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1. OVERVIEW

This document addresses problems, experience, and suggestions with respect to the ``JTC1 Electronic Document Formatting Guidelines``, JTC1/N3413. We have found several serious problems with these specifications. Our experience, both positive and negative, is shared in this document. Finally, we recommend changes to improve the document and the process.

2. FEEDBACK

2.1 Positive Feedback

We have had much encouragement to provide documents in electronic format. We would like to share our experiences with JTC1. The remainder of this section describes issues we have with the JTC1 electronic document format. Although the remainder of the section addresses negative feedback (open issues), we feel it is important to convey to JTC1 that we believe JTC1 is heading in the right, general direction (electronic documents) and we commend JTC1 for tackling this difficult problem.

2.2 Procedural Problems

2.2.1 No Balloting

To our knowledge, this document has not been balloted among those who are affected. Considering that working groups, project editors, national body delegations, and national body members are mostly affected by these procedures (these people produce the most paperwork), these people should have been consulted as part of the requirements analysis.

2.2.2 Incomplete

The document is missing specifications that greatly affect the interoperability (configuration management issues, data interchange, process workflow).

2.2.3 Workflow

There is no workflow description. The workflow would tell us how documents are handled during creation, editing, review, and distribution. Additionally, the workflow would address specific issues concerning existing workflow processes (e.g., balloting, CD, DIS, IS, TC, RR, etc.).

2.3 General Problems

2.3.1 Inadequate Analysis

Much more effort would be required to perform a complete analysis. The following issues would be addressed:

- Addressing needs of all parties affected.
- Workflow analysis.
- Existing document standards.
- Types of software available.
- Capabilities of authors.
- Capabilities of users.
- Capabilities of printers.
- Capabilities of viewers.
- Capabilities of electronic distribution systems.
- Capabilities of E-mail systems.
- Capabilities of physical media.
- International character sets.
- Page layout based upon different paper sizes.
- Preserving hypertext connections.
- Preserving document structure.
- Preserving document style.
- Preserving text-only format.
- Preserving document image.
- Revisions of documents.
- Managing versions (e.g., difference listings, red-lining, etc.).
- Configuration issues.
- Internal testing of these procedures prior to widespread use.

2.3.2 Configuration Issues

The following is a partial list of known configuration issues:

- The version of DOS or Mac operating system.
- The version of MS-Windows.
- The version of MS Word.
- The version of RTF.
- The version of Wordperfect.
- The version of the Wordperfect file format.
- The version of the memory manager.
- How much memory (RAM) is available.
- The version of the CPU (e.g., 80386, 80486, etc.).
- The video driver.
- The resolution of the monitor.
- The graphics format for embedded graphics.
- The version of the graphics file format.

- The version of the printer driver.
- The choice of fonts.
- The fonts and configuration loaded by previous users of the printer.
- The size of the paper for printing (A4 vs. 8.5x11).
- Which font manager is in use (e.g., Adobe Type Manager).
- Which macros are being used.
- The document style used.
- What language keyboard is in use.
- The hyphenation dictionary used.
- The locale.
- Which filesystem is in use (FAT, HPFS, NTFS, UNIX, BSD, etc.).
- The binary conversion tool (for transmitting documents via E-mail).
- The E-mail system used (for transmitting text and binary documents).
- The compression utility.
- Whether hidden text is included.

As a simple example of these configuration issues, I can take a document using the identical tool (Microsoft Word Version 6.0) printer drivers, hardware, disk drive, etc., yet cause the document to produce different output because I've booted MS-DOS 6.2 vs. Windows NT 3.5.

Some of the symptoms that result from these problems are:

- The word breaks change.
- The word spacing is different.
- The page breaks change.
- The margins are different.
- The hyphenation is different.
- The page numbering is different.
- The diagrams are different.
- The colors are different.
- The mapping of colors to grey scale is different.
- The imported diagrams don't appear the same or not at all.
- The font is completely different, e.g., the Greek character set was used instead of the Latin character set.
- The mapping of internal fonts (what the word processor uses) to external fonts (what the printer uses) is different.
- International characters aren't mapped or displayed correctly.
- Information changes within the document, e.g., the date of the document changes in its printing.
- The document cannot be printed because the user doesn't have the right configuration, e.g., not enough memory, missing macros, missing tools, and so on.

2.3.3 Proprietary Format

Microsoft Word, Rich Text Format, and Wordperfect are all proprietary formats by US vendors. Even though these formats are in widespread use, they have the following characteristics:

- When used primarily by small groups (individuals, LAN's, small offices, departments), the conventions are easily set, data interchange isn't an issue, and the author and user are in close proximity.
- When used by large groups (e.g., designed for data interchange among many departments over wide geographic areas), usually some set of 'templates' are used, there are restrictions on the features that can be used, and (most importantly) the organization has control over the configurations of hardware, software, printers, paper, and so on, for the authors and users.
- All other users have some difficulty exchanging documents of any substantial size. These problems are mostly caused by configuration issues listed above.

Considering that these are proprietary formats developed by US companies, with no input from a standards development organization, these would be inappropriate for forcing on the international community.

Another consideration is that these word processors and systems are available at substantial cost to the users. Some users would have to buy a PC, the word processor, and supporting software because he/she doesn't use a PC at his/her job.

2.3.4 Binary Format

All three formats are binary formats. This means that users need special tools (e.g., the word processor itself may be limited in features it can access) to examine and/or change the information in the word processor format. This would prohibit the use of a text editor (common to *every* system) for editing the files (assuming that the person understood the format).

Note that Rich Text Format is actually a binary format. The reason why is that lines that are emitted from these word processors are typically longer than 509 characters per line even though they only use ASCII character. The 509 limit is based upon the C programming language which was derived from much experience across almost all vendors and systems. Files with lines longer than 509 characters are considered binary files because the underlying operating systems might not support these files as text format.

2.3.5 Transmission Of Documents

Electronic media is most useful. This is where the document will be most useful to authors and users: sending or receiving a document via directly connected or store-and-forward electronic media.

2.3.6 Lack Of Standards

The JTC1 format ignores existing ISO standards for these capabilities. Why should the rest of the world follow standards when they are not good enough for us? JTC1 endorses proprietary standards of US origin.

2.4 Specific Problems

2.4.1 Scope

It is not clear if the JTC1 format applies to all documents or a subset. Does this format apply to correspondence, standards, corrigenda, etc.?

2.4.2 Media

The diskette media might not be large enough for documents. For example, the working draft of WG21 (C++ programming language) won't fit on a single diskette. There is no description of handling large, multi-volume documents.

2.4.3 Formatting and Filing System

Most floppy media that is pre-formatted (i.e., what is purchased at office supply stores) is compatible with MS-DOS 3.1. With MS-DOS 5.0, compression formats have been introduced. These are formats incompatible and unreliable for most users. The requirement should be MS-DOS 3.1.

2.4.4 File Format

The Rich Text Format is only for document formatting. None of the formats assure the user that the document will appear the same.

There is no requirement for including a text-only format using 7-bit characters. This requirement should be included.

There is no requirement that an image of the document be included, e.g. Postscript. With display (image) format, the document would be rendered the same on all printers.

2.4.5 Document Format

ISO Directives 3 is not appropriate for all documents. Most documents aren't in any style close to Directives 3 including the "JTC1 Electronic Document Formatting Guidelines".

One concern about Directives 3 is that the document may lose quality when transferring between A4 paper and 8.5x11 paper.

2.4.6 Usage of Compression Utilities

This specification is missing here. This is a critical feature and compatibility issue.

2.4.7 Direct Electronic Distribution

This specification is missing here. The ``JTC1 Electronic Document Formatting Guidelines`` should have been made available via electronic access, e.g., FTP as a text file or HTML. Since it was distributed as a text file, this would have required minimal effort. As of 1995-08-16, the specification is not on the ISO WWW site.

2.4.8 Packaging

The "readme.txt" file doesn't contain all the configuration information needed to assure data interchange (see above).

The proposed directory format obscures the number. Why not use the full document number, such as (replace slashes with backslashes for MS-DOS)?

ISO/JTC1/SC22/WG14/N460

or

ANSI/X3J11/95-061

The proposed directory format would map different documents to the same name. For example, these documents

ISO/JTC1/SC22/WG14/N460
ISO/JTC1/SC22/WG15/N460

are both mapped to "22N0460".

The suffix doesn't include a Postscript format.

The ".txt" files don't specify what control characters, overstrikes, or graphics characters are allowed.

3. WG14 AND X3J11 EXPERIENCE

3.1 Background Information

WG14 and X3J11 have been using electronic media for collaborating development and exchanging documents over the past 6 years. We use E-mail and an FTP site for distribution of documents. Occasionally, documents are exchanged via diskette when (1) they are too big for E-mail, (2) they are for limited distribution.

3.1 Positive Experience

3.1.1 Formats Based Upon Purpose

Our document formats are derived from purpose and workflow rather than force-fitting a tool or format. The following document forms each correspond to a purpose.

Structural Form. The structural components of the document are revealed. For example, chapters, paragraphs, footnotes, and so on are all represented. This form is mostly used by the document author since he/she is primarily concerned with the structure and content. All other forms are derived from this form.

Conceptual Form. Concepts and other connections are represented within this form. This form is mostly used for traversing hypertext or indexes.

Text Form. The text-only portion of the document is extracted. This form is mostly for reviewing content and by full text search programs

Layout Form. The layout information is derived from the document structure, the document style, and document layout information. This form is used to control the style of the document.

Display Form. The document is rendered as an image on paper or display screen. The image should look the same on all devices that image a particular display format.

3.1.2 Workflow

The author of the document modifies the document in its source form, i.e., the structural form. The author may import other documents into the structural form. In many cases, these documents arrive in text form. In some cases, the documents arrive in conceptual form or structural form. In a few cases, the documents arrive in display form -- they have to be manually re-entered or transformed via optical character recognition software.

The author may choose to compare this version of the document with a previous version. Since we use text-based formats, any common file difference tool (e.g., POSIX "diff") can be used to determine changes made. Also, because the format is text-based, all version control systems (also known as source code control systems) can be used to maintain control of the document.

When the author decides to distribute the document, he/she may choose to distribute one or more of the forms, depending upon the needs of the recipient. Each of the other forms,

as necessary, are generated from the structural form. In some cases, several formats are generated for a particular form (e.g., generating the display forms: Postscript, HP-PCL, ASCII with control codes).

The documents and their several forms are packaged (via "tar", "PKZIP", MS-DOS filesystem), compressed (via "compress", "gzip", "PKZIP"), encoded (via "uuencode" for text-only media, e.g., E-mail), and distributed via physical media (diskette and tape) and electronic media (E-mail, FTP, HTTP, NFS, etc.). Not all formats and filters (e.g., compression, encoding) are used for all distributions: it is dependent upon the needs.

3.1.3 Formats

The following formats are in use.

3.1.3.1 Structural Form

SGML (ISO 8879) is used for the structural representation and DOCBOOK is used as the document type definition. There are many publicly available tools to access data in this form. We can export SGML to several alternate formats for the convenience of some of our users:

- NROFF/TROFF/MM (UNIX text formatting tools). The C Standard was originally in this form. There are many publicly available tools for this format.
- TEX. The C89 Rationale was in this format. There are many publicly available tools for this format.

It should be noted that these alternate formats don't contain all the information of the primary format.

3.1.3.2 Conceptual Form

HTML (hypertext markup language) is the format used for our conceptual form. SGML and HTML are very similar (HTML is a subset of SGML with a hardwired document type definition), so we can easily export to HTML. The C Standard will be converted to HTML by 1996-10 (mostly it is an indexing job, not a formatting task).

3.1.3.3 Text Form

We use a subset of ``ASCII'' (graphics, space, and newline) for the text format. In addition, hyphenation and justification are turned off but filling is enabled. When distributing text format with no encoding through E-mail, we prepend each non-blank line with space so that lines beginning with "From" are not mapped to ">From".

Actually, ASCII is not required as an encoding (which is why it was enclosed in quotes above), but the graphics

characters must be available in the local character set. All E-mail and FTP systems are able to transfer between this limited subset of ASCII and their local character set.

There are other text formats available, such as ANSI X3.64 (also known as VT100 escape sequences) and ASCII with control codes. These formats are not used for the text form because: (1) they include formatting information which is not useful (see text form purpose above), (2) they add clutter to the format, (3) not all systems support these formats.

3.1.3.4 Layout Form

We are converting our document workflow to use ISO DIS 10179.2 "Document Style Semantics and Specification Language" for specifying layout information. The conversion to DSSSL should be complete by 1996-02. At that time we will publish our evaluation of this method. We've chosen to evaluate DSSSL because: (1) it was developed by ISO, (2) there are publicly available tools.

Previously, we've used (with good results) NROFF/TROFF/MM or TEX to supply layout information. We plan on maintaining these alternate formats.

3.1.3.5 Display Form

We use Postscript as our primary display form. We require the authors to limit their fonts to the following subset: Times Roman, Times Italic, Times Bold, Times Bold Italic, Courier, Courier Bold, Courier Italic, Courier Bold Italic, Helvetica, Helvetica Italic, Helvetica Bold. These fonts exist in every Postscript printer.

We require horizontal and vertical margins to allow for printing on both A4 and 8.5x11 paper. The left and right margins must be at least one inch to allow for hole punching.

As a secondary display format, we use ASCII with the following control characters: backspace, carriage return, form feed, newline. This format is expected to be imaged on a device that:

- Uses a fixed width font. All characters (and spaces) should have the same horizontal width.
- Is at least 80 characters wide.
- Does not provide automatic newline if the 80th character is displayed.
- For page oriented devices, provides 66-line pages OR provides a scrolling feature (e.g., CRT).
- Supports the form feed character.
- Supports overstriking or a reasonable approximation when backspace or carriage return characters are used.

The choice of how newline is implemented (carriage return-line feed, or line feed) is an open issue. This hasn't been too much of a problem for our users, but should be resolved for any future JTC1 format.

Of course, using ASCII has limitations (i.e., no graphics images), but we've found it useful in our work which is mostly text-based.

3.1.4 Text-Based Formats

SGML, HTML, DSSSL, ASCII, and Postscript are all text-based formats. Although WYSIWYG (what you see is what you get) editors provide conveniences to authors and users, the fact that these editors are text-based means that the user can use any text editor to make changes to the file (in any of the formats) even if the word processing, text processing, or conversion tool doesn't provide the feature directly via WYSIWYG or the application framework. While using a text editor or other text-based tools (e.g., the POSIX commands) might require specialized knowledge to access a special feature, the tools exist to make the change. See binary formats below.

3.1.5 Statistics From Our FTP Site

X3J11 has compiled statistics on electronic documents from its own FTP site (over 1200 accesses to the documents during the past year). The electronic documents were accessed in three formats: native word processor (16% of accesses), text (41% of accesses), and Postscript (43% of accesses). Text and Postscript account for 84% of what our readers want, yet they aren't part of the JTC1 electronic document format.

A good portion of the readers that take the native word processor format also take the other two formats: text and Postscript. The text and Postscript formats should be unnecessary if the native word processor format is used, but we suspect that our readers run into the same configuration problems we've described in this critique. Taking all three formats give the reader a fallback solution if he/she has configuration problems with the word processor: getting the other formats allows the reader to access the text version (for full-text search; incorporation into E-mail and other documents) and the Postscript version (for printing and displaying).

3.2 Negative Experience

3.2.1 Lack of Methodology

We've found that focusing on the use of particular tools or formats without any purpose causes many problems when producing documents. The lack of any workflow or methodology means that it is impossible to determine if a

tool is useful because its purpose is undefined.

A common mistake is that people believe that the format implies its purpose. For example, ASCII can be used as a structural form (for tiny documents), a text form (for full text search), or a display form (for printing). Thus, when someone sees an ASCII file they believe they know what to do with it, but this isn't so. For example, ASCII as a text format might not be suitable for printing (display form) because the text lines might exceed 80 characters per line and there might not be appropriate margins. Similarly, ASCII as a display format might not be suitable for text search because of hyphenation, justification, or extraneous information (e.g., page headers and footers).

Another example of this is using Rich Text Format: is it structural, layout, text, or display? The configuration issues compound this because even if you stick to a single form (i.e., purpose) you may get different results depending upon your configuration.

3.2.2 Word Processors

3.2.2.1 Wordperfect

The following are some of the problems found with this word processor:

- The selection of Wordperfect, system, Adobe type manager, or printer fonts all caused widely varying outputs.
- There are compatibility problems between Wordperfect 5.1 and Wordperfect 6.0 even when both are using the 5.1 file format.
- Wordperfect 6.0 files don't work on Wordperfect 5.1.
- Wordperfect for Windows produces different output than Wordperfect for DOS.

3.2.2.2 Microsoft Word

The following are some of the problems found with this word processor:

- There are compatibility problems between the version 2.0 and version 6.0 file formats.
- Version 6.0 behaves and prints differently when running under MS-DOS 6.2 (Windows 3.1) versus Windows NT 3.5.
- The MS-DOS version has incompatibilities with the Macintosh version.

3.2.2.3 Ventura Publisher

There are few people that use this format. Although this format is text-based, there are very few publicly available

tools for accessing this format.

3.2.2.4 Other

We have had very few requests for interoperability with other word processing (Ami Pro, Atex, Wordstar, XyWrite, Wang, etc.), text processing (Framemaker, RUNOFF, BOOKMASTER, GML), and other (Microsoft Write, Microsoft Help) systems. We don't plan on investigating these systems since there is little interest.

3.2.3 Text Formatting Tools

3.2.3.1 NROFF/TROFF/MM

While this format has served the committee well in the past (the Standard was in this form), there is no effort to standardize this format. With respect to document structure, SGML format is a superset of this format. The DOCBOOK document type definition provides all the necessary features that MM provided for us. We are investigating DSSSL for layout information.

3.2.3.2 TEX

This format was used for our Rationale in ANSI X3.159-1989. Like NROFF/TROFF, there is no effort to standardize this format. SGML, DOCBOOK, and DSSSL all provide the same improvements over TEX.

3.2.4 Document Tools

3.2.4.1 Adobe PDF

We evaluated Adobe PDF as a possible alternative when we were investigating electronic document formats. This format is impractical because:

- It is a proprietary, binary format.
- It provides that same functionality as Postscript with a completely incompatible syntax.
- There are no publicly available tools (including source code) to access this format.
- This is an "all-in-one" format: it contains the conceptual, structure, layout, text, and display forms.
- Unfortunately, there is no method of exporting to a single form, e.g., structural-only format (because you want to edit or access the document source).
- Incompatibility with virtually all existing word processing and text processing tools.
- The configuration issues are the same as for the word processors.

3.2.5 Other Formats

3.2.5.1 ANSI X3.64

This format might be useful as a display format, but the following problems exist:

- Widely varying levels of conformance to this standard.
- Few implementations for paper imaging devices.
- No support for graphics.

3.2.5.2 ISO 10646-1

This format might be useful as a text format. However, there is very little support yet in tools, compilers, operating systems, and hardware.

3.2.5.3 HP-PCL

HP-PCL is the format used on HP LaserJet and compatible printers. While there is much success with this format, we use it infrequently because:

- Most people have printers that print Postscript or a tool that converts Postscript to their native printer.
- HP-PCL is a binary format. It isn't suitable to sending via E-mail (would need text-to-binary encoding) and not all printers support this (e.g., Apple Laserwriter).
- We haven't had many requests for this.

3.2.5.4 Binary Formats

With binary formats, the tools don't exist if the word processor doesn't provide them. Not only is it difficult to access the feature (you have to know the binary format and write a custom tool from scratch), but with most binary formats the scope of the change isn't always local, e.g., inserting an extra couple bytes in the middle of a binary file is likely to corrupt the file. In summary, not only is the user lacking the tools, but it is difficult to do, the formats aren't well known, and it is dangerous (easily corrupts the file). Binary formats don't allow you to work around deficiencies in the tools that access the binary format. See text-based formats above.

3.3 Neutral Experience

3.3.1 Rich Text Format

Because of the interest in viewing the documents on commonly available word processors, we are investigating providing Rich Text Format as an alternate text form. It is important to note that the primary purpose of this format is to provide another text format. This format is NOT intended for displaying the image of the document, i.e., the word

processor would not function as a transformation to display form. This format is NOT intended for the usual word processing function: providing layout information.

We don't have enough experience yet to offer an opinion.

3.3.2 Layout Conventions

There is no commonality among authors in certain layout conventions:

- Location of page number.
- Location and format of document number.
- Location and format of document title.
- Location and placement of other identifying information, authors name, title, E-mail address, telephone, fax number.

While this has been established for standards in Directives 3, there is no commonality for correspondence and other document styles. The MM macro package for UNIX supported several document styles (letter, company correspondence, memorandum, paper, etc.). We have yet to investigate these styles within WG14 and X3J11.

3.4 Summary

Overall, the experience in WG14 and X3J11 has been positive. The use of electronic documents has greatly improved the productivity of the committee. The following have been some of the benefits:

- Incorporation and integration of documents from many sources (importing).
- Distribution of documents for incorporation for external purposes (exporting).
- Worldwide distribution within hours of submission.
- Distribution of certain documents to the user community via FTP (currently) and HTML (soon).
- Quick feedback on certain issues.
- Continuity of participation between meetings.
- Prioritizing discussion. Discussion that requires high interactivity (e.g., face-to-face) is scheduled for meetings while low interactivity (e.g., document reviews and discussions) are scheduled between meetings.
- Electronic balloting (we are experimenting with this now in X3J11).
- Higher quality analysis and response to defect reports because many people (not just the project editor) can work independently with a common, easy-to-use format.

We have established an E-mail reflector to discuss electronic document issues with respect to standards work. To subscribe, send E-mail to:

contra-mundum-doc-request@farance.com

To post a message, send to the reflector:

contra-mundum-doc@farance.com

The reflector is not specific to WG14 or X3J11 activities.

4. SUGGESTIONS

We recommend the following to improve the JTC1 electronic document format:

- Solicit input from affected users. This includes: working groups, project editors, national body delegations, and national body members.
- Ballot among affected users.
- Develop a workflow process.
- Develop purposes for each step in the workflow.
- Develop a format for each ``flow'' between the processes of the workflow.
- Try to minimize the number of formats acceptable for each ``flow''.
- When possible, use or adapt standards.
- If other conventions are required, minimize the number of features supported (e.g., the minimum fonts in Postscript) so the interoperability is maximized.
- When possible, use text-based formats over binary formats.
- Develop and test system configurations for evaluating these.
- Publish E-mail addresses, telephone, and/or fax numbers for people to call when they are having a problem.
- Set up an E-mail reflector to publish the development of electronic document procedures.

In closing, we believe much more discussion, testing, public review, and balloting are required before JTC1's scheme becomes practical.