes into today's wildly successful Java system.)

UNIX is a conundrum. It has prospered while some proprietary systems were dying, but it has never achieved mass-market stature. As Sun's Scott McNealy notes, UNIX has been dying at a sustained growth rate of 20% per year for the last 15 years. So it would appear that the technical merits of UNIX have given it a place in certain markets, but its complexity (and the Microsoft gorilla) have kept it from wide-scale use.

How to Choose

Aye, there's the rub… We are besieged by proposed standards, covering every aspect of computer hardware and software. As some wag noted: "The nice thing about standards is that there are so many to choose from." Sometimes a wrong decision doesn't matter at all; other times it can be devastating. Choosing the wrong bus on a PC is a small matter to most users, but it could sink a manufacturer. Choosing the wrong type of cabling for a LAN could cause a great deal of pain in 10 years' time.

My own advice would be to opt in favor of generality and openness. Standards that can't grow with improving performance cannot last long. Standards that force the industry to pay tribute to a single vendor are ripe for replacement, if the industry can muster a viable replacement. Thus, although Microsoft now seems too big to stop, you should remember that some other industry leaders have been deposed.

Finally, keep an eye out for standards that can outlive their original design goals. I use Category-5 twisted-pair cable for all my Ethernet wiring. Originally, this was my way of preparing for 100BaseT. Now, I realize that it will allow me to go quite a bit further than that, as smart engineers find ways to cram bits into it. If a standard is reasonably well-designed and becomes popular, the industry is quite likely to find ways of extending its lifetime.

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