

User Network Interface To Everything

Task Force on 'Total Solution User Interface'

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Part of this report summarises electronic mail exchanges between members of the RARE WG-ISUS task force on 'total solution user interface' (UNITE) during the period November 1992–January 1993. The purpose of such discussion was to identify and agree elements of an ideal user network interface. Comments on both the description of a desirable interface and a forward plan for the UNITE group are now invited from a wider audience.

Preamble

A means to access information from almost 'anywhere' is what is usually meant by a network user interface today. A matrix of multifarious information servers now exists across networks which, once the domain of academics, are fast becoming the meeting place for all types of enterprise.

To be effective, the advances of information systems must be harnessed in an appropriate user interface. The whole process of reaping useful data from network resources must be straightforward, otherwise the majority of network users will not be interested. Furthermore, a 'good' interface provides the user with a degree of independence from support staff and there is less (or no) need for user training—everyone benefits.

However, in addition to its own design, the success of the interface relies on the quality of information being accessed and the capabilities of server engines. Projects which seek to improve the classification of pertinent information, or establish common retrieval methods, or realise similar objectives, all influence the potential of the interface. Any attempt to specify that interface should be informed by these other developments.

At present the user has at their disposal a mishmash of client programs, for various platforms, which access diverse information servers in different ways. Some of these individual user agents are commendable interfaces to particular sources. However to approach the information age in an orderly fashion we require total solution interfaces which support transparent access to all available information from a familiar working environment.

Developments

Before proceeding with discussion of the interface proper, this section briefly outlines some of the many contemporary developments or specific projects involved with networked information. These will contribute to what is expected of a total solution interface.

Resource guides: once, not so long ago, there was primarily the NSF Network Service Centre's Internet Resources Guide, a large manual describing the major Internet services. Today there is a plethora of guides, written for both the naive and experienced, available via ftp on the network or published books. Software based guides, such as Hytelnet or the original Archie, have served us well and are now being subsumed by the profusion of server/client systems such as World Wide Web (WWW), Wide Area Information Server (WAIS), Gopher, and others which add to these basic models. Special servers, such as the directory of servers for WAIS, or Veronica for Gopher, improve the likelihood of successful resource discovery.

Topnode is a project initiated by the Coalition for Networked Information (CNI) and led by Indiana University and Merit Network Incorporated. The aim is to produce a directory of directories of network information sources that will ultimately be usable by different information retrieval technologies.¹

Universal Resource Locators: well progressed recommendations have been made by Tim Berners-Lee² and others for a generic syntax and specific forms to identify objects that are accessible using a wide range of Internet protocols.

Internet Anonymous File Archives: work has been carried out in an Internet Engineering Task Force (IETF) working group³ to establish a framework for additional information (e.g. descriptions of special datasets, abstracts of documents) which could be provided at a site to enhance the functionality of the archive. Mention has also been made of Uniform Resource Identifiers.

Essence is a resource discovery system which has been developed at the University of Colorado. Different file formats, such as uuencoded, compressed, tar, or postscript can be deciphered to produce summaries which are then indexed for a WAIS server. Its usefulness has been demonstrated with anonymous ftp archives; a user can browse files of possible interest before downloading them.⁴

Z39.50-92: the National Science Foundation funded Clearinghouse for Networked Information Discovery and Retrieval (CNIDR)⁵ is acting as a focus for the further development of the public domain version of WAIS. A new enhanced server is planned which will retain full compatibility with existing clients and indexes and support new features such as boolean searches, thesaurus based synonym substitution, stemming, and more. Many such enhancements have already been introduced as modifications to particular servers; these include support for multi-type documents.

The RARE working group for Interactive Multimedia (WG-IMM) are at present inviting project proposals on the theme of desktop access to remote multimedia information.⁶

A recent newspaper article⁷ describes how teenage workers are currently employed at a particular library to slit open book bindings and rip the pages out for computer scanning; all such electronic versions are then accessible to anyone with a networked computer and valid library password. This may be a rather radical way to embrace technology; however many other libraries have been involved in computerisation projects which go well beyond the usual on-line public access catalogue (OPAC) setup. Recently Online Computer Library Centre, Incorporated (OCLC) has announced Internet access to its repository of bibliographic data⁸ and produced a comprehensive research report entitled 'Assessing Information on the Internet: Toward Providing Library Services for Computer Mediated Communication'.⁹

Irish universities are currently involved in a Telematique sponsored project to link libraries over the academic network using the Z39.50 protocol. This involves collaboration with major library computer system vendors.

Project Mercury at Carnegie Mellon University, the 'Library of the Future' at Tilburg University, are examples where journal articles and abstracts are made available in electronic form. The Colorado Association of Research Libraries (CARL) also maintains a database of such articles but there is a cost for retrieval of the texts.

A recent report¹⁰ suggests that electronic-only journals are becoming popular. Many are calling for more concerted effort in this area and argue that there should be a professionally controlled electronic journal structure.¹¹

Plain text is still the most common format for exchange on networks but there is much interest in formats which preserve more structure, visually, as with postscript, and in the text body also, as with TEX or SGML. A recent development of interest in this area is Adobe's new portable document format (PDF) which maintains original layout, irrespective of what fonts are available on the receiving machine, and includes hypertext links, annotations and thumbnail views.¹²

The Elsevier Science Publishing company, with its subsidiary Pergamon, is reputed to be the world's largest commercial publisher of scientific and technical data and has embarked on a project known as Tulip. This will provide a set of current journals in electronic image format for trial at leading university libraries.

An ambitious project to produce an all purpose Internet interface is underway at Cranfield.¹³ This will consist of a 'human interface' on the desktop machine which links to a 'world interface' on a larger central machine and provides the user with 'intelligent' subject search facilities.

User Interface

This section discusses an ideal interface by considering: what functions it should enable a user to engage; how these functions should be combined in a single interface; what relationship the single interface should have to the rest of the computing environment; and what emerging technologies may make the resulting information environment more effective.

Functions

In defining an interface it is first necessary to specify what existing functions or services the interface must support. In the following it is generally assumed that the network station is a PC, Macintosh or other personal workstation rather than a dumb terminal. However with the advent of more sophisticated terminals, including X-terminals, and the emergence of advanced computing environments, such as Athena, the distinction between a 'dumb' and 'intelligent' terminal is blurring. Nevertheless, a network interface will not be a total solution unless it supports at least the equivalent of the following widely used functions.

Basic communications for connection to remote machines for login or file transfer (i.e. telnet and ftp capability). Domain name servers should be used when available and configuration of the interface with network parameters should be simplified (or even automated) by the use of a bootp server or something similar. This avoids user frustration over details which they don't need to struggle with and makes distribution of the interface easy within an organisation. A list of alias names for popular telnet and ftp sites should be readily available and customisable so that most connections can be initiated by simple selection from the list. Databases for which the user has access privilege can be included in such a list. User definable macros should be possible so that scripts for lengthy login sequences etc. can be prepared and effected with a single keypress.

Easy to use electronic mail for exchanging messages with other network users. Logging on to a central machine just to use email should not be necessary. Messages should be manipulated using familiar screen based editing facilities. Lists of aliases for regular correspondents, including popular discussion lists, should be available and easily customised. Message management should include hierarchies of user defined mailboxes, keyword find utilities, and sorting by message header information. File attachment to messages is also desirable.

In addition to email discussion lists, bulletin boards present an opportunity for participation in electronic forums. A recent article¹⁴ had this to say about Usenet News: "I posted a query to the newsgroup and within two days I had more information and invaluable tales of experience than I could have possibly gathered in six to eight weeks of intensive research". Easy access to such bulletin board systems is a valuable asset and should be part of the network interface. Customisation to highlight sections of interest to the user should be included.

Networked Information Retrieval (NIR) tools such as WAIS, Gopher, and WWW clients should be included so that the user can benefit from the public availability of such servers. Associated aids for resource discovery on the wider network (e.g. Veronica, Topnode) should be prominent or, if possible, employed transparently to

relieve the user of tedious searches. The software should be able to decipher unique resource identifiers so that duplicate information is not retrieved. Facilities should be present for constructing boolean search criteria for appropriate servers. It is desirable that multimedia information is accessible in the same manner as plain text. Default and customisable bookmark lists of pointers to specific repositories of interest should be available.

Access to Archie servers, to determine the location of a particular archive file, or whois type databases, to retrieve details such as the email address of a particular person, is possible using ordinary telnet links. However for such directory lookup applications it may be possible to use NIR tools, or employ specific user agents, e.g. an Archie client using the Prospero protocol. Whatever method is used, this service should be clearly presented by the interface.

Some will also argue that access to Multi-User Dimension (MUD) type environments is important, that these hold great possibilities for the exploration of information collections where object semantics can be preserved allowing the user to maintain a context of interest throughout their 'adventure'.¹⁵ Working links to Gopher and email systems have already been established from MUD environments.

United

A single interface should provide a layer of user interaction above the normal input/output idiosyncrasies of constituent functions. The user shouldn't have to be aware that they are using a particular tool. Ideally all the functions would be written as modules for the interface framework using an appropriate application programmers interface (API).

Some may argue that this is already being done using a standard graphical user interface system, such as Microsoft Windows or Macintosh Finder, as the framework. However, although this may provide flexibility by allowing the user to pick and choose what network programs they run, the separate applications and different modes of working lead to user confusion and also demand disproportionate machine resources (and of course there's packet driver problems on a PC). The ideal framework will harness all the low level capability of existing independent programs and present this rich functionality to the user in a coherent manner.

So, for example, the user should be able to select different object types which map to the supported functions. Each object type would have properties corresponding to the associated user activity. One such object type might be an interactive session which would include as properties a network address to connect with and a screen window; another object type could be a subject keyword search, the properties of which included the keywords to be found, appropriate sources based on some internal processing of those keywords, and characteristic screen windows for user navigation through levels of information returned from the network.

With all functions subjected to one master interface process, all tools appropriate to any particular task could be automatically invoked. Therefore, in subject specific searches a user could be presented with the equivalent of WAIS sources for further keyword searching and a list of Gopher servers for exploratory browsing, at the same time. This is a small step toward being able to request all information on one topic. It is foreseeable that the interface could include 'intelligent' search algorithms which would generate lists from which the user could select to narrow a search.

A further benefit of one interface would be consistent on-line help. Although every attempt should be made to make the interface as intuitive as possible, it would not be complete without context sensitive help and overview information of all its capabilities.

User preferences would also pervade all relevant functions: an example could be limiting network hunts to particular geographic regions. Although transparent use of local and wide area networks should be the default, there could be circumstances in which it was desirable to only use local, or national resources.

One interface also allows the possibility of more meaningful management of information. References to email messages, archive files, server documents, databases (and associated queries), newsgroup pointers, could all be stored together, perhaps in a simple database structure with user specified labels and rudimentary sorting. Such references could then be transparently resolved any time the user chooses.

Some progress toward the unification of common network programs has been made. We already have WAIS and WWW accessible through Gopher, WAIS and Gopher via WWW and so on. The whole Archie database has been indexed for use by WAIS. Normal ftp is possible using the NIR tools. Telnet sessions can be initiated from Gopher. All the resource pointers in Hytelnet have been incorporated into a WWW document giving the same functionality as the original free standing program. This may be the start of the evolutionary path to the desired single interface; it may also indicate that several different single interfaces may emerge; the user will benefit from either outcome.

Integrated

It is important to remember that the network interface is not an end unto itself. Most people do not just want a total solution network interface but the ultimate working environment. To be most effective then, the network interface should seamlessly complement the ordinary everyday jobs that people do with their desktop computers. Ideally the network interface will not be another application but an extension of the operating system which is always available and can interwork with every other application.

Thus it should be possible to click on a keyword in a document, which is being edited with a word processor, and obtain additional information from elsewhere on the network as an accepted matter of course. Similarly a passage of text in any screen window could be selected and mailed to a destination of choice by simply selecting to use the email facility. Any selection within the working environment would automatically become a meaningful parameter (property) for a chosen network interface function (object type).

If a simple database of references to different types of information or files available on the network was part of the network interface then this could be available to all applications, perhaps something like a specialised sophisticated scrapbook facility. Items in such a personal 'information reference repository' (IRR) could be included in other applications in two ways: either the reference itself (a simple text tag which could be resolved at a later stage by the operating system), or the resolution of the reference (text of a document or email message, picture from an archive site, QuickTime movie, sound, or whatever else the user has defined). And of course the IRR could be added to from other applications to include drawings, project plans, spreadsheets etc. produced by the user.

A facility should be available to allow users to nominate preferred applications to be associated with particular types of information, much the same as Hyperwais or Xwais does at present.

Technologies

One portrayal of an apparently total solution information environment is given in a video which Apple produced in 1988 entitled 'Future Shock'.¹⁶ To many this may seem like pure science fiction. Special wristbands are used to enable interaction with screen displays on a notebook computer using simple hand movements. The computer recognises and acts on the user's natural speech allowing, amongst other benefits, dictation to replace typing. The computer 'talks' back to the user. Email is full voice and video, and pops up in a window on the screen if the user chooses to acknowledge it, otherwise the message is retained for later. The computer is presented as a super efficient secretary and the user interface has become more of a human interface; interaction is essentially as it would be with another human. Of particular interest

here is the behind-the-scenes information management within the computer; the user asks for all information links on a certain topic and is presented with all relevant documents, video snippets, correspondents, which they can choose to read, view or contact respectively.

The special BBC production 'Hyperland'¹⁷ is a slightly more credible documentary based on similar ideas. There is a strong metaphor of the user agent (personified by actor Tom Baker) inside the computer, managing vast amounts of information and presenting what the user requests together with links to related information. All of the information is multimedia, usually video with sound. Reference is made to Ted Nelson's Xanadu project, to make all information everywhere accessible on a computer.

In the real world of today some steps are being taken to approach these visions of the future. Apple have already publicly demonstrated their Newton technology which is described as "a turning point—it will enable machines to be more than just tools; they can be assistants—they can watch what you're doing and take the initiative to help you".¹⁸ The same company have demonstrated the speech recognition prototype codenamed Casper.

Much of the success of current graphical user interfaces is attributed to the use of real world metaphors, the desktop, folders, trash and so on. A total solution network interface should eventually be subsumed in a general user interface which contains powerful metaphorical features for improved information management.

An example of such a scheme is given by Xerox Palo Alto Research Centre's ROOMS interface, in which a group of windows and functions related to a specific task or topic are collected together in a 'room'.¹⁹ One component of the interface is the Information Visualiser, which presents large amounts of information in a three dimensional structure on the screen, giving the information depth as well as height and width.

The Apple spin off company, General Magic, has recently released information about its planned personal intelligent communicator. The communications applications platform to be used (Magic Cap) will have an interface which "resembles an animated mall, with doors and avenues that lead to services such as email, fax and on-line information".²⁰

Voice mail, video mail, speech recognition, the seamless combination of multimedia material, virtual reality aspects of the interface—all of these technical advances have a part to play in making the information environment more intuitive.

George Munroe, February 1993

¹ For an overview of Topnode, see the email posting from Peter Percival, 13 November 1992, to several discussion lists including pacs-l@uhupvm1.bitnet.

² See file /pub/www/doc/udi3.ps at info.cern.ch.

³ Reports in /pub/iafa at archives.cc.mcgill.ca.

⁴ Documents are available in /pub/cs/distribs/essence at ftp.cs.colorado.edu; a prototype server is running and can be accessed on the Internet.

⁵ Jim Fullton, fullton@concert.net, is the CNIDR technical manager.

⁶ It is hoped that a report addressing this issue and outlining further development work will be presented to the working group during their meeting at the Joint European Networking Conference in May 1993.

⁷ Wall Street Journal, February 8 1993, page B6; the article describes the computerisation project at the Chicago-Kent School of Law at Illinois Institute of Technology.

⁸ See Public-Access Computer Systems News, volume 4, number 1 (1993).

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- ⁹ Report OCLC/OR/RR-93/1, available in postscript form via ftp from zeus.rsch.oclc.org in the directory /pub/internet_resources_project/report.
- ¹⁰ See, for example: 'Reflections on Developments in Network Based Electronic Serials: March 1992–March 1993', Michael Strangelove, Ottawa University; available on the BUBL bulletin board as section SA5R.
- ¹¹ See, for example: 'Email or Perish ?' by Geoffrey Stedman and Brian Wybourne, Physics World, February 1993, page 19.
- ¹² Byte, June 1992, page 257, 'The New Age of Documents'; MacUser, 19 February 1993, page 25, 'Portable Documents form Acrobat Adobe'.
- ¹³ Contact Bob Wallum, IS101S@CRANFIELD.AC.UK; briefs on this project are sent to the UNITE mailing list.
- ¹⁴ Computer Weekly, February 18 1993, page 38, 'Heard it through the Grapevine'.
- ¹⁵ Proponents of this argument include George Brett, Director of CNIDR, ghb@concert.net. A similar extrapolation is described by Bob Jacobson (moderator of Usenet sci.virtual-worlds newsgroup) in his excellent article entitled 'The Ultimate User Interface', Byte, April 1992, page 175.
- ¹⁶ This was distributed as a QuickTime movie on the QuickTime version 1.0 developer's CD (QuickTime™:Movies:Fun Stuff:Testimonials:Future Shock).
- ¹⁷ Produced by Max Whitby (now director of Multimedia Corporation), written by Douglas Adams, presented by Douglas Adams and Tom Baker, 1990.
- ¹⁸ See 'Newton Technology: An overview of a new technology from Apple', an Apple publication.
- ¹⁹ Byte, February 1991, page 277, 'An Easier Interface'; Image Processing, Spring 1993, page 20, 'Interacting with the Third Dimension'.
- ²⁰ See Connexion, 24 February 1993, page 5, 'General Magic to release new PDA'.