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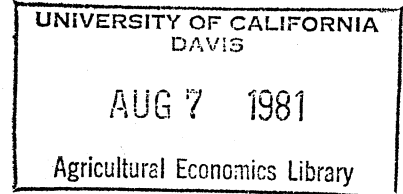
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DATA PROCESSING

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Microcomputer Hardware, Operating Systems and Languages,  
Is There An Industry Standard?

by

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## Microcomputer Hardware, Operating Systems and Languages.

### Is There An Industry Standard?

Compatibility of hardware, operating systems, languages and programs is a serious problem facing the microcomputer user. A discussion of trends in the industry and the alternative the users may have will enhance portability of our efforts. I wish to discuss hardware first followed by operating systems and subsequently the various programming languages.

Microcomputer systems may be classified as being an integrated system like the TRS-80, PET or APPLE or a bus oriented system. The main bus oriented system is the S-100. There are close to two dozen different manufacturers of S-100 mainframes and 50 manufacturers of over 400 S-100 plug-in boards. A most important factor in considering the S-100 bus main frame is the recent development of the Institute of Electrical and Electronic Engineers standard for the S-100 bus. The standard eliminates many of the problems in the S-100 bus and upgrades it for 16-bit microprocessors and permits intermixing of 8 and 16-bit memory cards. In addition to supporting the 16-bit processor, the standard provides for operating speeds up to 10 MHz -- the original S-100 was a 2 MHz system, 16 megabyte direct addressing range, up to 65k I/O ports, 8 or 16-bit transfers are some of the features in the IEEE S-100 standard. Most important is the fact that there is a standard and with manufacturers following the standard, we can expect compatibility amongst S-100 boards. We see manufacturers now advertising that their boards meet the IEEE standards.

We have a number of manufacturers that are supplying 16-bit processors and the trend will be to the 16-bit processor. Consideration of this projection should be recognized in main frame selection.

Operating systems are the next consideration in looking for compatibility. These are a number of operating systems that have been developed and maintained by software houses. These would include CP/M and MP/M from Digital Research and Oasis from Phase One Systems. The main microcomputer manufacturers also supply operating systems with their systems. Examples would be DOS and Monitor for North Star, TRSDOS for Radio Shack, MDOS for Vector Graphic and CDOS for Cromemco. Digital and Phase One Systems have extended their operating systems for the 16-bit processors. Microsoft has been licensed by Western Electric to handle UNIX.

Compatibility amongst operating systems, particularly those developed by the microcomputer manufacturers, doesn't exist as is true with those of the software houses. The closest is CDOS from Cromemco whom is licensed by Digital Research to use CP/M data structures.

CP/M, although not an established standard, has been accepted by many as an industry standard. CP/M was developed by Digital Research in 1975. Until 1980 its implementation was primarily for S-100 bus systems and the 8080/8085/Z80 based microcomputers. In 1980 we saw introduced CP/M for the APPLE and Radio Shack microcomputers. CPM has a users group called CPMUG. This group maintains an exchange library that now has 51 volumes of software available on 8" IBM single-density CP/M diskettes or on North Star diskettes readable by users of double-density CP/M 1.4; double density CP/M 2.2 or quad capacity CP/M 2.2.

As indicated previously, Digital Research and Phase One has operating systems that support the 16-bit processing systems. They both support multi-user operating systems. UNIX is a multi-user operating system that was written with C by Bell Laboratories. It was developed for the 16-bit processor and has

been popular for DEC systems in Universities -- partly because of no cost to them. UNIX is now being implemented in commercial operations. Microsoft has a license for distribution UNIX. Some have developed UNIX like operating systems.

No one appears willing to say UNIX will become the dominant operating system replacing CP/M 86 when we move to 16-bit processors. Our position is that we would likely move to CP/M 86 and follow with adaptation of UNIX to 16-bit microcomputer systems. Currently, we would have to accept CP/M as the de facto standard operating system for microcomputers. It should be pointed out that development of CP/M for the integrated systems requires special programming effort and was likely the reason it was not available for APPLE and Radio Shack systems until 1980.

Programming languages for microcomputers include all of the main languages like COBOL, PL/I, FORTRAN, BASIC and PASCAL. BASIC has been one of the most popular higher languages used for microcomputers. PASCAL has come more into use as a structured language. However, we are using structured BASIC and FORTRAN developed for microcomputers with control structures like PASCAL, AGOL, C and PL/I. FORTRAN 77 now also available on microcomputers was conceived in large part to improve upon the structural deficiencies of earlier FORTRANs and it includes many features of the more traditionally structured languages. We should expect to rely then on the newer developments in BASIC and FORTRAN that incorporate structured features.

The various BASIC languages are primarily interpretive. More recently we have seen an evaluation of S-BASIC which incorporates structured features and as a fully compiled language like FORTRAN. The review in the March, April and May issues of Lifeline was very favorable for S-BASIC.

Standards are being developed by IEEE for a number of languages. The languages include assembled high level languages (Task No. 755) and PASCAL (Task No. 770). IEEE activities in developing computer standards is important on overcoming problems created by companies that may create incompatibilities in order to protect their competitive position.

Telecommunication for microcomputers has grown tremendously this past year. We have seen both hardware and software announcements. Hardware and software are now available for all communications applications with Band rates up to 9600. Asynchronous communications via Modem is supported for standard Bell 113C, 103J, or 212A Modem. Bisynchronous communication software and hardware is available to support IBM 3270 protocol. We can expect further developments and adaptations in the commercial area, particularly in enabling microcomputer users to communicate with larger systems.

There are rapid developments in magnetic tape units for microcomputers. A recent reports from DATAPRO shows a number of reel to reel magnetic tape units that are available. Interfacing is through RS-232-C or IEEE-488 interfaces. Most units are 800/1600 BPI with tape speeds up to 75IPS. As microcomputers come more into use we will find the need for reel to reel units a real need. They may also be used for back up.

Cassette and cartridge magnetic tape units are being developed. There was a need to have an inexpensive back-up system for microcomputers, particularly with the advent of the large disk systems. Some may find these types of units meet their needs, particularly if they are not concerned with handling external tapes.

Software packages such as data base management systems, word processing, and report writers, to mention a few, should be seriously considered by the microcomputer user. These packages provide for uses that we cannot justify the programming effort for, at a very low cost. More recently we put all of our price series for California commodities and general statistics on our system with the use of a DBMS package. A report writer is used to create the tables for publication. Updating is efficient and helps us maintain a current data base.