Applying Hypertext to Managing Versions of a Standard

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Abstract

The process of configuration management of a standard's document has traditionally been paper intensive, and has suffered from the reduction in staff-hours available to process required forms. Hypertext document files have been developed to automate this process and are now being utilized for managing the document configuration management process for the Initial Graphics Exchange Specification from the raising of issues to the integration of fully approved changes. The hypertext document files take advantage of the interactive information deployment capability offered by computer databases, and the document navigation capability of hypertext. Both capabilities contribute to the quality of the standard, making the standard document and its comments visible to committee people through on-line editing and computer projection during editing. The hypertext set enables the standard to be maintained in electronic form while fulfilling all requirements for paper documented accountability and traceability records. The configuration management process includes provisions for the use of e-mail where it is available to authors and reviewers.

1   INTRODUCTION

An experimental hypertext[1] authoring application was developed as an interactive tool for managing the process of change to a standard being evolved by a voluntary standards organization. Hypertext offered the ability to use a computer with an overhead screen projector in meetings for the change process forms, and the ability to rapidly review related information facilitated with the hypertext features.

The process of configuration management for an evolving standard has a number of concurrent processes, and involves interaction among a number of standard's Project members. The process is developed to control the evolution of the Project's standard and to document the evolution "history" information. The Initial Graphics Exchange Specification (IGES) Project organization adopted the process of configuration management used by one of the member companies in 1980. Since then, the IGES document has evolved through some five major versions, and the configuration management process has been effective in providing the appropriate level of development control. The process has many steps consisting of reviews, sign-offs, and quality and impact assessments. All technical changes to every version are documented.

During the meetings in 1992 several new forms were introduced to capture more of the dispositions information about each proposed change and the ballot comments. The addition of these new forms placed a burden on the technical committees of the organization, reducing their ability to respond in a timely manner. A tool was needed to reduce the time needed to gather and make available the information while increasing the accuracy and content, particularly for the new forms.

The opportunity for technology transfer was also a facet of the application development, as the organization in which IGES is managed has several hundred members largely from the computer aided design departments of industries. The results of developing a hypertext configuration management tool could be individually evaluated and technology and files applied as appropriate to improve the deployment of information in the individual's company. Finally, in the event the organization wished to abandon the "in-vitro" experimental change management review process, the information in the hypertext application could be readily "exported" into a replacement application.

Several questions could not be answered without the development and use of a prototype hypertext configuration management system:

1) Could the new forms be employed without increasing the man-hours spent on configuration management for IGES?

2) Would the availability of a hypertext file of change documents benefit the IGES Project members?

3) Would the new (to IGES Project configuration management) hypertext paradigm facilitate or disrupt the capture of review dispositions?

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[1]The concepts of hypertext and its use in computer material such as books, presentations, and multimedia abound in current literature. References 7–9 offer more detailed technical discussions of uses related to this paper.

4) Could the paradigm be coupled to electronic mail (e-mail) information exchange and file server facilities?

And most importantly,

5) Would the use of displayed, interactive hypertext configuration management information significantly increase the ability of the project review meetings to "manage by fact"[2]?

The following section describes the existing process and its related forms. Also in the section is the text format of the change proposals as they exist outside of the hypertext implementation. Section 3 describes the experimental hypertext files introduced to the configuration management process. Section 4 describes the deployment of the hypertext files, and in Section 5 the preliminary findings are described along with possible directions for furthering this work.

1.1   The Standard's Document and Files Under Configuration Management

The use of the system in creating and modifying a standard document is described below. The opportunity for employing hypertext resides in managing the process, and as a means of quickly moving to the information needed for making decisions. The hypertext described in section 3 must be kept closely coupled to the text system.

The Initial Graphics Exchange Specification (IGES) [1] is an American National Standards Institute (ANSI) neutral data standard format widely used for exchanging product models originated on a computer graphics system. The standard has been clarified and extended since its inception in 1980 [2]. During the past 12 years the document has grown from about 60 pages to over 700, with an attendant difficulty in managing changes to the technical content [3]. It now includes many illustrations which have all been submitted following the guidelines (subset) for drawings in IGES format.

The standard is written and maintained in the LATEX [5] text markup language. The language is an extension of TEX [6] which adds macro capability. Macros are employed extensively for consistency and ease of editing to the IGES document source files. The change to the markup language (in 1986) removed the barrier of requiring a proprietary word processing application for authoring material for the standard.

All changes and additions to the LATEX files and the succeeding versions of the document follow a rigorous review, ballot, and resolution process. The change process includes the authoring of Request for Change (RFC) papers written in LATEX. Figure 1 is an example of such an RFC.

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[2]The "manage by fact" discipline referred to is one of the core values and concepts described in the "1993 Award Criteria, Malcolm Baldrige Quality Award." It is used throughout industry to to achieve operational performance and quality goals by striving to make process decisions based on reliable information, data, and analysis.

<div style="border:1px solid">

IGES

Pg _1_ of _2_

REQUEST FOR CHANGE

Name		Date		Serial No.	
Dennette A. Harrod, Jr.		01 Apr 91		⌐xxF	

Mailing Address	Change Type	Revisions			
		Ltr	Date	Author	Disoosition
WIZ WORX 83 Parkhurst Rd., Suite 166 Chelmsford, MA 01824	☐ Error Correction		.		
	☐ Clarification				
	☐ RRC Approval				
	Chair Signature				
Phone (508) 441-3129	Date				

Title

Title: UNITS CONSTANT GLOBAL

Description of Problem

Parameter 15 of the Global Section does not include units that are commonly used by some applications, such as AEC (surveying, naval construction) and FEM. Some of these units were added to IGES Version 5.0 by the FEM Committee for support of the Units Data Entity (Type 316) by ECO 528 (RFC 390). (See page 530 in Version 5.0)

Solution(s) Proposed

In IGES Version 5.0, on page 15, add the following to the table in 2.2.4.2.15

1

</div>

Figure 1. Example RFC

When fully approved, the RFC is in a format which has been integrated with the standard's files. The pages affected by the change to the standard are then printed so that all final ballot information can then be evaluated in context. In the following sections the change process is described only as a background for the supporting information system.

2   Elements of Configuration Control

The change process [3] begins with the recognition of need and follows the engineering change process employed by defense contractors following initial product design release. Each part of the process adheres to a proscribed review and approval cycle to assure due process and to minimize errors. The following is a summary of the cycle as a context for discussing the information management of the changes:

2.1   Issue

An issue is the non-formal (i.e., not part of the formal change process) recognition of a need for developing a clarification or extension to the standard. Issues arise as implementations of the standard are created, when identifying conflicts between different implementations, or as new capabilities in computer aided design (CAD) systems are accommodated. Issues are also documented during the ANSI ballot process for the standard.

Issues are usually raised and discussed in technical committee meetings. Where there is general agreement on the need for a change, a member is assigned to author an RFC. An issue may also be written as an RFC without committee discussion where the author is quite familiar with both the standard and the processing of similar changes.

2.2   Request for Change

An RFC is the formal document which discloses both the problem and possible solutions. A single solution is developed with technical committee consensus during the organization's "engineering" work on the RFC. Following an "oversight review," the RFC may then be sent out for mail ballot. During the process the RFC document will evolve from a paper draft to a LaTeX file with a specified appearance and set of entries. Completing the evolution includes the integration of the RFC content with the appropriate sections of the standard. Those sections of the standard are printed and the integrated text checked for consistency.

2.3   Cover Sheets

A "cover sheet" was developed [4] for recording actions on each RFC during its review and approval cycle. The cover sheet is originated by the configuration control manager and sent to the RFC's assigned "custodian committee." Figure 2 (a and b) is the front and back of an example cover sheet.

IGES
Request for Change (RFC) Cover Sheet

date printed
12/14/92

Receipt of the Proposed RFC by the Change Control Secretary:

RFC number

666

ECO number

Date the Proposed RFC was received: 4/1/88

Entity type [   ]   Entity form [   ]

RFC Title: GLOBAL PARAMETER 15 - UNITS

Name   Dennette A Harrod, Jr.
Company   Wiz Worx
Address   60 Thoreau Street, Suite 320
            Concord, MA 01742
Phone
FAX
EMAIL

Electronic form of the RFC Received? [X] Yes [ ] No   Integrated? [ ] Yes [ ] No

IGES Project Committee Coordination:

Date the Proposed RFC first considered: _____

Gray Page Testing Required? [ ] Yes [X] No

Custodian Committee: Drafting _____

Joint Interest Committees: _____

Comment or Recommendation to the Custodian Committee:

_____
_____

(Optional) For Extension RFCs, identification of 2 or more systems having
a similar entity or capability:

_____
_____

Signatures (required) for ECO to be merged into IGES document files:

_____   _____
Custodian Committee Chair   IGES Editor

_____
IGES Project Chair

Figure 2a. Example RFC Cover Sheet (Front)

IGES
Request for Change (RFC) Cover Sheet; Actions ⟨666⟩

Custodian Committee Coordination & Editorial Review:

7/20/92; Open for discussion

IGES Project Committee Oversight Review:

Figure 2b. Example RFC Cover Sheet (Back)

The committee chair records all actions to the RFC during committee meetings on the cover sheet. The cover sheet is also used to record the actions of an "oversight review" committee. The cover sheet finally serves to record the signatures required for the completed and ballot-ready RFC.

2.4   Ballot

Following an *approval to ballot* disposition by the oversight committee, RFCs are gathered into a ballot package each quarter and mailed to the voting membership. The vote returned may be *approve, approve with comment, disapprove with comment, or abstain.* The vote results are tallied, and the comments are gathered for each RFC.

2.5   Comment Resolution

The comments are numbered, printed (see figure 3), and distributed to the appropriate technical committee for resolution.

Figure 3. The Ballot Comment Distribution Form

Hypertext Process Overview, Version 1.1

The IGES Project Committee meets at the discretion of the IGES Project Manager with RFC disposition as one of the items of business. The RFCs may need disposition regarding assignment of custodian committee, joint action committee(s), Gray Pages testing, approval for ballot, Editor's disposition, ballot review, or ballot comment resolution. An example of IGES Project Committee dispositions recorded on the Cover Sheet is:

7/22/92: OPEN; assigned to custodian committee. Electronic form requested.
10/21/92; Accepted for ballot condition to completing editing changes.

(To browse the Cover Sheet database, click on the "RFC Covers" button on the first card)

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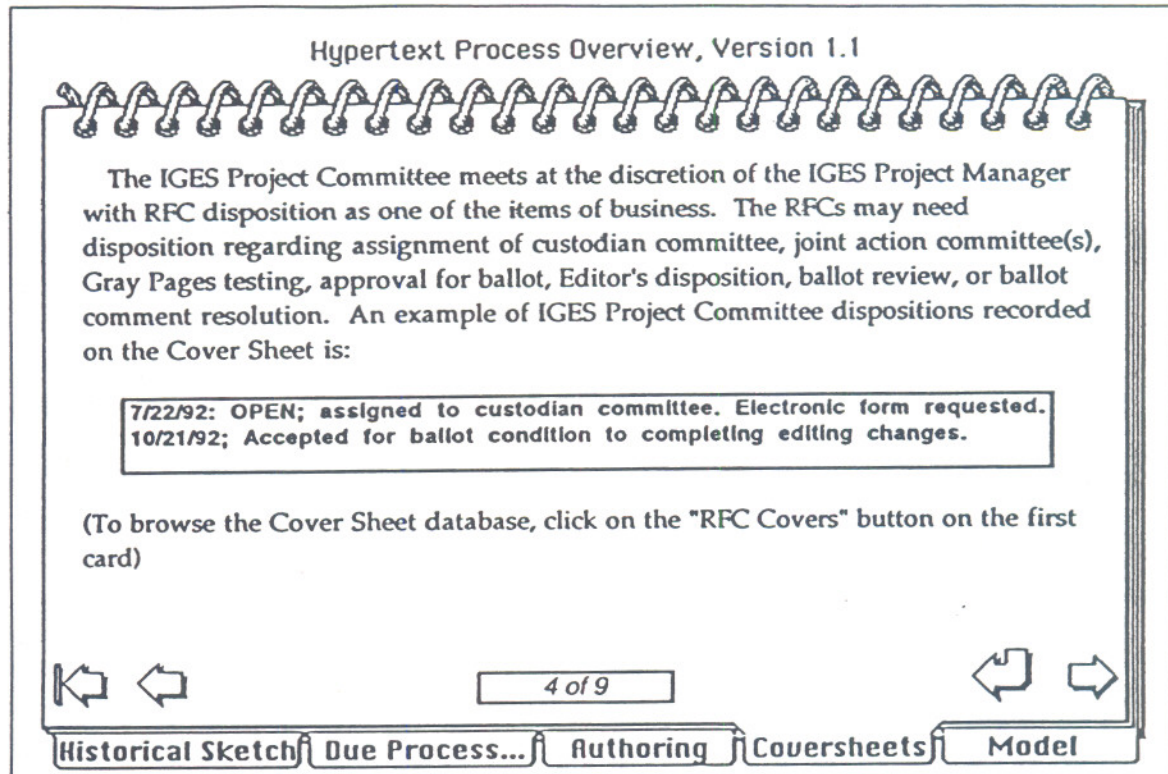Historical Sketch | Due Process... | Authoring | Coversheets | Model

Figure 4. Example "Page" of the Hypertext RFC Process File

The change process description in turn links to a structured activity model. The model diagrams the functions performed during the change process in a series of increasingly detailed, hierarchical views. The form and look of the model follows the Integrated Computer Aided Methods Definition (IDEF) format. The addition of hypertext makes the series of views accessible in a true hierarchical order. An additional file described below follows the IDEF "Reader - Author" cycle requirements.

From each sheet of the decomposition a comment log file can be accessed. The reader's name is requested and inserted in the comment record. The date is automatically inserted. The reviewer is then given a text field to record comments on the decomposition or the change description. A done button returns the reviewer to either the decomposition or the change process description. The comment file can be separately retrieved at the conclusion of the IGES meetings or sent on disk by other readers of the documents.

3.3   The E-mail Input and Archive System

An additional facility for employing electronic mail (e-mail) using Internet has been added to the RFC system. Authors who have access to e-mail can transmit their documents to change control for logging into the review process. When received, the e-mail facility forwards a copy to the IGES Editor, the change control secretary, and an archive copy to the EEEL server. The e-mail system uses active software scripts and does not require operator interaction.

3.4 The Audit Trail

The hypertext system was designed to augment and produce paper-based change control documents. All documents are distributed for appropriate organization action, and copies are filed by the change control person in RFC serial number order.

Both the cover sheet and comment resolution files are additionally designed to produce tab-delimited database exchange text output files. The files are stored using a data archive output, insuring that the material is always available to be read into another database or a word processor.

4 Interactive System Description

Part of the consideration given to the characteristics of the hypertext files was the need to have the information available for both a browsing use and to be deployed in an information-gathering use. These uses are described below.

4.1 Information On-line during Meetings

During the oversight meetings the cover sheet file is projected using a viewgraph panel attached to a portable computer. As each RFC is reviewed, the appropriate cover sheet record is found and displayed. The technical committee action can be viewed, and the oversight disposition is typed in and observed by people in attendance before moving on to the next RFC. The ability to observe the text when entered has reduced the time needed following meetings to capture, then proof each disposition.

The comment resolution form was also designed to look like, and produce, a printed form, one half page in size. This hypertext form, like the cover sheet, contains a number of $\boxed{\text{X}}$ (check box) selections. When one of a pair of the boxes is activated an X appears, and its counterpart is set to blank.

4.2 Output of Documents for Committee Use

As mentioned previously, the cover sheet and comment resolution files were designed to both look like and produce a printed form. The forms are distributed to the appropriate technical committee for use during meetings. Information on the committee's disposition is entered into the appropriate file when copies of the sheets are sent to change control. It should be noted that the dispositions are only a short sentence each and are dated.

4.3 Current Change Process Information Browsing During Meetings

The hypertext file set is installed on one of the computers available to the organization for the meeting. Immediately after the oversight meetings the updated cover sheet files are copied into the computer to insure the reviewers will find current dispositions on any

in-work RFC. This copy, and others of the information system, are for attendees use in checking the change work in process.

5   Conclusions

The number of hypertext structures have proliferated [7], largely due to their ease of developing customized files. The appearance of material in hypertext also benefits from the availability of a computer application which is widely distributed, easy to use, and accessible. In addition to functioning as a database, the hypertext paradigm has also been developed [8] as an interface to databases. Most of the hypertext products are easy to use and of interest to many containing information ranging from encyclopedias to symphony descriptions.

The use of the hypertext in a dynamic environment has opened new areas on the utility, timeliness, and quality of information. The hypertext system for change control of a standards document has reduced meeting follow-up work, including printing the sheets with new material and mailing as appropriate. The change control task has been eased by not having to bring a large collection of change documents to meetings. Lastly, the meeting attendees have available a great deal more historic and current information. The files are also available to be copied for review between meetings.

The hypertext files are only a step in achieving goals of reduced labor and improved quality. Many of the lessons learned during the deployment of this implementation can be applied to the use of computer group-ware and computer conferencing as applications become widely available. Two rules are valuable here: Learning the fruitful use of a technology is as important as the technology itself, and the records kept must exist in a usable form long after the medium and application is obsolete.

6   Acknowledgements

7. REFERENCES

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