

ASCII Standards + Codes

27 September 1968

MEMORANDUM FOR: Executive Assistant, OCS

SUBJECT : ASCII Standard (NBS Draft)

1. Consider this as an addendum to the memorandum of 25 September 1968, same topic.
2. Another point that hasn't been mentioned in any of the proposal discussions concerns binary data.
3. Most third generation machines have the option of internally addressing bytes or words. In particular, scientific users use both integer (pure binary) and floating point (an encoded binary) arithmetic and these formats use single (four bytes) or double (eight bytes) words.
4. I believe it is important to be aware that these formats are neither EBCDIC nor ASCII and that they do use the eighth bit of the byte. Thus, data in this form is not transmitted over lines in ASCII format without a code/decode process.
5. I overlooked this condition and so might others. It may be helpful if this bit of a reminder is kept in the file so that the possible presence of binary code is considered on future projects.



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25 September 1968

MEMORANDUM FOR: Executive Assistant, OCS

SUBJECT : Recommendation on Draft of NBS Instructions
for Application of the Federal Standard
ASCII Code

REFERENCE : C/IPS's Memo dtd 13 Sep 68 and NBS Memo
dtd 4 Sep 68

Recommendation

I do not recommend that the Agency endorse the NBS draft. The implementation guidelines cannot and will not be followed by agencies in even a token manner. The NBS guidelines impart a thrust to President Johnson's memo which is not prudent. Standards previously produced by the U.S.A. Standards Institute have been highly respected and quickly implemented by Government and industry. These standards have been aids to less confusion and more efficiency and more economy. A premature and pressured implementation of this standard on Government users by NBS will produce confusion, inefficiency, and more cost. The respect which agencies have for NBS and USASI will deteriorate and this will be unfortunate in future worthwhile "pressured implementations" of standards. I recognize that the guidelines have infinite loopholes and waivers, but these create ambiguity as to the force of the guidelines and this is bad. Why bother? All instructions pertaining to standards should be as clear as possible.

At first impression, it may appear that the above position is inconsistent with previous recommendations. It is not. However, the picture is exasperatingly confusing, and thus the following information and discussion are given.

Pertinent Information Items

1. An increasing majority of computers and data bases are in

EBCDIC, an eight bit code which was created by IBM for third generation equipment. All (or nearly all) eight bit byte machines of other manufacturers use this code. Because no STANDARD eight bit code has been specified and approved by USASI (United States of America Standards Institute), EBCDIC has become the de facto standard of the computer industry.

2. ASCII (USA Standard Code for Information Interchange), the USASI approved code for information interchange, is a seven bit code. Note that this code is designated by definition for information interchange, not for using in computers or for data storage. Granted, it would be nice if this code were 100% compatible with that used in computers or in data storage. This is not possible. Most new computers have eight bit bytes (not a seven bit byte code) and the remainder have six bit bytes. New style tapes have eight bit byte format (nine channel with one being a parity bit) and old tapes have six bit bytes (seven channel with one being a parity bit). Nearly all other magnetic storage for data files, disks, drums, data cells, strip files, etc. have eight bit bytes and have not been considered in the standard implementation.

3. USASI has approved only one transliteration of seven bit bytes to eight bit bytes and that was recently in X3.2/445 (800 C.P.I., NRZI). Note that this standard states how to code ASCII on one kind (800 C.P.I.) of magnetic tape only. This standard is feasible. By making a computer pass through a utility program, tapes written in EBCDIC can be converted to this code, and presumably the recipient of the tape can then reconvert it to EBCDIC so he can process it. Why do the conversion and reversion? This can be rationalized only in that "it is a standard," and in that it has never previously been imposed as a mandatory replacement for EBCDIC.

4. USASI has not approved a transliteration algorithm for placing seven bit byte ASCII on an eight bit byte computer. How can the guideline to "use ASCII in the computer" be implemented by either manufacturer or customer without specs?

5. No transliteration of seven bit ASCII to eight bit byte has been approved for other storage devices. (I am ignoring the transliteration problem on non-800 C.P.I. tape since standards for these probably will be approved shortly.)

6. Collating sequences between ASCII (i. e., if the 800 C.P.I. ASCII is assumed for all eight bit byte data bases) and EBCDIC are different. Most data bases go through a sorting process at times. Every application would have to be scrutinized in detail and very possibly, most applications would require conversion programming. Is anyone so brave as to suggest another programming conversion effort?

7. In 1964, the IBM/360 was offered with the internal option of EBCDIC or ASCII-8 (IBM's own transliteration version of seven bit bytes to eight bit bytes). Coincidentally, all early customers opted for EBCDIC, chiefly because it was the more compatible with BCD, the code used on the older machines. Subsequently, 1966-1968, IBM quietly ceased to offer the ASCII-8 option, and used the subtle persuader of "incompatibility to other systems" to ASCII-8 requesters. The fact that USASI had never approved a seven to eight bit transliteration was a clincher, and no IBM 360's were ever delivered to customers which internally use ASCII code. Also, it is doubtful if third generation machines of any manufacturers have been so endowed. Thus, the requirement of ASCII internally would introduce new hardware problems and more shakedown of third generation hardware.

8. After manufacturers failed to produce ASCII computers, the systems software designers gradually forgot about the ASCII option. It is a near certainty that no present systems software (and much others) would run on an ASCII machine. Would any user be willing to implement a new OS (Operating System)-360 in ASCII and presumably repeat the implementation agony?

9. A final but ironic point. USASI is pushing procedural languages and no one argues seriously against the concept. COBOL and FORTRAN are being standardized. However, two facts are fairly certain, 1) Neither COBOL nor FORTRAN will be the future general purpose procedural language, and 2) this future language will be a language very similar to PL-1 or to a superset of PL-1, and in fact possibly will be PL-1. PL-1 is powerful and can manipulate bits nearly as well as an assembly language. Thus, the language power can bring us full circle back to assembly language capability and also to its problems. The capability to manipulate bits may make a PL-1 program written to process EBCDIC data bases incompatible for use if the data base were changed to ASCII. (This problem also exists in ALC but to a much lesser extent in COBOL and FORTRAN.)

This incompatibility is superimposed on the collating sequence difference and thus potentially becomes a serious problem.

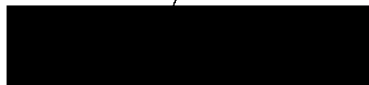
Discussion

No agency with much third generation hardware can follow the guidelines. The specs and the guidelines are too late. A standard is essential when a file is described. It is particularly essential when communicating with outsiders. It is not important that both parties use ASCII; it is important that they communicate clearly and precisely. This can be accomplished by specifying "ASCII" or "EBCDIC." If a receiving installation uses a code different from the sending, he can convert. Utilities are available for this purpose. Very likely, the latter condition is academic; since most installations are and will be locked to EBCDIC.

None of the above negates the importance of ASCII for information interchange. Most manufacturers have circuitry in the communication line control boxes which automatically transliterate eight bit bytes in the computer to seven bit bytes for the transmission and vice versa on return.

One of the original papers presenting the President's memo mentioned only ASCII and BCD as the codes which were considered; thus EBCDIC, the dominant and de facto standard, was not even considered. I believe this omission reflected the depth of the research into the conversion problems. Obviously, the Agency could go along with the proposal for "standards sake" but the working technicians would not take the standard seriously except through excessive and unwise coercion.

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30 September 1968

MEMORANDUM FOR: Chief, Information Processing Staff/OPPB

SUBJECT : Draft of NBS Instructions for Application
of the Federal Standard ASCII Code

REFERENCE : a. C/IPS's Memo dtd 13 Sep 68
b. NBS Memo dtd 4 Sep 68

1. One of the problems that we see with the draft is the variety of interpretation that may be drawn from its language, depending upon the reader's role in the ADP world. From the standards enforcement viewpoint, there are references to "Public Law 89-306," the "President," and "1 July 1969"--when "all computers brought into the Federal Government inventory must have the capability to use ASCII, etc."--which imply heavy handed enforcement. From the operations viewpoint, there is considerable language describing "evolutionary transition," and the authorization of departments and agencies to "waive application of these guidelines" in certain situations, from which one might assume unpressured implementation. All of which leads one to wonder when and with what force application of these instructions is appropriate. In addition to these differences in policy viewpoint, it has been quite evident from technical and management discussions generated by the draft that ambiguous definitions are being drawn from some of the technical language in the paper.

2. In 1964, the IBM/360 was offered with the internal options of EBCDIC or ASCII-8 (IBM's own transliteration of seven bit ASCII to eight bit bytes). So far as we can determine, no IBM 360's have been delivered which internally use ASCII-8. Because no standard eight bit code has been specified and approved by USASI (United States of America Standards Institute), EBCDIC has become the de facto industry standard for the internal logical operation of computer systems. USASI has not approved a transliteration algorithm which would describe how seven bit byte ASCII appears logically within an eight bit byte computer. This information is required for the development

of software and programs which manipulate bits rather than characters. With this in mind, I am not sure what is meant in paragraph 7 which states that all computers brought into the government "after 1 July 1968 must have the capability to use ASCII, etc." Does this mean read in or write out only, or does it also imply a standard ASCII internal machine logic which can be used for software development and the special application programs described above? If it means the latter--and this interpretation can easily be made--the impact will be severe on users and manufacturers. The number of manufacturers who will be prepared to deliver equipment which meets this specification by 1 July 1969 is not clear now and this may force some relaxation of the proposed deadline.

3. The ASCII standard does not appear to present any serious problems in the interchange of information. Programs can be used to convert the input or output of a computer from EBCDIC to ASCII or ASCII to EBCDIC. In electrical transmission, the computer controls for communication lines provide automatic conversion of the eight bit bytes in the computer to the seven bit bytes for transmission, and vice versa. However, I believe that there are many subtle technical problems concerned with the data files, special programs, software and internal computer logic which will need to be solved before the Federal ADP standards program can reach the ultimate objective of applying ASCII based code, media, and sequence standards to internal files. These problems will take a long time to resolve.

/s/ Charles A. Briggs

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