JHB 6-JUN-73 08:43 17061

Computer Augmentation of Human Intellect: A Revolution in Communication

This is the original version of the SID Proceedings publication; the latter was distributed to all interested parties. This version was proofread by Jim Norton and colleagues at SRI. It is Journalized for permanent storage and to release file space. (see -- bair,chisid,)

Computer Augmentation of Human Intellect: A Revolution in Communication

ABSTRACT

The implementation of the Augmented Human Intellect System (AHI) has permitted a new avenue for interaction: that of computer mediated communication. This paper is a description of experiences with this novel alternative to conventional ways of thinking and communicating in an organizational environment.

The AHI system has been designed to facilitate communication among knowledge workers who may accomplish their entire job utilizing this advanced technology. The system has the capability to send messages or other information to geographically distributed users. It permits access to and modification of stored information by a number of persons concurrently or independently.

The effects of the system in a government research and development office are threefold. (1) The individual is no longer limited to the rigidity of written information. Instead, he has an "information space" structured to his requirements through which he can "travel" rapidly, resulting in a flexibility approaching that of verbal thought.

(2) A team of users can also move with great ease through the information spaces of all team members to consolidate, collaborate, and reach a higher level of consensus. The result may be described as an "augmented knowledge workshop" that promotes the integration and synthesization of the efforts of individuals to yield increased group creativity.

(3) Consequently the organization can operate around a visible, dynamic body of information generated by the various levels in its hierarchy, and immediately communicate managerial as well as technical matters. The tradeoff from this increase in vertical communication has historically been a loss of efficiency, which AHI appears to prevent. As the problems of training a population of scientists and engineers are solved, this increase in communication is being observed.

The problems encountered include psychological resistance to this kind of major change in working habits, system failures, weak training due to inexperience, and hardware unavailability. Progression toward an Augmented Knowledge Workshop was marked by a transition from system use as an automatic typewriter to use for on-line composition. In addition, the system became transparent as the skills of operation were mastered. An unprecedented involvement with the system by individuals, especially when using the display terminal, was representative of the dramatic change in the work methods and communication patterns within the population.

Computer Augmentation of Human Intellect: A Revolution in Communication

CONTENTS 1g

Acknowledgements 1g9

Many thanks to Jim Norton, Dirk Vannouhuys, and Doug Engelbart of the Augmentation Research Center, Stanford Research Institute, for their review and comments; Professor George Borden, Pennsylvania State University, for his part in gathering data and reviewing the results; and Duane Stone for his ideas and review of the paper. 1g9a

Computer Augmentation of Human Intellect: A Revolution in Communication

INTRODUCTION 2

Background 2a

Computer technology has evolved with an almost incomprehensible rapidity over the past two decades. Applications of this technology have changed from purely numerical programs to sophisticated scientific problem solutions to manipulation and processing of natural language. The latter application has resulted in a man-computer symbiosis where the computer system becomes an extension of man's intellectual processes. In a now classic paper, J.C.R. Licklider (1968) outlined the total system with man and computer as integral components. Parallel to the development of computer capability over the past decade has been the development of a system designed to take maximum advantage of the computer's power to store, structure and retrieve textual information in a way congruent with the characteristics of an individual. 2a1

Appropriately, the name given was the Augmented Human Intellect System (AHI), developed under the leadership of Dr. Douglas Engelbart of the Stanford Research Institute. Originally, the purpose was to "...increase the capability of man to approach a complex problem situation, to gain comprehension to suit his particular needs, and to derive solutions to problems." (Engelbart from Lindgren, 1971) The intention was to provide an extension to man's intellect by utilizing a set of powerful computer based tools. This was gradually broadened to provide an extension to a group's capability, to that of an organizational structure, and finally to numbers of organizations. 2a2

A general overview of the system will be presented here. Detailed descriptions of the hardware and the software ("software" refers to any functioning computer program, as opposed to the machinery it runs on) may be obtained from the references. 2a3

System Description 2b

AHI is designed to take full advantage of the state-of-the-art in computer technology. It is an on-line, real time, time-sharing system with a full duplex (simultaneous transmission and reception) terminal-to-system link. The result is a highly interactive interface between the computer and the user. Indeed, there is a great deal of similarity between this man-computer interface and a man-to-man interface. 2b1

Once an individual user establishes a connection with the main computer he is able to create, store, structure and view written textual material. 2b2

> Every user-identified unit of text is automatically numbered and assigned a user-determined level in a hierarchical structure which establishes a relationship to the text as a whole. The structure permits addressing and viewing the text by units of the hierarchy such as statements and branches. 2b2a
>
> The Viewspecification system controls the viewing of text in many different ways analogous to "windows" into the stored information. The "viewspecs" control the levels in the hierarchy and the number of lines for each statement that the user wants to display or print. 2b2b
>
> Another structural unit is the file which is analogous to a document or book. Files provide a means of further structuring text. They can be combined, in part or in whole, with any other file, and the user can "jump" between various files. Part of the AHI capability is similar to a library where a person merely types his request and all relevant books are presented to him for immediate composition into a report or other new textual entity. Not only are the files in his own library ("directory") available to him, but all system users' files are available unless otherwise specified. 2b2c

The addressing and Viewspecification systems are key features of AHI. They illustrate some of the additional power of AHI relative to the numerous operational text editing software systems. A survey by van Dam (1971) states that: 2b3

> AHI "...embodies much more than just a text editor; their aim is to provide a new way of thinking and working by utilizing the power of the computer in all aspects of one's work." (van Dam, 1971, 110) 2b3a

According to Engelbart (1973), the additional capabilities include communication among teams with joint and/or simultaneous preparation of text -- a "collaborative dialogue"; sending documents, correspondence, and coordinating work -- "documentation production and control"; and a library system for the storage and retrieval of relevant literature, etc. -- a "research intelligence". 2b4

> Collaborative dialogue: There are computer aids for the

composition of messages and for their subsequent reviewing, cross-referencing, modification, transmission, storage, indexing, and full-text retrieval. A "message" may be one word in length, or several hundred printed pages. In any message there may be formalized citations pointing to specific passages in prior messages, so that a group of related messages becomes a network of recorded-dialogue contributions. There is also: automatic delivery of messages; full cataloging and indexing; on-line accessibility both to message notification and to the full text of all messages; and open-ended storage of the dialogue records. These services enable a community of people who are distributed in space and time to maintain recorded, collaborative dialogue. 2b4a

Document development, production, and control: There is a rich set of computer aids for the composition, study, and modification of document drafts, and for automatically generating high-quality photocomposition output with flexible controls for font-designation and formatting, to enable the production of publication-grade hardcopy (printing masters, or microform masters). There are processes for collaboration between several writers, and with an editor, in the process of evolving a final draft. There are also aids for the people who must keep control of changes, new-version distributions, etc., and provide the indexing to complex documents or sets of documents. Most of these particular aids are presently available only at SRI. 2b4b

Research intelligence: The provisions within the Dialogue Support System for cataloging and indexing internally generated items also support the management of externally generated items -- bibliography, contact reports, clippings, notes, etc. With these centrally supplied (therefore uniformly available) services, a community can maintain a dynamic and highly useful "intelligence" data base to help it keep up to date on external happenings that particularly affect it. Computer-generated indexes or on-line retrieval can facilitate access. Citations of external items from within the internally-generated dialogue base -- in the form of annotations, miscellaneous commentary, or supportive references -- offer computer-sensible interlinking of the external information with the internal, and considerably facilitate browsing, retrieval, back-citation searching, etc. (Engelbart, 1973) 2b4c

To be augmented is to have a powerful set of tools residing in a state-of-the-art computer system that are used in every

aspect of knowledge work, ie. activity that involves individual and joint preparation of communications, documentation, etc., and sharing the results with communities of knowledge workers. (Engelbart, et. al., 1967) 2b5

The Setting 2c

We are implementing AHI at the Rome Air Development Center (RADC) in part to observe its effects. This prodigious undertaking is motivated by a number of factors: (1) the desire to determine whether or not it can be applied to this working environment, (2) the fact that it appears to be a powerful tool for the team that developed it, (3) the costs (over $10 million for development and hardware), and (4) the fascinating technology. Realizing that those who created the system have a special motivation to use it, we decided that implementation in our own offices would provide a more realistic test environment. Thus, certain organizational units in the Information Sciences Division of RADC are accessing the computer at SRI through the ARPA Network, and using it in the daily performance of their jobs, while a descriptive analysis is done. 2c1

At present, we have a user group of 20 persons including three levels of management. Most of the personnel are engineers, scientists or managers. We plan to double the population and to include one more level of management by the summer of 1973. There is a considerable amount of development to be done to provide the software and hardware support for such a large group, but we are gradually overcoming the current limitations. 2c2

PREDICTED OUTCOMES OF IMPLEMENTATION 3

This investigation is concerned with effects on the population in three areas: (1) the individual, (2) the communication amoung individuals, and (3) the organization. A statement in each area of the effects that are ultimately expected as the population becomes an "Augmented Knowledge Workshop" follows to provide a structure for the descriptive observations. 3a

The three predictions and a discussion of each: 3b

1. The individual's thought processes will be modified by the rapid availability of his own information, the ease of changing that information both in its content and structure, and the flexible control of structure viewing. (cf. Engelbart, 1973) 3c

The rigidity of written information has a relatively unexplored

effect on the development of a person's ideas, thoughts, etc. He traditionally is limited to handwriting or typing to make thoughts initially visible, and then to rewriting each time clarification, correction, up-dating, restructuring, etc., is necessary. This may require the intervention of a typist and communication of the necessary changes to this second party. The longer the paper or whatever, the greater the problem of revision. Once a lengthy paper is prepared, the thinker's ability to massage, manipulate and creatively deal with those ideas is curtailed. 3c1

When thoughts, etc., are entered into the AHI system, it is predicted that they will not lose the flexibilty inherent in the thought process, but conceivably will gain additional flexibility resulting from the visibility of written information. The capability of AHI to permit rapid changes in stored text of any kind was described in the Introduction. From this it can be expected that an individual will move through his stored ideas with great ease -- massaging, and creatively engaging words, concepts, facts, patterns, and the various nuances of recorded thought. He also has, at any time, a copy to share with whomever he chooses. 3c2

In addition to the flexibility gained, the hierarchical structure adds what may be a new dimension to computer stored thought. The structure permits verbal units to be placed at a level indicating relative importance, source, category, etc. Thus, it is predicted that relationships can be captured or established which otherwise might be obscured by semantic limitations. 3c3

2. The communication of individuals accomplishing their work on the system will be modified by the free access permitted to all individual's work as structured into the system, by the ease of making changes in the written work of groups, by the capability to transmit messages or other information through the computer, and by the capability to simultaneously access and modify stored information by numbers of persons. 3d

Knowledge may be collected and compiled thus taking maximum advantage of the resources of the on-line working group resulting in better decisions and actions. 3d1

The result would be an "augmented knowledge workshop" promoting the integration and synthesization of the efforts of individuals to yield a new level of group creativity. Consensus would be represented by a stored record created simultaneously over time. The leaders of the Augmentation

Research Center (ARC), Mssrs. Engelbart, Norton, and Watson, elaborate on the concept of the "knowledge workshop" as follows. 3d2

> "The term "knowledge workshop" is built directly upon the terms "knowledge work" and "knowledge worker", whose special use is from Peter Drucker (1969). He develops a much larger theme about these concepts, adding terms such as "knowledge technologies", "knowledge economy", and "knowledge society", and pointing out that the growing level and importance of knowledge-work activity in our society will produce a discontinuity in our cultural evolution of a scale commensurate with that of the industrial revolution. 3d2a
>
> "The knowledge workshop is the specially provided environment in which knowledge workers do their knowledge work. We can talk about a small knowledge workshop for an individual, or a large knowledge workshop for an organization. Knowledge workshops have existed for centuries, but here we consider maximizing their effectiveness by systematically evolving tools, methods, etc., with heavy dependence upon the new technologies of computer time sharing and networking. The result is the "Augmented Knowledge Worker" (AKW) which describes an individual effectively using AHI. 3d2b
>
> > "Basic workshop functions will serve the daily handling of the AKW's working information -- of their notes, things-to-do lists, memos, letters, designs, plans, budgets, announcements, commentary, proposals, reports, programs, documentation, item-control catalogs, etc. And before it can sensibly be of much value, as Engelbart has stated, the Augmentation System has to provide for the grubby cut-and-try detail involved in the minute-by-minute, day-after-day worker's handling of this information: in the user's composition, studying, commenting upon, arguing about, modifying, communicating, publishing, presenting, etc." (Engelbart, Norton, Watson, 1973) 3d2b1

3. The ease of handling Knowledge Worker tasks and the openness among AKWs will have a strong impact on an organization where groups and teams are augmented, by changing the vertical communication in that organization and ultimately, the organization itself. 3e

When the AKWs are at all levels in an organization, management and subordinates can communicate through the system with the

same ease that co-workers can interact. The message transmission capability would facilitate the conduct of most of the organization's business through AHI. 3e1

The tradeoff from these increases in communication has historically been a loss of efficiency. (cf. March, 1965) However, a very important product of AHI is predicted to be the implementation of modern, "open" management techniques without loss of efficiency. 3e2

The overall effects in our organization would serve to move it toward being an Augmented Knowledge Workshop, a process very much worth documenting. 3e3

METHODS 4

Four means were employed to build an accurate description of the subjective experiences of the population, a chronicle, interviews, observations and personal account. 4a

The Chronicle 4b

The chronicle was established as a vehicle for recording the serendipidy experiences by members of the population. Any experience that was perceived as noteworthy by a subject was recorded in a special file named CHRON. Originally, a CHRON file was established in each subject's directory to permit easy insertion of a statement or two describing the experience with AHI. The observer then could peruse the files of the population and compile a summary, collating and synthesizing similar events. In addition, a CHRON file was established in the author's directory as an alternative. This provided some valuable data along the lines of a case study. It was not expected that the subjects would be very conscientious about recording unique experiences, thus other methods were relied upon for more consistant and thorough "data". 4b1

Interviews 4c

Interviews were conducted at intervals throughout the period that began with system availability to the population of 20 persons. A non-member of the organization was employed to conduct an unstructured interview that allowed the maximum opportunity for open ended responses. Hopefully this enabled the respondant to introduce those things which were most important to him, while minimizing the structuring of these perceptions by the interviewer. General questions such as, "Could you tell me more about that?" were followed by more

specific questions only when deamed necessary by the interviewer to gain some more detailed information from reluctant respondants. The interviews were non-directive to the point of resembling a discussion. Although the style was intended to be Rogerian, suggestions were used when certain problems were anticipated, eg. "Did you have trouble with output directives?" 4c1

The following techniques were relied upon to fill in the gaps between the voluntary responses. 4c2

Unstructured observation 4d

There was more available data than could be collected through the foregoing methods. It shed important light on what people were experiencing as they learned and attempted to use the system for required work. This was collected as it drew the attention of the author, who then recorded the event. These events included conversations that were overheard ("eavesdropping"), random participation in conversations, sessions arising out of a request for assistance on the system, observing the process of document preparation and the end product of system use, and reviews of the contents of subject's files. 4d1

This kind of record is highly impressionistic and is dependent even moreso than the other techniques upon the observer's perceptual set. In this case it was mitigated by the working environment in which subjects were non-volunteers involved primarily because of their location in the organization. There were no direct rewards for participation and no lessening of the workload imposed by management. A minimum of additional obtrusion into the working world of the subjects was imperative, thus supporting the use of techniques such as this one. 4d2

Personal account 4e

The author has been a heavy user of the system for over a year and has been using the display system for about 7 months since its initial availability outside the Stanford Research Institute. This as well as other papers have been prepared on the system. No attempt has been made to distinguish between author and population experiences although in many cases this is obvious. The author is, in fact, a member of the population and his experiences are treated as any other's. 4e1

Although the subjectivity of this kind of study is high, attempts

were made at all times to corroborate conclusions with the experiences of the population as a whole, in many cases directly consulting other users on the accuracy of the observations. Thus, although the personal experiences of the author played an important role, the conclusions drawn should represent the population in general. The other techniques utilized additional observers in the form of hired interviewers, consultants, and colleagues external to this environment. 4f

LEARNING TO USE THE SYSTEM

Becoming an Augmented Knowledge Worker 5

The traditional work patterns were adhered to with a great deal of persistance by the population. The methods of communicating and accomplishing daily work are habitual and consequently some extinction had to occur before new habits could be learned. 5a

The resistance to learning a new system as a way of doing one's daily knowledge work was higher than expected. The symptoms were manifested as excuses for not using the system. These were things like, "there isn't a terminal around," "I can't remember how to do it," "there isn't a good manual that I can understand," "I have too much work to do," etc. It seems worthwhile to discuss some of these, how we dealt with them, and offer some speculation about the reasons behind this behavior. (The problem here, of course, is that the reasons are largely a function of individual personalities. With our population size, any generalization must be done with this factor in mind.) 5a1

There are twelve portable typewriter terminals and 3 IMLAC displays for 20 subjects. The jobs for approximatey 70% of these individuals require, on the average, a great deal of written work. An important exception is programming for another system. This is a major task for at least 1/3 of the population and has not been done on AHI. At SRI, however, all programming has been done on the system since its inception. This will be discussed further in the section on population characteristics. 5a1a

Terminal availability is a crucial variable affecting the learning process. There is strong resistance to leaving one's work space to physically carry a terminal to that area from some other work space. Ideally, every user would have his own terminal. This is not warranted by current usage levels here, nor is it feasible financially. However, it has become a problem to the point where it has caused some people not to use the system. (Management and the observer

have tried to overcome this by carrying terminals to people who have use for them but resist getting their own.) 5a1b

The system use manual cannot serve as a training manual. It is over 200 pages in length and is not organized in a self apparent way. It does not serve the beginner well as a reference because its use requires an understanding of the system. The syntax for the command language is complex (although functional and very effective for those who have learned to use the system) and requires that detailed explanation be available for reference. The command language summary provided at the time was too cryptic to serve this purpose. 5a1c

An introductory, self explanatory training manual was not available. Perhaps the complexity and richness of AHI rendered it a formidable task. The stopgap measure was to have capable users stand by in the immediate vicinity to aid the struggling neophyte at a moments notice while an introductory command summary was developed. 5a1d

Learning to use AHI was assigned a low priority when the subject was under pressure to get other jobs done. Of course this could be an excuse that might in fact not be the actual cause. Admittedly, it is a real nuisance to change the tools for doing one's job and learn a new skill in the middle of things. 5a1e

However, after a trial period of approximately one month, it was concluded in light of these problems that a policy regarding use should be established by management. The decision to require use was made in light of the hypothesis that any work that can be hand written can be done on the system with the exception of that requiring special alphanumerics. 5a1e1

This was based on the following assumptions. 5a1e1a

If the system is only used occasionally, i.e. a couple of times a week, then the level of proficiency necessary to make the system truly an improvement will never be attained. Practice through regular use is necessary. 5a1e1a1

If new users are instructed to use the system for all possible knowledge work, then we can determine what work is not appropriate for AHI by observation. 5a1e1a2

The system offers alternatives to habitual ways of communicating in written form. New users will naturally be reluctant to use the system unless strongly encouraged. 5a1e1a3

The requirement is enforced by instructing the secretaries of the population not to accept any handwritten drafts for typing unless an exception was specifically authorized by their supervisor. Work that necessitated the supervisors review and coordiation would only be reviewed through AHI. (Drafts are printed out for transmission elsewhere.) 5a1e1a4

It was expected that there would be an initial drop in work output until some level of proficiency was reached, estimated to be about 1 month. A little friendly persuasion seemed appropriate to overcome initial problems -- "Try it, you'll like it". 5a1e1b

The requirement that all personnel within the section use this system met with definite negative reactions of an emotional nature. 5a1f

All persons involved were given at least a month and in some cases up to 4 months to voluntarily use AHI for whatever they wished. They were encouraged to use it for a status report to their immediate manager, himself a user. A secretary was employed to enter into the system any written work that had already been completed, which then would be available for updating, etc. This also met with resistance. 5a1f1

Individuals manifested a range of actions, from trying to simply ignore the whole thing to actively campaigning against it. Some of those who tried became distressed when system problems were encountered. Indeed, system performance did leave a lot to be desired in dependability, but was not much different from any experimental computer facility. The reactions seem to correlate with the observer's assessment of personality type. Those who seemed to fall toward the closed end of Rokeach's open and closed mind, were the most threatened by required use. Those manifesting a high ego involvement with their work reacted more negatively than did others. 5a1f2

Factors other than personality and demographic

attributes were relatively consistant. Equipment and training have been available for about four months. Everyone has been exposed to the system, either through classes or by being in the area where the system is being used. Age of the potential user does not seem to be a factor affecting motivation to begin the task of learning; neither does experience with computers, or job task type. The variable is one that is most obvious and generally true of any new tool--aggressiveness (generic use). The least aggressive subjects initially ignored the system. As the more inhibited persons saw their colleagues becoming involved with AHI, they responded to the pressure to become real AKWs. 5a1f2a

Ego threat was estimated on the basis of verbal and non-verbal behaviors over a period of several months. When questioned about their work, a subject's defensiveness was noted by facial flushing, elusive or aggressive statements, or reverse attack where the subject would say , "if I had nothing else to do like you, I'd learn it...." Complaining within earshot of the observer usually centered around how busy and how important it was that he not be imposed upon. These are examples of very impressionistic obsevations. However, most psychologists would allow some credence to impressions about work involvement over a period of several months of intense contact. 5a1f2b

Interviews of two subjects who are system programmers revealed that they were not able, in their judgement, to use the system for a long report. The joint effort was to be published. The primary reason was a lack of time to gain the proficiency necessary. 5a1f3

More specific reasons were given that reflect upon the difficulty of gaining that proficiency and the limitations of the teletype oriented TNLS (as opposed to the display version of AHI, DNLS, which will be discussed in a later section). The information was not visible enough for maintenance of the train of thought. Some subjects felt that they could not see previous pages or the context of the current location of the pointer [the position in the text where any editing commands will take effect) easily enough. (It requires that enough text be printed for the user to identify it in relation to the document). Addressing was not "natural" enough. Inadequate training was

probably a significant causal factor here. The installation of a printer for quality hardcopy output encouraged use and improved the situation considerably. 5a1f3a

It would be misleading to discuss the problems experienced by the trainees without mentioning the trainers. Teaching the use of such a complex system is difficult under any circumstances, and in this case it was the first attempt. We had some help from the staff at SRI(ARC) but this was limited for a number of good reasons. Thus, we were on our own learning about learning and the system at the same time. There does not seem to be much point in trying to assess the influence of teaching personnel and method, but it can be concluded that experienced and more skilled teachers would have lessened some of the problems encontered. 5a1g

Briefly, initial instruction was done in small groups. Each person was given a terminal so that he could do the operation as it was described by the instructor. The loggin operation, entering the appropriate subsystem, status listings, error messages, etc., were covered in the order they would normally be used. After that, operations were described in the order of usefulness, a function of usage frequency. After two or three days of this the trainees were told to practice, while the instructors stood by to give assistance. In the future, a conceptual overview of the system would probably help prior to any attempted usage. 5a1g1

The difference between on-line composition and use as an automatic typewriter became an important factor as new users progressed. This differentiation was remarkably discrete as evidenced by the work methods employed. 5b

On-line composition was the modis operandi with the first few persons to learn, who have been "on" the system for over a year. It is characterized by little use of paper, either for the original composition of new ideas or for the proofreading of drafted papers. Instead, all structuring, outlining, wording and phrasing, etc., is done while on-line. 5b1

Use as an automatic typewriter is characterized by handwriting outlines and original drafts often creating a complete draft that is typed into the system by a secretary. A printout is then used for proofreading and revising which are done on the printout itself. These are then entered into the system

on-line. Further reviewing is done in a similar manner. There is no effort to enter ideas directly using an on-line terminal. 5b2

There may be multiple reasons for this, not the least of which is the non-availability of a CRT display or inability to use the display version of AHI. As mentioned above, typing skill is another limiting factor, although those who have used the system for on-line composition have found that a typing ability evolves naturally. 5b3

The psychology of the situation also played an important role. Certain subjects expressed a reluctance to use a teletype because typing was beneath them. Comments such as, "what will the secretaries do," or "I wasn't hired as a typist," etc., were noted. 5b4

The transition from automatic typewriter use to intellect augmentation appears to be an important threshold in the process of becoming an AKW. 5b5

Continuing usage on a day to day basis begins to make the system transparent, which is probably necessary for the full realization of intellect augmentation. The command language, addressing, viewing, operating the terminal, and the other mechanisms necessary for usage become of less concern freeing the individual to deal directly with the subject matter at hand. None of our population has experienced total system transparency, but a few have come close. We are limited somewhat by technical difficulties such as computer crashes. 5c

Observations of true AKWs at SRI are evidence that a transparency can be acheived, at least for a large percentage of the kinds of work done. Those observed had been on the system for a number of years leading us to believe that full capability may take years. This is, of course, a function of what the user selects to do on-line -- little used facilities, such as other ARPA network resourses residing on other computers, would be less transparent. 5c1

Transparency is also characteristic of the rules of the spontaneous use of language, as in conversational speech. The experience and process of learning to use AHI is analogous to the acquisition of natural language and reminds one of the work of the noted psychologist, Jean Piaget. There is a definite syntax applied to the vocabulary that enables the person to combine command words to perform novel operations, thus generating new and acceptable patterns of language. These in turn facilitate different procedures and sequences of operations by the programs.

It is quite obvious at the outset that there are many different ways to do the same thing. This permits a personal "style" to evolve for each individual that is supposedly most effective for him. 5d

As with natural language, a subliminal knowledge of the basic rules is used to generate new command "sentences" from the given vocabulary that the computer will recognize. The subliminal attribute is closely related to the transparency discussed above. 5d1

We can speculate that a person's ability to generalize from the command listings will be a decisive factor in his successful utilization of the system, especially as a tool for creative efforts. 5d2

Once a person becomes adept at "speaking the system's language", different reactions are observable as he becomes increasingly dependent upon the system. 5e

OBSERVATIONS 6

Effects on the Individual 6a

One of the most prominent experiences observed was a kind of pressure that exists on the user to work at a high capacity while he is on-line. A great deal of involvement occurs, especially when the user is on a display terminal. 6a1

One causal factor may be the automatic logout if nothing is done for about fifteen minutes, resulting in some anxiety whenever one is distracted. This is not sufficient cause for things such as an extraordinary reluctance to engage any person who wishes to interrupt an AKW. Another possiblility is limited system availability due to "down time" and hardware "bugs". An available system, functioning reliably and rapidly is a strong incentive to "use it while you can". These factors are influential, but the reasons appear to be more profound. 6a1a

The act of creating something that will be highly dynamic, not permanent or rigid, is very attractive, albeit subliminally. A person experiences a freedom and release from the responsibility of having to live with some document that is set in ink. Its analogous to thinking through ideas and structuring a draft mentally. It can be altered in any way at any time, thus facilitating creative experimentation. 6a1b

Not only is there an increase in the freedom to be creative with content, but there tends to be an uninhibited work rate, limited only by the present hardware devices. If a writer is aware that he will have to "mess up" or retype his paper if he makes an error or forgets an idea, the rate at which he proceeds must necessarily be restrained. 6a1c

In fact, a new user may have to learn to be less inhibited about rendering his ideas visible. Perhaps more important is that he feels free to change and remould whatever he "dumped" into the system. There has traditionally been a lot of negative reinforcement associated with changing written matter, even if it is only a personal working document, which AHI minimizes. 6a1d

AHI appears to provide unprecedented flexibility and freedom with textual information for the individual. (This is partly dependent upon the use of the display terminal (DNLS) which is not availble to all subjects at present. Since this is a matter of time, no distinction will be made in this section -- observations include both types of terminals. The DNLS subsystem will be described in a later section.) 6a2

It is interesting to note that freedom and flexibility seem to require structure, rather than being inconsistant or contradictory. The ability to position ideas so that their relative importance is clearly shown, to control what level of detail one is viewing, to show trees of relations, is crucial to the flexibility gained by AHI. The utility of the addressing structure terminology, the various informaton units, etc., is illustrated by the tendency of AKW's to think in similar terms. For example, "Well, 'expunge' that file or 'delete plex 1', it was rejected...." 6a2a

Freedom and flexibility are not limited to individual usage of AHI, but are extended to groups, teams, and the organization by the interpersonal communication capabilities. 6a3

Use of the Communication Facilities 6b

There are two specific sub-systems for on-line communication (part of the TENEX Executive software) and an extensive communication capability as part of the "Journal", a subset of the Dialog Support System. 6b1

"Send Message" permits message transmission by entering a literal and the names of any number of recipients at any node on the ARPA Network regardless of geographical location

or use of AHI. The message is automatically sent to each user noting "copies to (username)", subject, and title. Notification occurs ("you have a message") upon initial system log in. 6b1a

The "Link" command ties together 2 (or more) terminals so that messages may be transferred or one user may observe while the other works. "Advise" may be invoked enabling one user to work on the other's files thus facilitating a shared control over the editing, viewing, etc. This is the basis for on-line conferencing and is most useful in the display version of AHI with a supplemental audio (phone) link. 6b1b

The Journal System is a collection of tools and procedures to manipulate documentation. The user may essentially send any on-line textual entity, a message, a letter, a document or a book to any number of users in any format merely by specifying the initials (id's) of the recipients. Distribution, recording, printing, mailing, library filing, and indexing are handled completely automatically with numerous options for the author. 6b1c

These subsystems can be activated at any time. Journal and Send Message will deliver the item to a specified file (analogous to a mailbox) belonging to the receiver. Any amount of information may be so transmitted almost immediately for the recipient's perusal at his convenience. Again, this speed and ease appear to encourage "mailing" information. 6b2

The message sending feature is analogous to sending memos and has similar characteristics of ease and convenience although it tends to be less formal. It is an important advantage that the receiver does not have to be on-line at the time. We are able to retain copies of the messages when they are printed out for reading or by inserting them into the appropriate subsystem. However, they usually are not retained by the recipient. 6b3

Messages are transmitted more easily than memos in that they do not involve paper processing, a secretary-typist, or addressing and mailing. We have found that they are sent in situations where no written communication would have been used otherwise, resulting in an increase in communication, especially vertically within the organization. 6b3a

A manager who is usually difficult to reach due to meetings and other preoccupations can be easily notified. Although advantageous from this standpoint, messages are easier to ignore due to the tentativeness of the computer

storage. A memo or letter is a little more demanding -- perhaps due to its physical presence and visibility. 6b3a1

The interviews of users have surfaced an important potential disadvantage. The use of the message system can tend to depersonalize communication. This is in large part due to its ease of use as an alternative or substitute for face-to-face communication as was predicted by Turoff (1972). For example it may be selected as the mode of interaction because of a distasteful or negative content. On the other hand, face-to-face contact has resulted from a message, but this is infrequent. 6b3a2

The Journal System is being used ostensibly as a computer based mailing system for handling written communication of longer lengths. A hardcopy can literally be mailed but most of our users read their "mail" on-line using the easily executed retrieval commands. 6b4

It also has a message sending capability where, unlike the TENEX Send Message feature, messages are permanently stored, indexed, cross referenced, and catalogued. This is part of the Dialog Support System which has a potential impact much beyond what we have explored. 6b4a

With few exceptions, the population has not been using the Journal for dialogue support. The Journal is perceived as a place to store items of permanent value, which is usually not felt to be the case with messages. This may represent a reluctance to store routine transactions -- they are feared in that they may return to "haunt" the originator. 6b4b

The lack of understanding of the purposes and operation of the Journal may be more significant. "Dialogue Support" is definitely a clue that continuing interactions might be recorded much as are the minutes of meetings. Not only does this provide the communicators with a history of transactions relevant to certain subject matter, but it provides the using community with an insight into developments that otherwise would have remained obscure. 6b4b1

The Augmented Community based at SRI is facilitated by the dialogue record as we may be with additional experience. Links (addresses that may be activated to load the information specified) are imbedded in subsequent dialogue records providing cross references to

previous or relevant transactions. Thus, an interested party may follow the progression of transactions at SRI and quickly grasp the meat of the issue. 6b4b2

The use of Link addresses may be supplemented by simply reading other's files. File read access and sharing has not been used as extensively as expected (our people tend not to be nosy....) A few of the users have perused others files to learn of their doings or to answer a pressing question in their absence. By and large, however, this access is limited to copying some information that was known of before hand or responding to specific requests. This will be described in the section dealing with effects on the organization. 6b5

Linking (note the entirely different use of the term) may be compared to a telephone conversation. The significant difference is that linking is more convenient when a user is on-line. 6b6

As mentioned above, when an AKW is on-line other interactions are resisted and interruptions are discouraged. However, it does not seem to constitute an interruption to engage in dialogue through the terminal. The novelty of this means of interacting may have some effect on its attractiveness. 6b6a

It is unique in our experience. It has the tentativeness of oral communication, but lacks the paralinguistic, non-verbal cues that would be transmitted via the phone. It is limited by the typing ability of the users and has the immediate appearance of being a written communication. It differs in permanence (none), immediacy, spontaneity, and its real time interactiveness. There is no time to peruse the communication or deal with written text. It is usually relegated to short interactions. This results in a stylistic difference which requires, among other things, an explicitness not inherent in oral communication, eg. humorous jesting has to be labeled with a "ha, ha" or something similar to ensure correct interpretation. 6b6b

Linking has been used extensively as an integral part of the AHI system. It is important to note here that although neither Send Message or Linking are unique to AHI, usage appears to be dependent upon the design and purpose of the entire system. If the system were not employed to accomplish the daily knowledge work of groups it is doubtful that either feature would have any significant utility. Both features are available for immediate use if the AKW is

on-line and the need arises. We have linked among ourselves and with various users on the Network including our colleagues in Washington D.C. and the team at SRI. In many cases contact occurred where there otherwise would have been none, thus promoting teamwork. 6b6c

The link feature is being used within the teams for short, extemporaneous questions and comments. Surprisingly, links are utilized when AKWs are within close proximity in the same building, in neighboring rooms, or even within the same room. Novelty might play a part in this, but usage emphasizes the ease and convenience. It can be concluded from our observations that communications occurred where they would not have otherwise -- they were usually not important enough to warrant leaving one's working area. 6b6d

Effects on Groups and Teams 6c

The system has promoted the evoluton of teams independent of geographical location. Although this was optimistically predicted, the nature of the teams is different than expected. 6c1

The teams centered around common problems, or at least tasks of mutual interest to the members. The novel outcome was that people within the same organizational unit did NOT become more unified, or experience any of the other characteristics of group identity. The subgroups remained isolated from each other when the user population was expanded to the present size (at the outset of organizational implementation). This was the case even when the subgroups were located in the same room. 6c2

Channels of communication that did open within the organization were based on training requirements and usually consisted of help from the more experienced users to the neophytes. Of course, the observer opened channels in order to gather the reactions of up and coming users. These spurious channels are certainly not representative of improved communication. 6c3

Judgement of this lack of increased interaction across task boundaries as an insufficient outcome is unfair. The task structure within the organizaton did not change. Individuals and subgroups continued to work on problems in separate areas of specialization thus minimizing the need for horizontal communication. 6c4

It is encouraging that the consistency and quality of communcation within a priori clusters of AKWs noticably improved, especially the vertical channels, which will be

discussed in a separate section. The Journal was the primary vehicle for sending messages, documents, interesting articles and references, plans and programs, copies of correspondence for non-AKWs, minutes and agendas of meetings, etc. Where these written communications might have occured on a chance basis before, they were duly sent to the concerned team members and stored for usage through the Journal. 6c5

Team collaboration was very evident when an individual was in need of additional resources outside his own "information space". During the preparation of briefings, and papers on related topics, individuals drew directly upon the work of colleagues by either using their files in the briefing or by moving the appropriate information directly into their information space. 6c6

An exemplary transaction involved the development of a Technical Planning Objective intended for several levels up in the management hierarchy. The responsible writer generated a draft of the document covering all areas even though some individuals were not present. Then, via Send Message, he notified those people to examine the document for comments, and revise their particular portion. They simply copied it into their working space, rewrote as appropriate, and moved the finished product back into the master document. 6c6a

The most exciting channels opened were those with SRI, a continent away. Concerned individuals were able to collaborate on papers for conferences, proposals for funding, and the necessary support of AHI users. 6c7

One case involved higher management at RADC who requested a paper be submitted for a conference within a deadline of a few days. Consequently, the paper was coordinated, formats and content agreed upon, and a final copy printed in the manager's office, on time in spite of the mails. 6c7a

A similar situation was initiated by the California based AKWs. The proposal by which SRI/ARC is funded each year was prepared on-line prior to the final submission to the appropriate authorities. Our project monitor reviewed the proposal draft and made suggestions. SRI then re-examined it, the process continuing until it satisfied both parties. The ease with which revisions are made with real time interaction, not involving the preparation and mailing of written documentation, is quite apparent with these important, somewhat controversial, lengthy papers. 6c7b

Perhaps we will realize increased communication between subgroups with more time. For the present, however, satisfying teamwork on a given task is facilitated by the ease and timeliness of AHI. 6c8

Organizational Effect: Changes in Vertical Communication 6d

Predicted problems 6d1

The problems that were anticipated are discussed here to alert the reader to the cuing which may have biased our observations. It was predicted that managers would be hesitant to access the working files of their subordinates because of a kind of psychological anxiety about discovering something they should not see, and the potential overload of detail and sheer volume of information. 6d1a

Managers above the immediate supervisor (already an AKW) would be reluctant to acquire the necessary skills because of the interruption of their tight schedule, the ease with which they can assign jobs to others, the nuisance of sitting down at a terminal especially with the numerous routine interruptions, and the fairly habituated mode of solving problems through conversation. 6d1b

Consistant effort is required to become proficient on a basic level. Some of this problem would be alleviated by employing a CRT display terminal to be permanently installed in the managers' offices, providing a more attractive interface. 6d1b1

Engineers at the worker level would experience some reluctance to enter files into the system where they might be perused by a manager prematurely. The file access controls would be used reluctantly. 6d1c

These predictions center around the problem of changing strongly ingrained work habits. There are numerous additional predictions which could be made, however, this should adequately indicate the expectations generated by experience to date. 6d1d

Traditional patterns of organizational communication 6d2

The patterns of communication before AHI were typical of any large business or industry where the majority of people are scientific/professional. The patterns were dependent

largely upon the formal authority structure and the task assignments. 6d2a

There is a "section" of about 18 persons involved with the system. They were supervised by a "section chief" who represents the first official level of management. A pseudo management level between the section chief and the "worker bee", is called the group level, and is based on a specific system development activity which is the primary function of that group. 6d2b

The section chief in this population managed in an easy going way where the primary means of direction were through scheduled meetings (rare), chance meetings, and direct contact. Few if any memos were ever used. Return communication to the manager was through the same means with the addition of periodic required status reports. An open door policy (and first name informality) were the norm. 6d2c

Thus, a loosely knit structure existed at this level where much of the vertical interaction was by default. Directives--requirements which came down from higher levels were usually passed on by word of mouth. 6d2d

New patterns 6d3

The systems message sending capability has been used extensivily. The section chief has been using this capability to schedule meetings, respond to questions, and make requests. Message traffic has been heavy and effective, even at early stages of its use. The most important usage has been to contact a subordinate who is not available at the time in an informal manner without the necessity of written records. Thus, the overhead in resources is low. 6d3a

Scenarios of situations in which the message feature has been used to advantage are numerous in the chronicle. Quasi-official vertical communications are occuring where they might not have been possible. 6d3a1

For example, the third level manager was able to work directly with the first level manager, the section chief, in obtaining a guest speaker at a professional conference. In this case the second level was not involved as he would have been through the traditional chain of command. Arrangements for guests, etc., have been made in the same manner. 6d3a1a

The system enables messages of an informative nature, not requiring action, but increasing the effectiveness of the recipient, to be sent directly to him without the usually prohibitive problems. 6d3a2

The Journal System has been appropriate for document coordination through the "chain of command". It has been relegated to more formal documents in most cases. The major power has been realized when lengthy documents must be revised numerous times to satisfy managers. 6d3b

A recent plan to procure additional terminals is a case in point. Over a period of 7 working days a plan was prepared and rejected as "too all encompassing", prepared again and met upon, revised as a result of the meeting, revised as a result of the minutes of the meeting, and submitted to the Division Chief in finished form. 6d3b1

Another instance involved the creation of special working documentation which has been created for management to provide an up-to-date description of research and development "efforts". These are prepared by the individual in charge and may represent a procurement, or particular investigation or development activity. 6d3b2

The procedure utilizes the editing power of AHI between users directories. A standard format is copied by the individual who then "fills in" his information. Previously, any such periodic and lengthy paperwork (monthly) would have to be completely retyped after updating even though much of the actual verbage remained the same. Now revisions are entered on-line and the finished product is sent to the manager on-line with a hardcopy printout for backup. A marked increase in the promptness with which this kind of job is completed attests to AHI's effectiveness. 6d3b2a

This is an especially good example of information availability to augmented managers. The on-line effort description may be read at any time, whether the originator is available or not, including the latest updates. "What's going on", a question so often asked by managers, is easily and quickly answered by procedures such as this. 6d3b2b

Trip reports, a standard government form, are also handled in this way. Availability to team members and

other interested colleagues is an added advantage, especially for establishing contacts. 6d3b3

Minutes of meetings, whether held locally or on a business trip, are entered in a commonly labeled file in each user's directory. The standard format again provides an easy way of employing a common structure to prepare documentation for management. 6d3b4

Vertical communication has been facilitated more through the sharing of special, "open" files than through any of the other channels. "Open" refers to files that have been created with read and write permission for the organizational unit. 6d3c

A file called "Staffmeet" is used by the section chief to record items of interest to his subordinates by membership in one of two task groups. Occasionally, items are entered that are for one or two individuals. The file is continually updated (weekly as a minimum) and may be reviewed at any time. The real value is the opportunity for the subordinates to add comments, answer questions, or add items of general interest at any time. The file has become a supervisor's meeting in absentia, and is retained as a record of the continuing dialogue. This file seems to have become a highly efficient means of conducting the business of the organizational unit. 6d3c1

Imagination is the limit where open file usage is concerned. Another file is used to record for the manager any news items for potential inclusion in an administrative newsbrief. It is not clear why this channel is so attractive, however, its use in addition to the more formalized communication features provides a complete vertical communication tool. 6d3c2

To this point we have been discussing experiences based primarily upon the teletype terminal. It is most likely that a display terminal would not appreciably change communication usage, but it is certain that it does affect individual performance as borne out by the few that have become proficient. 6d3d

The Display On-line System (DNLS) vs. the Teletype 6e

DNLS constitutes a separate subsystem of AHI. It includes human engineered devices that result in the ultimate ease (within the state-of-the art) for man-computer communication. 6e1

A hand held, cursor control transducer, the "mouse," enables an AKW to point to any textual entity on the TV like display. He then can perform any of the operations that were available in the teletype version without further addressing. Any editing or other changes are immediately visable. To supplement the standard terminal keyboard, a "binary keyset" may be used to key in alphanumerics much as one would play chords on a piano. 6e1a

The screen shows a number of feedback "windows" for commands, addresses, viewspecifications, literal inputs, etc., in addition to the display of an approximate page of a textual file. Commands that execute, delete, and point are actuated by buttons on the mouse. (see Engelbart, 1968) 6e1b

This brief description of the highly interactive and optimized interface will hopefully establish the setting for the particular effects of DNLS. It is through DNLS, it can safely be said, that the full potential for individual augmentation can be realized. Much of the foregoing discussion might be revised to show more positive ramifications if every user had a display terminal. 6e2

I hope to establish here the additional effect and capabilities we experienced beyond the teletype usage. 6e3

No one has tried to learn DNLS without first becoming reasonably capable with the teletype. The experience of those who have learned both indicates that it would be difficult to start with DNLS, although we have yet to show this. The present cost of the display terminal ($15,000 per IMLAC with mouse & keyset) has encouraged the emphasis of teletype access for the time being. 6e3a

One subject, who has been using DNLS for about 6 months, describes the effect quite vividly as a "trip" that is addicting. 6e3b

"When DNLS is flying so am I This causes a noticeable change in my behavior. I am extremely reluctant to break for lunch, social conversation, coffee, the 5:00PM whistle or weekends. I smoke more (unconsciously). This is making me an emaciated, constipated, emphysematous, introvert; who is neglecting his family." 6e3b1

He offers the following analysis using some learning theory concepts. 6e3b2

He states that the use of DNLS is self-reinforcing because it is immediate, happens often, and happens at the level at which the behavior occurs. 6e3b2a

Less frequent, but perhaps more powerful reinforcment is obtained from coworkers -- "Oh I didn't know you could do that " -- which gives one a feeling of being on top of things, one-up-man-ship, superiority, etc.; and it is obtained from bosses in a similar way. In addition, the ability to respond quickly, often before the question is asked, engenders admiration. 6e3b2b

My personal experience has been very similar to these perceptive responses from this member of the populaton (D. L. Stone). 6e3b3

The increased speed with which one can address, change text, and actually see the change, results in a dramatic experience for the skilled user (there are three in our population). Pointing to a link address not only displays the addressed information at the push of a button, but also controls the viewspecification or "window" through which one looks at a body of information. 6e3b4

Link addresses are entered as any other text. Thus, the AKW typically enters links as he develops information units which are then linked together (cross referenced) including the specified views of the information. For example, the user may need to refer to an outline of the document he is massaging. By actuating the link he may display a toplevel view. The system stores up to five views at a time which may be quickly recalled as needed, thus facilitating return to the detail and location where the AKW was originally working. 6e3b4a

In the same manner he can refer to any information unit for reference, which includes the vast Journal documentation. Or, he can "split" the screen into up to four parts each representing a window -- textual units can be moved around between these. Searching for a topic area is easily done by sucessively showing more levels and detail in any particular file. 6e3b4b

Displaying various windows into the information space is appropriate for briefing, etc., as visual aids: dynamic, computer generated "viewgraphs". The power

is in moving quicky forward or back through the aids, and making changes at the request of the audience. Movement is done by imbedding a hidden link to the next viewgraph/display. 6e3b4c

A complete description would continue, but it defies reasonable brevity. Overall, it is as if the AKW were traveling through information space comprised of the work of communities of AKWs. At any point he can stop and utilize the information at that location or move it to his own information space from others. 6e3b5

One of the few notable limitations we have encountered is display recreate speed, which is a function of our terminals, transmission line rate, and system load. Even under slow conditions, a "page" is written on the screen in a few seconds. Improvements in computer hardware will probably remove even these few seconds. 6e3b6

This description is offered despite the anticipated comments about over enthusiasm and starry eyes. How fast an AKW can "travel" through information space is surely a function of the individual and the nature of the task. We have been extremely limited by our population size. However, these are in fact experiences we have had to date. 6e3b7

Population characteristics and effects 6f

The kind of work done by the population could have important bearing on the interpretation of these experiences and generalization from the results. Thus, the investigator established a framework which was used to categorize what kinds of work involved what percentage of the person's time. 6f1

The list of "job task types" was created by the experimenter intuitively from observations and discussions with members of the population (see below). A semi-structured interview was then given. The subjects were asked to determine the percent of time spent in each job task type. 6f1a

A group profile was compiled from the job task type data. This graph (see figure) shows the respective job types for the organizational unit involved based on the mean percentages of time in each job task types. 6f1b

Job task types [general categories of job activities): 6f1c

1. Programming computer systems 6f1c1
2. Project engineering, including: 6f1c2
   Contract paperwork (forms memos, etc.) 6f1c2a
   Reviewing proposals and reports 6f1c2b
3. Writing plans and/or reports 6f1c3
4. Software operation (incl. evaluation, debugging of software packages) 6f1c4
5. Briefings 6f1c5
6. Demonstrations of equipment 6f1c6
7. Managing other personnel 6f1c7
8. Administrative paperwork (eg. working time sheets) 6f1c8
9. Study, review of the state-of-the-art, reading, literature search, etc. 6f1c9
10. Secretarial work. 6f1c10

It was difficult to separate the influence of the job task type variable from the personality variable but some interesting experiences were observed. 6f2

Those who spend the majority of their time programming might actually be impeded in the learning of AHI because of proactive interference. Expectations due to experiences with other systems interferred with at least one of the subjects as he tried to use AHI. 6f2a

The job task type profile is provided here to aid the reader in the assessment of the results. No other observations or conclusions have been drawn about the relationship of jobs of this particular population and the appropriateness or effect of AHI. 6f3

SUMMARY AND CONCLUSIONS 7

The Augmented Human Intellect System (AHI) was developed under the leadership of Dr. Douglas Engelbart at the Stanford Research Institute over the past ten years. The purpose is to increase the capability of man to accomplish "knowledge work" through the use of a set of powerful computer based tools that provide an extension to the capability of groups, organizations, and networks of organizations. This paper describes the experiences and effects of implementing this system on an organizational unit at the Rome Air Development Center. 7a

Four methods were employed to gather and record data: a chronicle file maintained by the subjects, interviews, unstructured observations of the subjects at work, and personal account as the unit moved toward becoming an Augmented Knowledge Workshop. This

was defined as an aggregate of knowledge workers successfully using AHI. 7b

Knowledge work in this case consisted of research and development in computer technology for the Air Force. Individuals learning to use the system experienced certain problems before becoming Augmented Knowledge Workers. 7c

There was a strong resistance to changing habitual work methods and communication patterns. There were psychological as well as hardware causes for the resistance which were mutually escalating. Weak training techniques, system failures, and hardware unavailability were some of the difficulties encountered. As the problems were overcome, thresholds were observed in the way the system was used and perceived. 7c1

AHI use tended to fall into two discrete kinds, use as an automatic typewriter and, with the more advanced users, use for on-line composition. With use on a regular basis, the skills were acquired that rendered the system "transparent", so that the individual was no longer concerned with system operation. This tended to free him for spontaneous, creative work while the rules of operation and syntax remained subliminal in much the same way as with the use of language in conversation. 7c2

Observations of the population subsequent to training noted three areas of effect, (1) on the individual, (2) on groups and teams, and (3) on the organization. 7d

Hypothesized effects were not entirely realized, however, they may be with additional time and system development. At present there are profound changes that point toward that realization. Individuals experienced an unprecedented flexibility and involvement with textual information through powerful features such as the link address, viewspecification system, and information structure. 7d1

This power facilitates the construction of an information space which may be easily and rapidly communicated and shared with other AKWs to promote dialogue among task teams. The communication facilities, Send Message, Linking, and the Journal System, were employed to create new patterns of communication that would not have been attained through alternate means. The resultant documented team collaboration extended to the organization. 7d2

Vertical communication improved, as new channels were opened and formal channels were modified from the traditional

patterns. The system capabilities became a new management tool which increased openness without a loss of efficiency. A number of examples of this were discussed, including collaboration with geograpically distributed groups and the sharing of special dialogue files. 7d3

Display terminals were available to a few of the population promoting a fuller realization of the impact of AHI aided by human engineered interface devices. A dynamic information visibility was achieved by utilizing "windows" into the information space. The result was like traveling through the dynamically structured information space of a community of knowledge workers with such rapidity and ease that it was almost addictive to the user. 7e

The dramatic changes in the work methods and communication of our population in the time span of six months indicates that Peter Drucker's "knowledge revolution" will arise from the use of systems such as AHI. At least for a population of scientific and engineering personnel in the government, AHI's potential is on the way to being that which it's designers at SRI intended: a revolution in communication in the broadest sense. 7f

REFERENCES

8

Bair, J.H. "Evaluation of the Augmented Human Intellect System: A Plan." Presented at the Annual Conference of the International Communication Association, Atlanta, Georgia, 1972. 8a

Conrath, David W. "Measuring the Computer's Impact on Organizational Structure." In: Stanley Winkler (Ed.), COMPUTER COMMUNICATION, First International Conference on Computer Communication, Washington, D.C., October 24-26, 1972, 68-73. 8b

Conrath, David W. "Teleconferencing: The Computer, Communication, and Organization." In: Stanley Winkler (Ed.), COMPUTER COMMUNICATION, First International Conference on Computer Communication, Washington, D.C., October, 1972, 145-146. 8c

Drucker, Peter F. AGE OF DISCONTINUITY: GUIDELINES TO OUR CHANGING SOCIETY. New York: Harper & Row, 1969. 8d

Engelbart, D. C. and W. K. English. "A Research Center for Augmenting Human Intellect". In: AFIPS CONFERENCE PROCEEDINGS, Fall Joint Computer Conference, Vol. 33, Part 1. Washington, D.C.: Thompson Book Company, 1968, 395-420. 8e

Engelbart, D. C. "Experimental Development of a Small Computer-Augmented Information System." Annual Report to Office of Naval Research, Covering Period 15 April 1971 through 15 April 1972. SRI-ARC 10045, April 1972. 13p. 8f

Engelbart, D. C. "Intellectual Implications of Multi-Access Computer Networks." Paper presented at the Interdisciplinary Conference on Multi-Access Computer Networks, Austin, Texas, April 1970. To be published. 8g

Engelbart, D. C. "Coordinated Information Services for a Discipline or Mission-Oriented Community." Paper presented at the Second Annual Computer Communications Conference, San Jose, California, January 1973. 8h

Engelbart, D. C. "Human Intellect Augmentation Techniques." Stanford Research Institute, Menlo Park, Calif., Final Report, July 1968. 8i

Engelbart, D. C., J. C. Norton, and R. W. Watson. "The Augmented Knowledge Workshop". Preprint of paper to be given at the National Computer Conference, June, 1973. 8j

Haavind, Robert, ed. "Man-Computer Partnerships Explored." ELECTRONIC DESIGN, 17:3 (Feb. 1, 1969), 25-32. 8k

Licklider, J.C.R. "Man-Computer Symbiosis." In: CONVERSATIONAL COMPUTERS. New York: John Wiley & Sons, 1968, 3-5. 8l

Lindgren, Nilo. "Toward The Decentralized Workshop." INNOVATION, 24 (September 1971), 50-60. 8m

March, J. G. (Ed.) HANDBOOK OF ORGANIZATIONS. Chicago: Rand McNally & Co., 1965. 8n

Selltiz, Clare, Marie Jahoda, Morton Deutsch, & Stuart W. Cook. RESEARCH METHODS IN THE SOCIAL RELATIONS. N.Y.: Holt, Rinehart, & Winston, 1965. 8o

Turoff, Murray. "Delphi and Its Potential Impact on Information systems." AFIPS CONFERENCE PROCEEDINGS, 39 (Fall 1971), Joint Computer Conference, 317-326. 8p

van Dam, Andries, & Rice, David E. "On-Line Text Editing; A Survey." COMPUTING SURVEYS, 3:3 (September 1971), 93-114. 8q

JHB 6-JUN-73 08:43 17061

Computer Augmentation of Human Intellect: A Revolution in Communication

(J17061) 6-JUN-73 08:43; Title: Author(s): James H. Bair/JHB;
Sub-Collections: RADC; Clerk: JHB;
Origin: <BAIR>CHIN.NLS;1, 1-MAY-73 11:01 JHB ;

JLM 6-JUN-73 11:30 17062

prject Admin

summary oof a phone call from Frank Allen.

prject Admin

Phone call frome F Allen 1

Frank called to inquire about our relationship with MPC on the microform job.They had been down there the week before and talked to Col Coggins about their project and its potential relationship to what MO(PC is doing.Coggins said that he thought it would be a good idea to chat with Col Thayer about some possible tie in.I think the Admin peopple are getting nervous about the prospects of getting r&d money on their program .I think they feel going through ESD/MCI is going to take for ever and so they afe fishing as to what project might be avaialble to hitch a ride on.He said that he ,Major Broadbent or their new chief col ? would call Col Thayer in a week or so to chaat.He asked if i would let him know about the potential call and their long range interest in the application of techologies like NLS. 1a

He also said that Major Zarra was down there briefing on this new study on the data processing needs of the non-command &control requirements of the Air Force.This study was triggered be General Robbins who commented at the Base Mission Analysis review that he did not agree that ccip-85 covered all dp requirements.He said then that a study should be done on what the processing needs will be on the typical base. 1b

This study offers good news and bad.(good(,it should strengthen our proams like NLS,bad they will assuredly ask for a man from RADC.I think we should be prepared to argue that we could contribute only on some pulse basis and we serve the study better by doing our r&d. 1b1

17062 Distribution

Edmund J. Kennedy, William P. Bethke, Duane L. Stone,

DHC 6-JUN-73 12:21 17063

New Organization and (?) Directory

Marcia -- UCLA-BC is currently a Group. It should be deleted entirely. AFF-14 is currently an Organization. It's idnet should be changed ot UCLA-bc. The only info not currently in AFF-14 is Coordinator (JJV) and full name [University of California at Los Angeles Bio-Cybernetics.

Actually, they should also have a Directory <UCLA-BC>. If that would be possible to set-up I (and they) would be most appreciative.

OK?

tnx. -- Dave.

1

17063 Distribution
Marcia Lynn Keeney, Dirk H. Van Nouhuys,

**064

Replace Number caused a blank to be inserted before the number and the semi-colon which was after the number was deleted. 1

17064 Distribution

Diane S. Kaye, Harvey G. Lehtman, Charles H. Irby,

EP 6-JUN-73 13:31 17065

AIAA paper, "Integration of Data Managment systems ..."

I found your AIAA paper very interesting. Do you have any more documentation? I gather that you have implemented a prototype system. Is there any way we could play with it? We are in the process of implementing a resource directory for the network, and are looking for a good, easy to use DMS to put it under. 1

17065 Distribution
Arie Shoshani,

DHC 6-JUN-73 13:36 17066

File Updating Error

Output File (and possibly Update) sometimes wipe out the Origin statement, deleting any text that was in there and replacing it just with the new filename (version number, usually). Since I tend to have directives inn .0, this is most irksome. 1

17066 Distribution

Diane S. Kaye, Harvey G. Lehtman, Charles H. Irby,

**67

Dean -- I can't find the user program that you used to jump to all the links in sysgd. I would like to use it (modified?) for locator to see if any links don't work. Do you think this is possible? 1

17067 Distribution
N. Dean Meyer,

MDK 6-JUN-73 15:26 17068

Draft Memo on Alternatives to Pushing Proposed NLS Command Language Changes

Please read and comment. (It's not long.)

MDK 6-JUN-73 15:26 17068

Draft Memo on Alternatives to Pushing Proposed NLS Command Language Changes

1

What follows is a draft of a journal item I am preparing. I would very much appreciate your earliest possible feedback as to the validity of my recommendations and arguments. Your ideas for modifying this draft in any way would be most welcome, as I want it to be a document that represents the NIC's viewpoints, not just MDK's viewpoints.

1a

Subject: "On Proposed NLS Command Language Changes: Part II" 2

Introduction 3

This note is a sequel to my previous note on this subject (see -- IJOURNAL,17013,1:w), and proposes a plan of action. The plan is offered with my "NIC hat" on, not just as an MDK plan. We believe the plan to be in the best interests of the NIC and of the Network NLS community. 3a

The problem, as I understand it, is this: 3b

The Utility, scheduled to begin operation around September 1st, will introduce a substantial number of new users to NLS. 3b1

We would like to be able to present to them a system which has a relatively easy to learn language, i.e., one that is consistent and mnemonic and more "natural" to use, as far as is possible. 3b2

But to accomplish that task we will have to undertake what appears to be a significant amount of coding and debugging, a significant amount of documenting, and a significant amount of training and retraining. And we will have to do this in what for us is an uncomfortably short time span. 3b3

As I stated in my previous Journal item, we absolutely cannot afford to put in global changes to the language without adequate warning and training for the users, without adequate documentation, and without an adequate "shake-down" period to debug the code, debug the language changes themselves, and debug the documentation. I don't even see how we can afford to BEGIN the documentation until the language changes are proved to be satisfatory. 3c

I don't think we can do all that in time for the present and anticipated new NLS users to have made a clean transition to the new command language by September 1st. 3d

Consequently, I propose the following alternative courses of action, which from the NIC's standpoint would be highly satisfactory. 3e

Scope of the Plan 4

The main emphases should be on 4a

1) on-line "HELP" type facilities, and 4a1

2) improved NLS/Tenex interfaces. 4a2

HELP Facilities 4b

DSK and I have been putting together a scheme for HELP that we think should be given top priority for design, review, and implementation. This scheme will be journalized soon. 4b1

Through these HELP facilities, users will be able to learn while using the present NLS command language. They will also be able to adapt to changes as they are implemented on a more normal schedule than that currently being considered. 4b2

NLS/TENEX 4c

The interfaces between NLS and Tenex, which currently are not good from the users standpoint, must be improved. I propose, therefore, that we address this problem head-on and make our computer system a truly NLS system, not a Tenex/NLS system. 4c1

Particular areas where improvements are needed are: 4c2

- interface to the Archive and Interrogate commands;
- interface to the Directory, Delete, and Expunge commands;
- cleaner way of handling partial copies;
- interface to the "sendmessage" facilities (I know that's under way). 4c2a

I don't think "goto exec" is sufficient. What's needed, it seems to me, is direct access to some of the exec's functions while in NLS mode ... with NLS editing capabilities, and with NLS commands that do the same things that Tenex does (while fooling Tenex). 4c2b

These ideas have been around ARC a long time. I think the time has come to place them at the top of our priority list. 4c3

Reasons for the Plan 5

The reasons for not supporting the proposed schedule for implementing the command language changes have been outlined above, and in the earlier journal item already cited. 5a

The reasons for the above alternative plan are: 5b

1) Both the HELP facilities and the improvements to the NLS/Tenex interface will in fact result in making NLS more acceptable to the new Utility users; 5c

2) Neither of the items proposed here HAS to be done by a given date. That is, we can proceed at top priority, but don't have to be finished by September 1st; 5d

3) Implementation of the HELP faclity will make to easier to train new users on future command language changes. 5e

Some Further Considerations 6

As we get into the design and implementation of HELP facilities, other requirements for command language cleanup will become expicitly apparent. These have to do primarily with error messages and feedback prompting messages. 6a

We will need to put high priorities on getting these cleaned up, as they are uncovered. 6a1

As we relax the schedule for implementing global command language changes, we can then take a different look at the problem, as suggested by the following possibilities: 6b

- could perhaps A FEW of the proposed changes be implemented, debugged, documented, with appropriate training aids etc. by September 1st. 6b1

- could the time gained be profitably spent in attempting to redefine the language formally, as far as is possible. 6b2

- should we begin the process of rethinking the concepts of "jumping", of placement of output processor "directives", of "back-links", of file privacy, personal information handling techniques, file space management in Tenex, archiving practices ... all these (and ideas that others in ARC have) could certainly influence the language structure and its evolution. 6b3

- shouldn't we in fact ascertain from DCE more fully how he thinks the process of NLS command language evolution has fared, and what course he thinks it should take? 6b4

Need for an Early Decision 7

There are pressing reasons why a decision is needed SOON. 7a

From the NIC's standpoint, the above alternative courses of action represent the only logically consistent action to take, given that we are where we are now in time. 7b

17068 Distribution

James E. (Jim) White, Jeanne B. North, Elizabeth J. (Jake) Feinler, Diane S. Kaye,

NLS File Structure: Documentation

(J17069) 6-JUN-73 15:49; Title: Author(s): Harvey G. Lehtman/HGL;
Distribution: /NPG RWW DCE NDM JEW KEV; Sub-Collections: SRI-ARC NPG;
Clerk: HGL;
Origin: <LEHTMAN>FILEFORM.NLS;9, 6-JUN-73 12:12 HGL ;

.PEL; .PGN=PGN-1; .GCR;This document was created in response to several requests from network users desiring to create interfaces to NLS files. It should also be of interest to NLS system programmers. The previously available documentation was sketchy at best, scattered through several files, and very often misleading. Copies of this file should be accompanied by copies od the L10 Manual and the source code files (nls, const,), (nls, data,), (nls, filmnp,), (nls, strmnp,), (nls, utilty,) and (nls, ioexec,) to permit readers to examine the relevant code.

NLS File Structure: Documentation

NLS FILE STRUCTURE -- INTRODUCTION 1

The discussion of the structure of NLS files which appears below is based in part on material appearing in the April 1970 ARC Report (5139,) which described the slightly different file system which was implemented on the XDS-940. Other material appeared in the June 1972 report (13041,). Most of the relevant code and data structure declarations may be found in the L10 source files (nls, utilty,), (nls, data,), (nls, filmnp,), (nls, ioexec,), and (nls, strmnp,). 1a

Minor changes in the logical structure of the system were made in the conversion of the system from the 940 to the PDP-10 for several reasons: 1b

1. The current ARC programming language, L10, is more powerful than the several languages it replaces, MOL and the SPL's. L10 permits special purpose constructions anywhere in its code. It is a higher level language and provides greater compiler optimization. 1b1

2. An effort has been made to modularize further the functions within the system to ease development by a team of programmers. This functional modularity will be increased with the introduction of the Modular Programming System, 1b2

It is assumed that the reader is familiar with NLS as a user and is thus aware of the heirarchical structure of NLS files. 1c

GENERAL CONSIDERATIONS 2

The format and structure of NLS files were determined by certain design considerations. 2a

It is desirable to have virtually no limit on the size of a file. This means it is not practical to have an entire file in core when viewing or editing it. 2a1

The time required for most operations on a file should be independent of the file length. That is, small operations on a large file should take roughly the same time as the same operations on a small file. The user and the system should not be penalized for large files. 2a2

In executing a single editing function there may be a large number of structural operations. 2a3

A random file structure satisfies these considerations. Each file

is divided into logical blocks that may be accessed in random order. 2b

NOTE ON FIELDS IN NLS RECORDS AND OTHER L10 LANGUAGE FEATURES 3

Several sections of this note are taken directly from record declarations in the code of the NLS system written in the L10 programming language. 3a

Record declarations in the L10 language serve as templates on data structures declared in the system. Byte pointer instructions are dropped out by the compiler permitting access to specified parts of the array. Multi-word records are filled from the lowest to the highest address of the array. Within words, bits are allocated from the first bit on the right. (Thus words are allocated from left to right, and fields within a word are allocated from right to left.) If several fields fail to fill a 36 bit word and the next field definition would go over the remaining bits in the word, the field is allocated in the next word available. 3b

Example: 3b1

Suppose there is a record declaration of the form: 3b1a

```
(newrecord) RECORD % A two word record %                    3b1a1
   field1[10]. %bits 0 (rightmost) through 9 of first
   word%                                                    3b1a1a
   field2[25], %bits 10 through 34 of first word %          3b1a1b
   field3[15]; %bits 0 through 15 of second word (field
   would not fit in remander of first word%                 3b1a1c
DECLARE array[2];                                           3b1a2
```

There may be code within a program of the form: 3b1b

```
variable ← array.field2;                                    3b1b1
array.field3 ← 20;                                          3b1b2
```

In L10, false is zero and true is non-zero. 3c

See the L10 manual for further information. 3d

BLOCK HEADER AND TYPES OF BLOCKS 4

An NLS file is made up of a file header block and up to a fixed number (currently 465) of 512-word (= one TENEX page) structure blocks (up to 95) and data blocks (up to 370). 4a

Each block has a two word header telling the type and giving the file page number and an index into a core status table. The record declaration from (nls, utilty,) follows: 4b

```
(fileblockheader) RECORD %fbhdl = 2 is length%                    4b1
   fbnull[36],     %unused%                                       4b1a
   fbind[9],     %status table index%                             4b1b
   fbpnum[9],    %page number in file of this block%              4b1c
   fbtype[5];    %type of this block (types declared in (nls,
   const,))                                                       4b1d
      hdtyp  = 0   = header                                       4b1d1
      sdbtyp = 1   = data                                         4b1d2
      rngtyp = 2   = ring                                         4b1d3
      jnktyp = 3   = misc (such as keyword, viewchange etc.)%     4b1d4
```

There are several types of blocks, each with its own structure. 4c

File header block-- always page 0. Contains general information about the file. 4c1

Structure (ring) blocks-- contain ring elements which implement the NLS structure. There currently may be a maximum of 95 of these blocks each containing 102 five word ring elements. They may appear in file pages 6 through 100. 4c2

Data blocks-- contain the data (currently text) of NLS statements. Each data block has statement data blocks (SDBs) which have five word headers followed by text strings. There currently may be a maximum of 370 data blocks. They may appear in file pages 101 through 471. 4c3

Miscellaneous blocks-- not used in the current implementation. 4c4

FILE HEADER BLOCK 5

In each file, there is a header block that contains general information about that particular file. The header block remains in memory while the file is in use. 5a

FILE HEADER CONTENTS (taken from (nls, data,)): 5a1

```
DECLARE EXTERNAL                                                    5a1a
%...file header...%                                                 5a1b
   % DONT CHANGE THE ITEMS IN THE HEADER %                          5a1b1
   filhed[5],                                                       5a1b2
      % these extra words may be taken for additions to
      header%                                                       5a1b2a
   fcredt,   % file creation date-- TENEX gtad jsys internal
   format %                                                         5a1b3
   nlsvwd = 1,                                                      5a1b4
      % nls version word; changed when NLS file structure
      changes %                                                     5a1b4a
   sidcnt,   %count for generating SID's%                           5a1b5
      % An SID (statement identifier) should not be confused
      with PSIDs (see below). The SID is uniquely generated
      for each statement in a file and is not reused if a
      statement is deleted; it is unchanged if a statement
      is moved. It may be used by a user for accessing
      paricular statements in a file without worrying about
      changes because of additions or deletions (as is the
      case with statement numbers). The sidcnt field in the
      header is increased by one as statements are created.
      The value is stored in the RSID field of the ring
      element. (See description below.) %                           5a1b5a
   finit,                                                           5a1b6
      % initials of user who made the last write (by
      updating or outputting the file)-- see DATA BLOCK
      description below for explanation of initials %               5a1b6a
   funo,     % user number (file owner) %                          5a1b7
   lwtim,    % last write time-- TENEX internal JSYS gtad
   format %                                                         5a1b8
   namdl1,   % left name delimiter default character %             5a1b9
   namdl2,   % right name delimiter default character %            5a1b10
   rngl,                                                            5a1b11
      % upper bound on ring (structure) file blocks used %          5a1b11a
   dtbl,     % upper bound on data file blocks used %              5a1b12
   rfbs[6],                                                         5a1b13
      % start of random file block status tables (see
      description below) %                                          5a1b13a
   rngst[95],  % ring block status table %                         5a1b14
   dtbst[370], % data block status table %                         5a1b15
   mkrtxn = 20,   % marker table maximum length %                  5a1b16
```

```
    mkrtbl,      % marker table current length %                    5a1b17
    mkrtb[20],   % marker table %                                   5a1b18
       % Markers provide an alternative form of NLS
       addressing;  see NLS Users Guide for description %          5a1b18a
    filhde;   %end of the file header%                             5a1b19
```

NOTES ON FILE HEADER 5a2

The file header is read into core by the procedure (nls, ioexec, rdhdr). This procedure checks for the validity of certain keywords. If the file is locked and has a partial copy, the header is read in from the partial copy. If the partial copy header block is invalid in the key spots, the file is unlocked and the header read in from the original file. If that is bad, the file may be initialized. RDHDR sets the value of filehead[fileno] where fileno is the NLS file number of the file-- (an index into the file status table which provides, among other things, a correlation between JFNs for the original and partial copy and the single NLS file number; see description of the file status table below.) 5a2a

(nls, ioexec, setfil) initializes a file header. 5a2b

It should be noted that fields within a file header are accessed by full word indexing rather than by record pointers for speed. Thus we have the following typical code (from (nls, utilty, esc)) which reads the default name delimiters from an NLS file header: 5a2c

```
    .                                                              5a2c1
    .                                                              5a2c2
    .                                                              5a2c3
    ELSE IF rplsid.stpsid = origin THEN                            5a2c4
       BEGIN %use standard delimiters for that file%               5a2c4a
       fhdloc ← filehead[rplsid.stfile] - $filhed;                 5a2c4b
       dlleft ← [fhdloc + $namdl1];                                5a2c4c
       dlrght ← [fhdloc + $namdl2];                                5a2c4d
       END                                                         5a2c4e
    .                                                              5a2c5
    .                                                              5a2c6
    .                                                              5a2c7
```

Also, code from (nls, ioexec, rdhdr) which gets the address of the word in core which contains the nls version word for the file whose header has been read in order to check its validity: 5a2d

```
    .                                                              5a2d1
```

```
.                                                              5a2d2
&vwd ← (header ← filhdr(fileno)) - $filhed + $nlsvwd;          5a2d3
filehead[fileno] ← header;                                     5a2d4
.                                                              5a2d5
.                                                              5a2d6
```

The file header is initialized by (nls, ioexec, rdhdr) which fills up contiguous words declared in (nls, data,) and then moves the contents of those words to page zero of the file. 5a2e

Procedures in (nls, filmnp,) are responsible for reading, manipulating, creating, garbage collecting, and storing into ring blocks and ring elements within those blocks and data blocks and statement data blocks within them. 5b

RANDOM FILE BLOCK STATUS TABLE ENTRIES IN FILE HEADER 6

The random file block status tables appear in the file header. There is one word per ring block or data block page. Each entry contains the following: (record declaration and comments from (nls, utilty,)) 6a

```
(rfstr) RECORD % Random file block status record. (The entry
will be equal to 0 if the page (i.e., block) in the file is
unallocated. Otherwise, the entry will be an instance of the
following record.)%                                              6a1
   rfexis[1],   %true  (i.e., non-zero) if the block exists in
   the file%                                                     6a1a
   rfpart[1],   %true if block comes from partial copy%         6a1b
      %Whether page has been modified by a user.                6a1b1
         (rfpart will be true in that case.)%                   6a1b1a
   rfnull[2],   %unused%                                        6a1c
   rfused[10],  %used word count for the block%                 6a1d
      %Current used word count (may be used to calculate
      post-garbage collection free space count.)%               6a1d1
   rffree[10],  %free pointer for the block%                    6a1e
      %Free space count (for data block)                        6a1e1
         Pre-garbage collection free space count.               6a1e1a
      Free list pointer (for ring block)%                       6a1e2
   rfcore[9];   %0 then not in core, else page index%           6a1f
```

NOTES ON RANDOM FILE BLOCK STATUS TABLES 6b

The table RFBS in the file header is broken into two sections each of which contains a collection of records of the above type. The first section includes RNGM entries from RFBS[RNGBAS] up to and including RFBS[RNGBAS+RNGM-1] and contains information about the ring blocks in the file. (RNGBAS is currently 6 and is the first page in a file which may be a ring block; RNGM is currently 95 and is the maximum number of ring blocks permitted.) 6b1

The second section includes DTBM entries from RFBS[DTBBAS] up to and including RFBS[DTBBAS+DTBM-1] and contains information about the data blocks in the file. (DTBBAS is currently 101 and is the first page in a file which may be a data block; DTBM is currently 370 and is the maximum number of block blocks permitted.) The entry RFBS[RNGBAS+i] may also be referenced as RNGST[i]; likewise RFBS[DTBBAS+i] may be referenced as DTBST[i]. The index in RFBS of a block is the actual page number of the block in the file. 6b2

A pointer to an SDB (statement data block) (PSDB) consists of a nine bit data block number in the range [0,DTBM) and a nine bit

displacement from the start of the block. The variable DTBL is maintained in each file header as the current upper bound on allocated data blocks for that file. This is used to limit the search for a location for a new SDB. The variable DBLST contains the index of the block from which an SDB was last allocated or freed. 6b3

A pointer to ring element (PSID) consists of a nine bit ring block number in the range [0,RNGM) and a nine bit displacement from the start of the block. The variable RNGL is maintained in each file header as the current upper bound on allocated ring blocks for that file. This is used to limit the search for a location for a new ring block. The variable RNGST contains the index of the block from which a ring was last allocated or freed. 6b4

STRUCTURE BLOCKS -- RING ELEMENTS 7

These blocks contain five word ring elements with a free list connecting those not in use. 7a

```
(ring) RECORD %ringl is length% % from (nls, utilty,) %                  7b
   rsub[18],     %psid of sub of this statment%                          7b1
      % A pointer to the first substatement of this statement %          7b1a
   rsuc[18],     %psid of suc of this statement%                         7b2
      % A pointer to the successor of this statement (to the up if
      no successor) %                                                   7b2a
   rsdb[18],     %psdb of sdb for this statement%                        7b3
      % Pointer to the data block that contains text for this
      statement. %                                                      7b3a
   rinst1[7],  %DEX interpolation string-- scratch space%               7b4
      % Information in scratch fields may be reset and used by
      other subsystems such as DEX.  No other assumption
      concerning their contents shold be made. %                        7b4a
   rinst2[7],  %DEX interpolation string-- scratch space%               7b5
   rdummy[1],    %DEX dummy flag-- scratch space%                       7b6
   repet[3],     %DEX repetition-- scratch space%                       7b7
   rhf[1],       %head flag. true (= 1) if this is head of plex%        7b8
   rtf[1],       %tail flag, true if tail of plex%                      7b9
   rnamef[1],    %name flag, true if statement has a name%              7b10
   rnull[2],     %unused%                                               7b11
   rnameh[30],   %name hash for this statement%                         7b12
      % hash algorithm may be found in (nls, utilty, hash) %            7b12a
   rsid[30];     %statement identifier%                                 7b13
      % See SIDCNT description in file header above. %                 7b13a
   %although only need four words, use five so that have room to
   grow%                                                                7b14
```

PSIDs and PSDBs are pointers to other ring or data blocks in a file. They have two 9 bit fields: one (stblk) is a block index; the other (stwc) is a word displacement within that block. Procedures in (nls, filmnp,) permit the traversal of a file's structure. 7c

Given an STID (see below), one may use the primitive procedures in (nls, filmnp,) (e.g., (nls, filmnp, getsuc)), or the more elaborate procedures in (nls, strmnp,) (e.g., (nls, strmnp, getnxt)) to move around to related ring elements and retrieve or change (display or edit) relevant data. 7d

There are two "fixed" values for PSIDs for special statements: 7d1

The PSID of the origin statement is always 2. 7d1a

The entire STID (and hence PSID) of the end of a file is

endfil (=-1) (which does not correspond to any real statement in the file, but which is returned by the "get" procedures in flmnp and strmnp to indicate the end has been reached or an error has been found.) 7d1b

Some other conventions implemented in the data structure make possible special features in NLS: 7d2

The successor of a statement with no real successor is its "up". 7d2a

The substatement of a statement with no sub is itself. 7d2b

The origin is at a unique level; thus statement 1 is the sub of the origin. 7d2c

DATA BLOCK -- STATEMENT DATA BLOCKS 8

Data blocks are composed of variable sized blocks called Statement Data Blocks (SDB's) which contain the text of NLS statements. Each SDB has a five word header with the following information followed by the text made up of 7 bit ASCII characters packed five to a word. New SDB's are allocated in the free space at the end of a data block. SDB's no longer in use (because of editing changes) are marked for garbage collection when the free space is exhausted. 8a

```
(sdbhead) RECORD %sdbhdl is length% % from (nls, utilty,) %                8b
   sgarb[1],     %true (non-zero) if this sdb is garbage, i.e., no
   longer used%                                                            8b1
   slength[9],   %number of words in this sdb%                             8b2
   schars[11],   %number of characters in this statement%                  8b3
   slnmdl[7],    %left name delimiter for statement%                       8b4
   srnmdl[7],    %right name delimiter for statement%                      8b5
   spsid[18],    %psid of the statement for this sdb%                      8b6
      %Pointer to ring element.%                                           8b6a
   sname[11],    %position of character after name%                        8b7
      % This is 1 for a statement with no name. Thus if the text
      of the statement were:                                               8b7a
         (author) The person who                                           8b7a1
      and the name delimiters were "(" and ")", the value of this
      field would be 9. %                                                  8b7b
   stime[36],    %date and time when this sdb created%                     8b8
      % This is stored in TENEX internal format; see the TENEX
      JSYS manual, gtad jsys %                                             8b8a
   sinit[21];    %initials of user who created this sdb%                   8b9
      % This is stored in 5 bit characters to permit NLS user
      idents of 4 characters and still maintain compatability with
      files created when only 3 character idents were available.
      This kludge still requires translation of old-style idents,
      but at least both old and new style fit in the same space.
      (See (nls, filmnp, getint) and (nls, filmnp, trnsint) if you
      care.) %                                                             8b9a
   %sgarb and slength must be in the first word of the header for
   newsdb% %although only need four words, use five so that have
   room to grow%                                                           8b10
```

STRING IDENTIFIERS (STIDS) AND TEXT POINTERS 9

A string identifier (STID) is a data structure used within NLS to identify strings (possibly within NLS statements). 9a

If the string is in an NLS statement, the STID contains a file identifier field (STFILE) and a ring element identifier (STPSID). (See PSID description above under ring elements.) 9a1

The presence of a file identifier within the STID permit all editing functions to be carried out between files. 9a2

Procedures in (nls, filmnp,) and [nls,strmnp,) permit traversal through the ring structure of a file given an stid. See, for example, (nls, filmnp, getsuc) which gets the stid of the successor of a statement; see also (nls, filmnp, getsdb) which returns the STPSDB for the statement whose STID is provided as an argument. (An STPSDB has, correspondingly to an STID, a file number field and a pointer to a data block, a STPSDB). 9b

Text pointers are used with the string analysis and construction features of L10. They consist of an STID and a character count. 9c

LOCKING MECHANISM -- PARTIAL COPIES 10

The NLS file system under TENEX provides a locking mechanism, which protects against inadvertant overwrite when several people are working on the same file. Once a user starts modifying a file, it is "locked" by him against changes by other users until he deems his changes consistent and complete and issues one of the commands: Update File, Output File, or Unlock File which "unlock" the file. Note, a user can leave a file locked indefinitely -- this protection is not limited to one console session. 10a

When a file is locked (is being modified), the user who has modification rights sees all of the changes that he is making. However, others who read the file will see it in its original, unaltered state. If they try to modify it, they will be told that it is locked by a particular user. Thus the users can negotiate for modification rights to the file. 10a1

This feature is implemented through the use of flags in the status table in the File Header and through the partial copy mechanism. 10b

All modifications to a file are contained in a partial copy file. These include modified ring elements and SDB's. 10b1

Any file page which is to be and which is not in the partial copy (discovered through a write pseudo-interrupt) is copied into the partial copy. All editting takes place there. The TENEX user settable word in the FDB (TENEX file data block) for the original file contains locking information. 10b2

The NLS Update file command merely replaces those structure and data pages in the original file which have been superseded by those in the partial copy, unlocks the file, and deletes the partial copy. For Update old, this is done in the original file; for Update to new version, the pages are pmapped to a new file from the original or partial copy where necessary. The Output file command garbage collects unused space; the update file command does not. 10c

OTHER RELEVANT ARRAYS 11

The following arrays are used in system core and file management. They are described here to facilitate the study of NLS file handling code. 11a

FILEHEAD 11b

An array of pointers (each contained in a single word) to the file headers of files currently in use is FILEHEAD. At present, up to 25 files (and their partial copies, if any), may be open simultaneously. 11b1

CORPST-- Core Page Status Table; CRPGAD-- Core page address table 11c

The array CORPST provides the correspondence between the 100 (octal) pages in core reserved for file pages and user prgoram buffer and the pages in files which are currently loaded into core. (This is really a maximum of 100 octal since the user program buffer may be enlarged into this area; the maximum is given by RFPMAX - RFPMIN +1.) 11c1

```
(corpgr) RECORD %one word. core page status record. gives
status for a given core page for random files.%                  11c1a
   ctfull[1],    %true if the page is in use%                   11c1a1
   ctfile[4],    %file to which the page belongs; an NLS
   file number%                                                 11c1a2
   ctpnum[9],    %page number within the file%                  11c1a3
   ctfroz[3];    %number of reasons why frozen (locked into
   core because of some current NLS system need-- editing
   is in progress on an statement, a statement is being
   displayed, etc) %                                          11c1a4
```

The array CORPST is the core page status table and is made up of instances of the above record. (RFPMAX - (current user program bufffer size)) gives the number of core pages that may contain file pages. The core pages are located at positions indicated by the array CRPGAD (core page address). CORPST is indexed by numbers in the range [RFPMIN, RFPMAX). The elements in this array are actual addresses. The starting location of page k is given by crpgad[k]. RFPMIN is initialized to be 5; 4 pages are initially allocated for a user program buffer. See (nls, usrpgm, gpbsz) for the procedure which changes these limits. 11c2

FILST-- File status table 11d

An NLS file number provides an index into the FILST, the file status table. This 100 word array is made up of 25 four word

entries and contains the following information for files of interest that have NLS file numbers at any time (these may or may not at that time be open; they do, however, have JFNs.) The information comes form the record declaration in (nls, utilty,): 11d1

```
(filstr) RECORD %File status table record.  entry length =
filstl = 4, max no. entries = filmax  = 25%                    11d1a
   flexis[1],    %true: entry represents an existant file%     11d1a1
   flhead[9],    %crgpad index of the file header%             11d1a2
   flbrws[1],    %this file in browse mode%                    11d1a3
   fllock[1], %This file was locked by another user when
   loaded%                                                     11d1a4
   flpcread[1],  %PC read only-- write open failed
   (openpc)-- see discussion of partial copies below%          11d1a5
   flaccm[8],    %file access mask%                            11d1a6
      % Used to tell whether or not the file may be written
      on by the current user.  Used primarily for files such
      as those in the journal which are read only to most
      users. %                                                 11d1a6a
   fldirno[12],  %directory number for the original file%      11d1a7
   flpart[18],   %JFN for the partial copy%                    11d1a8
   flbpart[18], %JFN for the browse partial copy%              11d1a9
   florig[18],   %JFN for the original file%                   11d1a10
   flastr[18],   %address of the file name string%             11d1a11
   flpcst[18],   %address of partial copy name string%         11d1a12
   flbpcst[18]; %address of browse partial copy name string%
                                                               11d1a13
```

CORE MANAGEMENT OF FILE SPACE 12

When space for more data is needed, the following steps are taken in order until enough is found to satisfy the request (See (nls, filmnp, nwrngb), (nls, filmnp, newsdb), and related routines.): 12a

1. Core-resident pages are checked for sufficient free space. 12a1

2. Other pages are checked for free space. If one has sufficient space, it is brought in. 12a2

3. If garbage collection on any page in the file will yield a page with sufficient free space, then the page which will give the most free space is brought into core and garbage collected. 12a3

4. Otherwise a new page is created. 12a4

17069 Distribution

Kenneth E. (Ken) Victor, James E. (Jim) White, Charles F. Dornbush, Elizabeth K. Michael, Jacques F. Vallee, James G. Mitchell, L. Peter Deutsch, Diane S. Kaye, Don I. Andrews, Walt Bass, J. D. Hopper, Charles H. Irby, Harvey G. Lehtman, Richard W. Watson, Douglas C. Engelbart, N. Dean Meyer, James E. (Jim) White, Kenneth E. (Ken) Victor,

MLK 6-JUN-73 16:33 17071

TNLS Class Practice Journal Message Sending

Hi Judy, I thought you might enjoy finding a journal message from me in your journal file. Lucky you And just think, this will be recorded forever in harrcopy in the red binders, the black binders, and the distribution binders All of the TNLS class practice journal garbage is going to come through for us to file Ain't it wonderful? Marcia.

1

17071 Distribution
Judy D. Cooke,

CHI 6-JUN-73 17:28 17074

A replace number problem

Elizabeth, please see (Journal, 17064,). 1

17074 Distribution
Elizabeth K. Michael,

JDH 6-JUN-73 17:34 17075

Command Language Meeting

The next meeting of the Command Language / Novice-expert review groups is tentatively scheduled for Wednesday morning 13-JUN at 8:30. Let me know if you have a conflict (timewise). 1

17075 Distribution

Dirk H. Van Nouhuys, Richard W. Watson, Charles F. Dornbush, James C. Norton, Michael D. Kudlick, Diane S. Kaye, Marilyn F. Auerbach,

CHI 6-JUN-73 17:35 17076

Output File and Update File and the Origin statement

Dave, Output File and Update File replace the text from the begining of the statement to the second '; in the origin statement. If in adding text to this sttatement you delete the ';, NLS may delete some of your text. If this does not seem to describe your problem, please let me know. -- Charles. 1

17076 Distribution
David H. Crocker,

Robert,

We have np onjection with yur using the on-line file, however, with respect to contacting people therein referenced, we would appreciate your contacting us first and indicating what the nature of your contact will be. Reason for this is to avoid embarassing people or organizations referenced within on-line. You may recall that we first asked you prior to giving your organizations name to afsc and other potential CDC 6000 series entrants. In our experience, we have found that although it appears like buraucracy, the investment in detail ensures that no one is placed in an akward position. Appreciate your consideration in asking.

Best regards,

Jean

1

17077 Distribution
Robert N. Lieberman,

prof exercise

We would like you to do some specific things with the following information to see how efficiently you operate in the AHI system. I hope the instructions are sufficiently clear so you will have no difficulty in understanding what you are to do. 1

This exercise was generated on the execuport terminal. There are no correct answers to any of the questions, but we do to want get your general feelings. Try and work as rapidly as is comfortable for you. If you have time interruptions please note them. (Continue to read the instructions, then come back and replace the dashes with an X at the appropriate answer.) 2

time started (?) 2a

I have been using the AHI system for -24months. 2a1

When I am writing or editing a manuscript i feel very comfortable with the AHI language. 2b

X strongly agree --agree --neutral --disagree --strongly disagree. 2b1

Why? 2b2

The command language is consistant and almost self teaching, once one understands the basic matrix of editing commands. 2b2a

The AHI system is helpful in my everyday work. 2b3

X strongly agree --agree --neutral --disagree --strongly disagree. 2b4

time completed (?) 2c

17078 Distribution
James H. Bair,

Dave,
Got your message re: Health Sciences File System. I plan to contact them as soon as I clean out my backlog. Mark is about finished with the directory command for SMFS. How are things? ---Ron

1

17080 Distribution
David H. Crocker,

Non-errors in update and replace number: reply to (17066,), (17064,)

Dear Dave: 1

Output and update will, in fact, wipe out information in the origin statement up through the second semi-colon (the one following the users ident). You may have information after the first semi-colon and it will remain intact. This is not a bug. The items up to the second semi-colon include the file name, the date of the last update or output, and the person who did the updating. 2

The "number" entity in editing commands does not behave as the other entities do. It was created to preserve (right justified) columns of numbers. Thus, spaces may be inserted to the left of the number, and characters (other than "." or "," will be deleted In most normal instances, the proper entities to use are "word" or "visible". 3

17082 Distribution

Diane S. Kaye, Harvey G. Lehtman, Charles H. Irby, David H. Crocker,

MDK 7-JUN-73 08:55 17083

Command Language Meeting

Wed 13-JUN 8:30 o.k. MDK

17083 Distribution
J. D. Hopper,

JBN 7-JUN-73 08:57 17084

Comment on (17068,) on Alternatives to Command Language Effort Priority

Mike - I agree with your thesis that HELP and interface of NLS with other Network systems are the two priority issues. Thanks to NIC we are now out in the world, and can no longer afford to depend on the informal dissemination of NLS knowhow and can no longer sell users on a design with parochial features, even if these features are superlative.

1

17084 Distribution

Donald C. (Smokey) Wallace, Richard W. Watson, Don I. Andrews, Michael D. Kudlick, Mark Alexander Beach, Judy D. Cooke, Marcia Lynn Keeney, Carol B. Guilbault, Susan R. Lee, Elizabeth K. Michael, Charles F. Dornbush, Elizabeth J. (Jake) Feinler, Augmentation Research Handbook, Kirk E. Kelley, N. Dean Meyer, Kay F. Byrd, James E. (Jim) White, Diane S. Kaye, Paul Rech, Michael D. Kudlick, Ferg R. Ferguson, Linda L. Lane, Marilyn F. Auerbach, Walt Bass, Douglas C. Engelbart, Beauregard A. Hardeman, Martin E. Hardy, J. D. Hopper, Charles H. Irby, Mil E. Jernigan, Harvey G. Lehtman, Jeanne B. North, James C. Norton, William H. Paxton, Jeffrey C. Peters, Jake Ratliff, Edwin K. Van De Riet, Dirk H. Van Nouhuys, Kenneth E. (Ken) Victor

DSK 7-JUN-73 11:22 17085

Novice Team HELP Design

Please read this soon, and meet to discuss it. It needs to be considered in conjunction with the planned command reorganization and the utility NLS...Thanks

Novice Team HELP Design

This document contains a set of proposals formulated by the Novice/Expert Design Team for discussion and modification or approval by the Novice/Expert Review Team.

Novice or Expert?

We have observed that the new user starts out as a "beginner novice" with respect to the entire command set and with respect to the concepts he will need for survival. Printed material is useful to him at this point, but only on-line experience can get him to where he can pursue a personal goal or solve a problem. As he experiences using the system, certain operations are repeated often enough with success that they eventually become tools in his repertoire. Now he's able to devote more of his awareness toward getting whatever he logged in to get and less to tool-learning. (In our system, once he is familiar with the tool, he may not figure out it's most appropriate use for some time.)

Now the former beginner is moving into becoming an "expert" with respect to those operations he needs often and he is faced with the prospect of self-education with respect to those tools he hasn't needed yet or he once learned in a class and forgot. Many of us have discovered what happens when you know how to do everything you normally have to do. When a "semi-expert" is in a hurry to get something done and requires assistance, he either (a) does it some other inefficient, more difficult way or (b) asks someone who knows, but virtually never (c) consults a hardcopy or on-line manual. Certainly, when we have need for assistance here at ARC the information is available somewhere in written form, but by observation we can see that even motivated, tolerant users such as ourselves require much more on-line help and feedback than the system has now, especially in DNLS.

The main thing to keep in mind is that a user logs in and runs NLS in order to do work, not in order to learn more about the arbitrary and fascinating nature of the tool.

Thus, it is apparent that both "beginner novices" and "semi-expert-novices" need on-line help of some kind in order to efficiently perform all the tasks they would like to all of the time. 4h

41

Help System Requirements 5

5a

Listed below are our considerations with respect to designing something coherent to meet our various requirements. 5b

5b1

Attitude of User - Assume the user is lazy and hostile and ignorant. (These may not all be true all of the time, but people should be treated politely and without the usual sophisticated shorthand.) 5b2

5b3

Attentiveness of User - Assume the user is conscious and, in DNLS, watching the screen. (We would like not to have to make this restriction, but it seems necessary, given the state of the art.) People who type ahead rapidly are not going to be very helpable. 5b4

5b5

Multiplicity of Needs - We recognize that users as a whole group get into various different states of confusion with respect to the system, and thus require various types of aids to get them functioning purposefully again. 5b6

5b7

Optional Nature of Help - Help tools will be availabe by default to those officially defined "novice" users (see below) and otherwise should not be automatically in effect because the extra execution time and feedback activity is disturbing to experts. Any user will be able to turn them on with commands. 5b8

5b9

Command Set Size - Having observed the nature of the course from "beginner novice" to "semi-expert" we reject any method of assistance which prevents the novice from executing he full

command set. This means the new user will know the truth about the fact that he is operating with a known subset out of a large unknown. (We do endorse teaching and documenting simple forms of commands which have fancy options and we support the future plan of actually having a user-configurable command set.) By taking the risk of executing something "by accident", the beginner will (a) get in the habit of watching his feedback and (b) have plenty of space to grow at his own rate in his own direction, unhampered by someone else's evaluation of which commands he needs next. 5b10

5b11

Help in both NLS's - We acknowledge that the TNLS user also needs further system assistance, and we are concentrating particularly on DNLS in this document. 5b12

5b13

Command Language Formats - It is very important that we get CHI's proposed command recognition scheme, enabling us to rename many commands for a more natural and consistent language. In the meantime, Help aids should make any language easier. 5b14

5b15

DNLS Proposal 6

6a

Implementation and resource considerations aside, we propose a comprehensive set of aids designed to assist the user ("beginner novice" or "semi-expert") to raise his own level of proficiency for the purpose of being able to devote his main energy to the task he is handling. This proposal consists of three separate categories which are designed to assist users with the three categories of "problems" listed below. 6b

6b1

(1) The user does not know what command to use, or he knows the name of the command but not the exact syntax. [addressed by the Help Subsystem] 6b2

6b3

(2) The user is specifying a command and becomes confused

about the options available and the order of parameters. [addressed by Immediate Syntax Help feature] 6b4

6b5

(3) The user is uncertain about whether the system is running or waiting for him. Or, he has just entered input and doesn't know how the system is interpreting it. (For example, as text, viewspecs, or an address?) [addressed by the Status Feedback Line feature] 6b6

6b7

The HELP Subsystem Proposal 6c

6c1

The new command: 6c2

6c2a

Go to Help CA 6c2b

6c2c

puts the user into a system whose purpose it is to determine the level of questions he has and furnish the appropriate answers without a lot of hassle. 6c3

6c4

The user needs only to answer questions and follow simple instructions on the screen. QUIT gets him out of the subsystem. 6c5

6c6

HELP Subsystem Description 6c7

6c7a

Upon entry, the system informs him 6c7b

6c7b1

"This is the HELP subsystem. Type QUIT to get out. Please answer questions to obtain information about DNLS. 6c7b2

6c7b3

Do you need halp with a specific command?" 6c7b4

6c7b4a

YES - "Please type in the first word of the command:" 6c7b4b

6c7b4b1

Now the system recognizes the command, if possible, and shows parameter information in a good format. If more information exists, it asks: 6c7b4b2

6c7b4b2a

"Do you want more information?" etc. 6c7b4b2b

6c7b4b3

When the user is done viewing the information for this command, it asks: 6c7b4b4

6c7b4b4a

"Do you want to see any other commands?" 6c7b4b4b

6c7b4b4b1

YES - It continues allowing him to interrogate and view via the same method. 6c7b4b4b2

6c7b4b4c

NO - If he doesn't want help with a specific command, the system assumes that he has a function in mind and does not know what commands are available, so it proceeds: 6c7b4c

6c7b4c1

"DNLS command categories are: 6c7b4c2

6c7b4c2a

editing, files, (etc.) 6c7b4c2b

6c7b4c3

Please type in the name of a category for more information about the commands." 6c7b4c4

6c7b4d

When he has selected a valid category, the system asks: 6c7b4e

6c7b4e1

"Do you need help with a specific command?" 6c7b4e2

6c7b4e2a

YES - The user is in the loop described above. The way he finds out command names to investigate is by category. 6c7b4e2b

6c7b4e2c

We will define the state mechanism such that CD puts him back to a place where he can continue one level above with a different option, if desired. 6c7b4e2d

6c7b4e3

The Immediate Syntax Help Proposal 6d

6d1

Once the system has recognized the first word of a command, the user may type '? and receive a list of his options, as he currently may in TNLS. We will assume that he understands system symbolics for conventional options. If he is confused enough to want a list of all commands, he will receive a message telling him about the HELP Subsystem, where he can get the information organized in a meaningful way. 6d2

6d3

The feedback resulting from typing '? will appear in the literal feedback area, similar to the current Execute Status File. This display of options will remain on the screen until he chooses to remove it by typing CA. 6d4

6e

The Status Feedback Line Proposal 6f

6f1

We want a new display window which appears continuously if the user has selected the feature by executing the command: 6f2

6f2a

Set Feedback CA 6f2b

6f3

At any time he may cause it to disappear by typing 6f4

6f4a

Reset Feedback CA. 6f4b

6f5

The window is located directly above the Command Feedback Line and is updated in conjunction with changes affecting the arrow, the viewspecs window, and the name area. The Status Feedback Line shows the state of the system and, when only one option exists, shows the expected option in anglebrackets. 6f6

6f6a

States reflected in this line are-- 6f6b

6f6b1

Running - same as †T "running" or "processing suspended" 6f6b2

6f6b3

Command - system is expecting a command to be entered next or is in the process of recognizing a command. 6f6b4

6f6b5

Parameter - system has recognized at least the command name and is expecting he next parameter and there are more than one possible types of parameter which could be entered at this point. 6f6b6

6f6b7

Entity - branch, plex, character, etc. 6f6b8

6f6b9

Viewspecs 6f6b10

6f6b11

Levadj 6f6b12

6f6b13

Text 6f6b14

6f6b15

Address 6f6b16

6f6b17

File name 6f6b18

6f6b19

For example, if text is the only thing which can come next, the system displays "<Text>", but if there are several possibilities, it waits until the user has typed the first character and shows "Text". 6f6c

6f6d

Example: 6f6e

6f6e1

Status Feedback: <entity> 6f6e2

6f6e3

Command Feedback: Insert 6f6e4

6f6e5

Position Feedback: ↑ 6f6e6

6f6e7

Additional remarks about command feedback standards - 6f6f

6f6f1

The arrow should in all cases be used only during command specification and should point to the next position of

input. Where parameters are expected, it should point directly below the appropriate prompt or status in the Status Feedback Line. This means that under the proposed command recognition scheme it will be very obvious whether the system has recognized a whole word yet and whether there are more words to type in the command name itself. The use of the arrow must be consistent. 6f6f2

6f6f3

If the system receives unrecognizable input and goes to an earlier state, we want the arrow to show the new current next command character position and a question mark should appear directly above the arrow in the Command Feedback Line. 6f6f4

6f6g

Additional Proposal - ERROR HANDLING 7

7a

This is the basic set of tools we propose for Help. One additional area remains to be considered with respect to aiding the user in determining the nature of his state. We propose that a user be able to execute a new command 7b

7b1

Set Error Help CA 7b2

7b3

Reset Error Help CA 7b4

7c

which will put him in a special mode with respect to error messages. 7d

7e

We have observed that error messages generally fall into two categories, those representing states anticipated by the system designers, and those representing undesirable and unexpected system states. The user has a short-term goal of continuing to do his work, no matter what. To do this, he needs to understand a certain level of information about what happened and what safe

action he may take next. If special error feedback is ON, we propose displaying errors in the form-- 7f

7f1

<message>--type CA to get more information 7f2

7g

If he types CA, the system uses the literal feedback area to show a further explanation of the state and what to do about it. 7h

7h1

NOTE--Some errors, especially with respect to that entity in which he may have hours invested, his FILE, are members of the unfortunate category called "unxpected states". For no readily explanable reason, the system cannot complete an operation. It might be a data-dependent bug or a randomly bad file. The user needs to know the recommended course of action. Seasoned users know that continuing (at some unknown risk) may prove to be profitable, in spite of bad system states. They are also used to the many other errors which may get propagated in a chain reaction as the dinasaur dies. However, for anyone who selects the Error Feedback feature, the message will be very conservative and simple nature, like 7h2

7h2a

"Quit out of NLS. RESET. Enter NLS and reload the file." 7h2b

7h3

The vocabulary used in these messages should be taught to "beginner novices." The implementation design has to be simple because the state of the system may be very very bad at this point. 7h4

7h5

We want to change the size of the message area by extending it's two lines clear to the right of the screen and making date/time information available only by command. We recognize the need to go through the system and at least reword common error messages and also take advantage of the two lines, where applicable. We take the view that the implementers of these features can be trusted to choose appropriate text for messages and help feedback and make an experimental system available for explicit content review by committee, if desired. 7h6

7i

"Novice Mode" 8

8a

System parameters affecting feedback and help will normally have defaults which are biased toward the expert user. Therefore it is convenient to implement a scheme whereby a user may flag himself as a novice via the IDENT system and automatically receive "novice" parameter settings on entry to NLS. (The syntax for this feature should come from the person(s) concerned with that system.) 8b

8c

In addition, a command should be available to set these parameters to "novice" or "expert" settings for the duration of a session: 8d

8d1

Set Novice CA 8d2

8d3

Reset Novice CA 8d4

8e

System parameters affected are: 8f

8f1

DNLS: set status feedback ON, set error help ON 8f2

8f3

TNLS: show selections, levadj, input, etc. - all parameters to give full feedback, statement numbers ON 8f4

8g

In addition, under the new command recognition scheme, the system will automatically supply the novice with a SPACE before all typed in command words so that recognition takes place with one consistent algorithm. 8h

8i

****

Please consider this document in your next review meeting and communicate your comments to the design team. We are anxious to have implementation begin because of UTILITY time constraints.

Novice Team HELP Design

(J17085) 7-JUN-73 11:22; Title: Author(s): Diane S. Kaye/DSK;
Distribution: /EKM RWW JEW CHI DVN MFA MDK CFD; Sub-Collections:
SRI-ARC; Clerk: DSK;
Origin: <KAYE>NEDOC.NLS;8, 7-JUN-73 11:12 DSK ;

17085 Distribution

Elizabeth K. Michael, Richard W. Watson, James E. (Jim) White, Charles H. Irby, Dirk H. Van Nouhuys, Marilyn F. Auerbach, Michael D. Kudlick, Charles F. Dornbush,

The Buggthat really was [and is)

Thank you both for the prompt reply. I will be careful with the replace number.

I am afraid, tho, that the Updat/Output stuff really was a bug. I never touch the filename, thru the secoond ';. I only do Insert Text > to the Origin.

I have had the entire statement wiped out at least twice. And that is only since I was sure of the phenomenon. To the best of my knowledge, I did not do anything special either of these times.

-- Dave

1

17086 Distribution
Charles H. Irby, Harvey G. Lehtman,

Ron -- Things are busy. And in two weeks, it gets worse when we get a new sect'y who I have to train to use all the wonderful editors.

Jim White told me about the Direcotry command. YEAH

--Dave

17087 Distribution
Ronald M. Stoughton,

Carbon Copies

This is a quick reply to (16935,), to record some initial reactions and raise one somewhat tangential question. 1

My initial reactions are that the concept of separating action from "cc" type of distribution items is a good one. 2

However, we should be sure to include "secondary distribution" items in the "copies" category at distribution time. 2a

I also suggest that to be sure the user understands the distinction, we modify the initial file branch statements to look like this: 2b

(JOURNAL) Journal Mail: Action Items
(COPIES) Journal Mail: No Action Required 2b1

My somewhat tangential question is opened by the intention to make an addition to the Journal file header (origin) statement. 3

The NIC needs one more category of information in the file header. Since we are going to revise the header (with the attendant software changes which that presumably implies for the Journal subsystem itself), then I'd like to take this opportunity to push for this need: namely, a field for "title key words", 3a

The journal system should eventually be modified to scan the title at submission time, extract all the relevant key words by discarding prepositions and other noise words, and put them into the header. 3b

Addition of the new field to the header at this time would make it easier later (it seems to me) to modify the journal to do the key word thing. That's the reason for jumping in at this time with this somewhat tangential comment. 3c

(The "key word thing" would greatly facilitate the making of the title word index, which currently does not exclude ANY noise words. 3c1

(The list of noise words against which the title would be matched would be provided in an NLS file accessible to the Journal.) 3c2

17088 Distribution
Diane S. Kaye,

Am in the throes of trying to learn how to get my NETED draft out to the USING gang.
Thought you'd like to know. (If you know how to do it (it's currently in runout form on Multics), do tell.) cheers, map 1

17089 Distribution
David H. Crocker,

KEV EKM CHI JEW 7-JUN-73 14:50 17090

interfacing nls with other subsystems

this document is a rewrite of the document you all read previously. it incorporates the suggestions made. i would like each of you to read and comment before i submit it to the review team.

interfacing nls with other subsystems

interfacing nls with other subsystems

(action) Documents to respond to, or to act upon 4

RWW Second Request for Plans and Review Status
2-MAR-73 10:09 14867 Message:
A couple of weeks ago I requested task area pushers and review pushers to send me brief plans and time estimates and status of where thy planned to start in the design review cycle outlined in (14164,). Some people responded, others like me didn't. The last two weeks or so have been incredibly hectic for most people so I understand, but the next wek or so looks better so please send me the requested info next week if you haven't already. Thanks
4a

(old) old journal documents of interest 5

DIA Cross Reference system: instructions for use
3-MAY-73 10:39 (MJOURNAL, 16275, 1:w)
5a

Comments: Try it out I would like to improve the interrogate commands but know know exactly what is needed - please use it, find out what you would like to be able to do, and send me a message. Lsso, tell me about any problem. 5a1

KEV photographing ARC
5-DEC-72 13:40 (MJOURNAL, 13137, 1:w)
*****Note: Author Copy*****
5b

KEV Proposal from Ken Victor to ARC for Special Photographic Work
19-SEP-72 7:45 (LJOURNAL, 11822, 1:w)
*****Note: Author Copy*****
5c

Comments: This proposal for work by Ken Victor is submitted to the ARC Journal by JCN for record purposes. 5c1

HGL First ARC Photo Selection
16-FEB-73 10:47 (IJOURNAL, 14469, 1:w)
5d

Comments: Please see the array of photos outside of Walter's office. Vote for ten before 3:00 PM Friday, 23 February. 5d1

JCN ARC Victor-Photo Selection Team
24-JAN-73 13:30 (IJOURNAL, 14062, 1:w)
5e

JCN ARC in Action Photography

interfacing nls with other subsystems

19-SEP-72 7:48 (LJOURNAL, 11823, 1:w) 5f

(administration) Administrative type things 6

(nls) nls notes, etc 7

HGL NLS File Structure: Documentation
6-JUN-73 15:49 (GJOURNAL, 17069, 1:w) 7a

Comments: This document was created in response to several requests from network users desiring to create interfaces to NLS files. It should also be of interest to NLS system programmers. The previously available documentation was sketchy at best, scattered through several files, and very often misleading. Copies of this file should be accompanied by copies od the L10 Manual and the source code files (nls, const,), (nls, data,), (nls, filmnp,), (nls, strmnp,), (nls, utilty,) and (nls, ioexec,) to permit readers to examine the relevant code. 7a1

KEV DIA DSK plan of attack for getting DNLS into the world
24-MAY-73 15:07 (IJOURNAL, 16800, 1:w)
*****Note: Author Copy***** 7b

KIRK Proposal for a Structural Language that Communicates Databases Online
20-MAY-73 19:16 (IJOURNAL, 16347, 1:w) 7c

Comments: This file has been formatted for easy online access and is not intended to "flow" if read in hardcopy. Much thanks to Mill Jernigan and Dirk vanNouhuys for their comments and suggestions. 7c1

(operations) Operations notes, measurement 8

(seas) Seas communication 9

DNB Proposed ARPA Energy Project Work Statement
19-APR-73 16:37 (MJOURNAL, 16020, 1:w) 9a

Comments: This work statement describes the type of areas the energy project headed by Dave Berg is going to be looking at. Preliminary discussions with ARPA NMR Office indicate that of the two main goals specified their interest is primarily in the

data managemnt system rather than setting up a community at this time, although they feel some effort can be expended in this direction as I understand it (RWW) 9a1

CFD Comments on proposed Coding Standards
17-APR-73 09:46 (MJOURNAL, 15974, 1:w)
9b

Comments: This note is in response to (mjournal,15934,1) Sorry about yesterday's submission of my journal command form (due to careless bug selection I suppose). 9b1

HGL KEV Proposed NLS Code Format and Documentation Standards
13-APR-73 12:53 (MJOURNAL, 15934, 1:w)
*****Note: Author Copy*****
9c

Comments: Suggested standards for NLS code. The most important part is the suggestion for documentation and commenting of files and procedures. We will soon will attempt to clean up NLS using these or similar conventions. A general meeting of NLS programmers will be held on Wednesday, 18 April, for further discussion and possible clooective modification. 9c1

DCE RWW JCN The Augmanted Knowledge Workshop
1-MAR-73 14:07 (IJOURNAL, 14724, 1:w)
9d

Comments: preprint of paper to be given at the National Computer Conference in June 1973 9d1

DCE Visit Log: 4 Apr 73, Dick Garrett, Gary Stowell, Phil White, from Purdue
6-APR-73 18:19 (MJOURNAL, 15607, 1:w)
9e

Comments: Notes on their recent activity, and collaboration-proposal possibility on DPCS, graphics, SEAS 9e1

DCE Visit Log: 5 APr 73, William Hanna, Director of the Bureau of Data Processing for the Social Security Administration
6-APR-73 17:40 (MJOURNAL, 15606, 1:w)
9f

Comments: Possible client for Workshop Utility, particularly SEAS 9f1

JEW Farming Batch Work out to UCSB -- A Scenario

interfacing nls with other subsystems

4-APR-73 17:51 (MJOURNAL, 15491, 1:w) 9g

Comments: This is a scenario for using UCSB's batch processing facilities via the Net. The NIC was motivated to become familiar with this subject; what we learned is hereby made available to anyone else in ARC who may be interested. 9g1

DIA Summary of review team for getting DNLS out into the world meeting 3/28/73
30-MAR-73 11:40 (MJOURNAL, 15399, 1:w) 9h

DCE Visit Log: 30 Mar 73, Graphics Group from LRL
30-MAR-73 17:40 (MJOURNAL, 15397, 1:w) 9i

Comments: See (15250,) for background. 9i1

DCE Outline of purpose and need relative to SEAS marketing help from SRI people
29-MAR-73 16:55 (MJOURNAL, 15377, 1:w) 9j

Comments: Handout to Tom Humphrey, Ralph Keirstead, Donn Parker and John Wensley at meeting 29 Mar 73; see (15375,) 9j1

RWW Help Needed in Knowledge Workshop Work Station Development
27-MAR-73 9:37 (MJOURNAL, 15313, 1:w) 9k

DCE Phone call to Licklider: JCN visiting him on 5 Apr, and NLS Utility services
26-MAR-73 11:47 (MJOURNAL, 15269, 1:w) 9l

Comments: Tie to Project Cambridge, and Items (15267,) and (15268,); a brief touch on SEAS NP; a new, distributed, Bio-Cybernetic project from ARPA HRRO (Kibler) 9l1

DCE Visit Log: 2 Mar 73, Joe Markowitz and John Strayhorn, Project Cambridge and Stew Robinovitz, U of Michigan
26-MAR-73 9:13 (MJOURNAL, 15267, 1:w) 9m

Comments: ATTEN jcn rww mdk jake kev chi / FYI bc dls pr: Possible community subscribers; interest in IMLAC setup soon; interest in adding to Resource Notebook; related to Parker (115268,) and Licklider (115269,). 9m1

interfacing nls with other subsystems

DCE Visit Log: 14 Mar 73, Alan Cobham, Bill Burge, Moshe Zloof, and Dave Grossman, IBM Research Laboratories
16-MAR-73 15:33 (LJOURNAL, 15122, 1:w) 9n

Comments: 9n1

WLB Dialog-Supported Debugging System
15-MAR-73 15:46 (LJOURNAL, 15101, 1:w) 9o

Comments: Here's a think-piece on a possible addition to ARC's acronym soup -- DSDS. These ideas are still in pretty rough form, and your feedback will be appreciated. The printed document is about 20 pages long, so please give the system a break by picking up Xerox copies from my office. -- Walt 9o1

DCE COORDINATED INFORMATION SERVICES for a DISCIPLINE- OR MISSION-ORIENTED COMMUNITY
12-DEC-72 10:29 (MJOURNAL, 12445, 1:w) 9p

Comments: Paper for Second Annual Computer Communications Conference, San Jose, 24 Jan 72 9p1

DCE Phone Log: 12 Oct 72 from Dick Garrett
15-OCT-72 16:49 (LJOURNAL, 12218, 1:w) 9q

Comments: 9q1

HGL Phone call to Lance Miller of IBM
13-JUL-72 9:41 (KJOURNAL, 11029, 1:w) 9r

DCE Comment on user-feature change coordination, and (10587,)
31-MAY-72 10:01 (JJOURNAL, 10614, 1:w) 9s

MDK on mouse/keyset macros
30-MAY-72 13:52 (JJOURNAL, 10609, 1:w) 9t

KEV additional use of case shifts
25-MAY-72 16:17 (JJOURNAL, 10587, 1:w)
*****Note: Author Copy***** 9u

KEV macros for the mouse and keyset

interfacing nls with other subsystems

25-MAY-72 16:10 (JJOURNAL, 10586, 1:w)
*****Note: Author Copy*****
9v

DCE Possibility for SEAS to Take on a Small Contract with CIRAD
17-MAY-72 18:22 (IJOURNAL, 10536, 1:w)
9w

KEV integration of new people
28-APR-72 12:58 (IJOURNAL, 10255, 1:w)
*****Note: Author Copy*****
9x

HGL SEAS Team Notes
27-APR-72 10:38 (IJOURNAL, 10241, 1:w)
9y

Comments: While the content seems to fulfill many of the requests of JCN's Plan Elements document (7634,), the structure could be improved. A discussion of times scales and staffing needs is also necessary. We should have a meeting before WHPs departure. It seems that Tuesday would be a good day for the SEAS team to meet next.
9y1

KEV augmentation of arc operating systems programmers
25-APR-72 12:36 (IJOURNAL, 10224, 1:w)
*****Note: Author Copy*****
9z

KEV augmentation of ARC system programmers
20-APR-72 12:53 (IJOURNAL, 10202, 1:w)
*****Note: Author Copy*****
9a@

(tug) Tenex stuff
10

DCW Copy of DCW Sndmsg re Group Allocation Operations Details
3-JUN-73 10:01 (IJOURNAL, 17008, 1:w)
10a

LPD 29-APR-73 23:45 16236
GP semi-design
Location: (MJOURNAL, 16236, 1:w)
10b

Comments: I will complete this before our next meeting (to be held this week, hopefully)
10b1

DHC Comments after two days' experience with IMNLS/DNLS over the

interfacing nls with other subsystems

Net: there are some problems
17-APR-73 17:40 (MJOURNAL, 15977, 1:w)
10c

Comments: I would like to be involved with any process to deal with these issues, if I can help 10c1

KEV maintaining the user.idents file for login
11-OCT-72 14:33 (LJOURNAL, 12122, 1:w)
*****Note: Author Copy*****
10d

Comments: this document describes the automatic handling of idents that has been running for some time now 10d1

KEV MAINTAINING <IDENTFILE>USER>ACCOUNTS
18-SEP-72 9:08 (LJOURNAL, 11818, 1:w)
*****Note: Author Copy*****
10e

Comments: THIS DOCUMENT DESCRIBES THE USE AND MAINTAINANCE OF <IDENTFILE>USER.ACCOUNTS WHICH IS USED AT LOGIN AND CHANGE ACCOUNT TIME 10e1

MEH MOUSE AND KEYSET CONVERTER, a first cut description.
11-APR-73 08:50 (MJOURNAL, 14901, 1:w)
10f

KEV description of arc mods to standard tenex
4-APR-73 20:31 (MJOURNAL, 15493, 1:w)
*****Note: Author Copy*****
10g

Comments: this is a copy of a file sent to bbn. it contains overall descriptions of the modifications needed to run tnls on standard tenex 10g1

KEV arc mods needed to run tnls
4-APR-73 20:29 (MJOURNAL, 15492, 1:w)
*****Note: Author Copy*****
10h

Comments: this file is a copy of one sent to bbn. it contains detailed instructions as to what modifications must be made to standard tenex to run tnls 10h1

KEV final imlac protocol (?)
8-FEB-73 16:21 (IJOURNAL, 14345, 1:w)

KEV EKM CHI JEW 7-JUN-73 14:50 17090

interfacing nls with other subsystems

*****Note: Author Copy*****

10i

Comments: this document supercedes any previous similar documents

10i1

JEW On Making NLS, the Journal, and the Network the Best of Friends
6-FEB-73 14:44 (IJOURNAL, 14312, 1:w)

10j

Comments: Mike-- This is the information you asked for, I think. It's material for the RFC we've talked about as well. Critiques, etc. gratefully accepted. --Jim

10j1

CHI Our Current Thinking on EXEC Level Mail Sending and Reading
6-FEB-73 11:38 (IJOURNAL, 14308, 1:w)

10k

Comments: We know that Bob Kahn and others are interested in this subject and are writing an RFC discussing these issues and inviting all interested parties to attend a meeting to be held here at SRI in a few of weeks to discuss the topic more fully.

10k1

KEV final(?) imlac protocol
5-FEB-73 15:33 (IJOURNAL, 14301, 1:w)
*****Note: Author Copy*****

10l

Comments: this document supercedes my previous documents. this protocol wll be implemented in the very near future. please get in touch with me about any questions or comments.

10l1

CHI Proposed EXEC level capabilities: Journal Submission and Printing
20-JAN-73 20:07 14006 Message:
I recommend the addition of two more entry points into NLS, one for Journal submission and one for Print Journal. I recommend that a new EXEC command be created, say JOURNAL, such that there is are two subcommands, one for submitting a message and one for printing your Journal mail. The default for not specifying which submode should be submission, I think. Also, the Print Journal function should be slightly modified so that it marks the statements it has already typed -- so that repeated use of the command will result in only new material being typed. NOTE: If we can fit this into SNDMSG and MESSAGE, all the better. -- Charles

10m

RWW NP for a Printer Escape Mechanism

interfacing nls with other subsystems

17-JAN-73 10:05 13857 Message:
A problem has arisen today which has been seen before, namely someone sends a very large file or large number of copies of a file to the printer and then realizes he made a mistake, in the meantime the printer is tied up for 20-30 minutes. Can an escape mechanism be put in the system so the the operator can tell the printer process to stop printing the current file and move on to the next on in the queue?

10n

KEV more on imlac protocol
5-JAN-73 13:45 (MJOURNAL, 13708, 1:w)
*****Note: Author Copy*****

10o

Comments: this document includes what the user program will see as input for big character input from the IMLAC 10o1

MDK Allocation of Disk Space
4-JAN-73 8:47 (MJOURNAL, 13690, 1:w)

10p

DCW New Charges at BBN
3-JAN-73 11:03 (MJOURNAL, 13663, 1:w)

10q

DIA Proposed JSYS's for reading monitor core.
23-DEC-72 11:19 (MJOURNAL, 13509, 1:w)

10r

Comments: I hope BBN will implelent these JCIES in the standard TENEX. They will be used by future versions of SUPERWATCH, and perhaps can be used for monitor debugging. 10r1

KEV coming changes to ADVISING in the EXEC
14-DEC-72 18:45 (MJOURNAL, 13292, 1:w)
*****Note: Author Copy*****

10s

KEV tenex news
15-DEC-72 14:54 (MJOURNAL, 13366, 1:w)
*****Note: Author Copy*****

10t

Comments: this is a copy of the document smokey and i received giving current news about tenex (received from bbn) 10t1

KEV proposed new imlac protocol for transmission from imlac to tenex

interfacing nls with other subsystems

14-DEC-72 18:44 (MJOURNAL, 13365, 1:w)
*****Note: Author Copy*****

10u

Comments: this is the protocol that we will eventually implement when we get around to cleaning up more of the display code (within 6 months)

10u1

DIA Measure of CPU time spent converting characters for our line printer
19-DEC-72 16:45 (MJOURNAL, 13423, 1:w)

10v

LPD Reply on proposed new IMLAC protocol
16-DEC-72 21:52 (MJOURNAL, 13414, 1:w)

10w

Comments: reply to 13365

10w1

CHI Comment on new IMLAC input protocol
17-DEC-72 11:39 13402 Message:
Ken, in your new imlac input protocol you specified that upon recovering from a crash, the imlac should send ESC ESC ESC ESC. Will this reset info get to the user program??? If not, how are we going to remain consistent in, for example, viewspec input (mouse buttons down)? In addition to the specs you wrote, I think we need a write up of what the user program will receive. -- Charles

10x

KEV new ADVIZ jsys
14-DEC-72 16:17 (MJOURNAL, 13291, 1:w)
*****Note: Author Copy*****

10y

Comments: this document describes a new version of ADVIZ. The need for this new version grew from Smokey's and my trip to BBN. (see (13292,) for resulting side effects of this new implementation.) Please make any comments in the next few days in order that i may send this to BBN for approval before final implementation.

10y1

KEV expunge at logout time
I would like to see us put back the expunge at logout time that we removed some time ago. By doing this, we would have one less difference from standard TENEX as well as the fact that temp files would disappear properly at logout time. Please let me know your feelings on the matter.
14-DEC-72 9:00 13297 Message: Message:

Author Copy*****

10z

DIA Proposed JSYS's to collect stuff from the Monitor
6-DEC-72 15:59 (MJOURNAL, 13184, 1:w)

10a@

Comments: Let me know what you think. Then perhaps we should send this off to BBN.

10a@1

JCP The New DELD
10-NOV-72 11:21 (LJOURNAL, 12710, 1:w)

10aa

KEV <SYSTEM>SYSDOC.TXT;3 as of 10/18/72 18:47
18-OCT-72 18:53 (LJOURNAL, 12257, 1:w)
*****Note: Author Copy*****

10ab

Comments: this is the sysdoc message prior to its obsoletion at the above time

10ab1

DCW Documentation for Bryant Drum Diagnostic
18-OCT-72 14:41 (LJOURNAL, 12264, 1:w)

10ac

WRF Documentation for XCORE Diagnostic
18-OCT-72 14:32 (LJOURNAL, 12263, 1:w)

10ad

WRF Arc Report Form for DEC Hardware Problems
18-OCT-72 14:15 (LJOURNAL, 12262, 1:w)

10ae

MDK Loading and Logging in from the ARC IMLAC
16-OCT-72 9:04 (LJOURNAL, 12232, 1:w)

10af

Comments: This note describes a sequence of steps that should enable you to load the SRI-ARC IMLAC terminal and log in to TENEX. Would appreciate it if you'd try it out and tell me of any bugs or problems before Thursday (10/19). Note that virtually the same procedure should work at ICCC, except for one or two changes where terminal location must be designated. These changes will be defined before the conference begins, and you will be informed of them.

10af1

DCW an answer to WHAT HAPPENED TO SYSTAT?

interfacing nls with other subsystems

16-OCT-72 9:02 (LJOURNAL, 12228, 1:w) 10ag

KEV creating new users
12-OCT-72 11:39 (LJOURNAL, 12144, 1:w)
*****Note: Author Copy***** 10ah

DIA Description of Compute-bound cutoff system
11-OCT-72 16:02 (LJOURNAL, 12130, 1:w) 10ai

Comments: Compute-bound jobs will be suspended from running during periods of heavy load under TENEX 1.29.01. 10ai1

KEV erwrt - a new jsys to be implemented in 129.01
4-OCT-72 17:45 (LJOURNAL, 12067, 1:w)
*****Note: Author Copy***** 10aj

Comments: there will be a new subsystem, WRTERR, to make use of this jsys 10aj1

PR Analysis Notes: Some Typical Measurements
4-OCT-72 9:06 (LJOURNAL, 12058, 1:w) 10ak

MEH Loading Procedures for the ARC Imlac
26-SEP-72 16:41 (LJOURNAL, 11938, 1:w) 10al

WRF New Jsys 411 - .CHPSW
26-SEP-72 16:02 (LJOURNAL, 11937, 1:w) 10am

WRF Improved SIN - Jsys 52
26-SEP-72 15:54 (LJOURNAL, 11936, 1:w) 10an

DIA Results of TTY-simulation process clock measurements
26-SEP-72 13:59 (LJOURNAL, 11933, 1:w) 10ao

KEV new jsys uasqd
17-SEP-72 9:35 (LJOURNAL, 11817, 1:w)
*****Note: Author Copy***** 10ap

Comments: this jsys will be implemented in tenex version 129.01 10ap1

interfacing nls with other subsystems

KEV new jsys sbcim
17-SEP-72 9:34 (LJOURNAL, 11816, 1:w)
*****Note: Author Copy*****
10aq

Comments: this jsys will be implemented in tenex version 129.01 10aq1

KEV new jsys gcoor
17-SEP-72 9:32 (LJOURNAL, 11815, 1:w)
*****Note: Author Copy*****
10ar

Comments: this jsys will be impemented in tenex version 129.01 10ar1

KEV new jsys
17-SEP-72 9:31 (LJOURNAL, 11814, 1:w)
*****Note: Author Copy*****
10as

Comments: this jsys will be implemented in version 129.01 of tenex 10as1

DIA Why TENEX 1.29 has been so bad, including a message from DLM
14-SEP-72 8:59 (LJOURNAL, 11784, 1:w)
10at

LPD Additions to IMLAC protocol
8-SEP-72 18:04 (LJOURNAL, 11726, 1:w)
10au

Comments: per our discussion today 10au1

LPD Possible cause of an IMNLS bug
27-AUG-72 22:41 11580 Message:
Re IMNLS bug causing top of text area not to be redisplayed after Execute Status File: I suspect that NLS is doing an "unsuppress DA" and expecting it to reverse some "suppress string"s. This is not the way IMNLS interprets these commands. KEV or CHI, please contact me to straighten this out.
10av

Comments: see (11578,1:w), item (5) 10av1

JGM Update to IMNLS bug Report
25-AUG-72 23:13 (KJOURNAL, 11578, 1:w)
10aw

Comments: This updates a previous issue of this log of known kmnls bugs and their status. The status appears to imply that

the list of reported but uncorrected bugs is growing monotonically and none are being fixed. 10aw1

DIA About the partition scheduler: some questions
25-AUG-72 17:59 (KJOURNAL, 11575, 1:w)
10ax

JGM Catalogue of Known IMNLS Bugs.
31-JUL-72 14:14 (KJOURNAL, 11186, 1:w)
10ay

Comments: It is hoped that this file (imlac,imnlsbugs,:) can be used as the primary means of communicating about the many IMNLS bugs and can aid in getting them fixed. 10ay1

KEV new jsies
25-JUL-72 11:15 (KJOURNAL, 11137, 1:w)
*****Note: Author Copy*****
10az

Comments: this is the description of two new jsies to be implemented soon in our version of monitor 129. they are the first step in not having to specify device type to nls. 10az1

EEP Monitor 1.29 Bug
5-JUL-72 15:58 (KJOURNAL, 10952, 1:w)
10b@

PHL Monitor 1.29 Bug
19-JUN-72 15:27 (JJOURNAL, 10764, 1:w)
10ba

PHL Monitor 1.29/Exec 1.38 Bugs
17-MAY-72 17:01 (IJOURNAL, 10535, 1:w)
10bb

KEV new jsys
8-MAY-72 18:40 (IJOURNAL, 10391, 1:w)
*****Note: Author Copy*****
10bc

KEV parameterizing bugstrings - an update
27-APR-72 15:20 (IJOURNAL, 10244, 1:w)
*****Note: Author Copy*****
10bd

KEV delnf jsys and gtjfn(-4) jsys
25-APR-72 12:23 (IJOURNAL, 10223, 1:w)

interfacing nls with other subsystems

*****Note: Author Copy*****

10be

KEV delnf jsys and -4 option to gtjfn
20-APR-72 14:13 (IJOURNAL, 10205, 1:w)
****Note: Author Copy****

10bf

KEV A Request for Comments About Startup Switches
14-MAR-72 13:18 (HJOURNAL, 9398, 1:w)
****Note: Author Copy****

10bg

KEV reclaiming resident ddt
11-MAR-72 18:11 (GJOURNAL, 9504, 1:w)
****Note: Author Copy****

10bh

KEV sri-arc changes to standard tenex
9-MAR-72 13:28 (GJOURNAL, 9485, 1:w)
****Note: Author Copy****

10bi

KEV updates about ddt flushing
14-FEB-72 15:43 (GJOURNAL, 9124, 1:w)
****Note: Author Copy****

10bj

interfacing nls with other subsystems

(J17090) 7-JUN-73 14:50; Title: Author(s): Kenneth E. (Ken) Victor, Elizabeth K. Michael, Charles H. Irby, James E. (Jim) White/KEV EKM CHI JEW; Distribution: /EKM CHI JEW; Sub-Collections: SRI-ARC; Clerk: KEV; Origin: <VICTOR>KEV.NLS;489, 7-JUN-73 12:55 KEV ; '(/ "KEV"; jform2

MLK 7-JUN-73 15:12 17091

New IDENT

Marilyn told me you'd like to change your ident because your last name has changed from Perez to Graf-Webster (correct my spelling if its wrong). It's a rather complicated process because you have to make your old ident a synonym for your new one, so if you don't mind, I'll do it for you. Is EGW or EGW2 OK for your new ident? Let me know and I'll make the necessary changes. Marcia Keeney. 1

17091 Distribution
Erika Perez,

JCN 8-JUN-73 07:49 17092

Memo re NCC NSRDC/ARC Meeting and RLL Questions

Thanks for helping me to meet with Dr. Gleissner and the others at the NCC this week. I met them at the conference reception and noted that they attended Doug's paper Wednesday am. I wonder what Gene thought of his presentation. Doug and Dr. G. were not able to meet due to funny schedules...but Gene says he will be out in California I think in July and would be willing to drop in at ARC. that is the best place for him to see what it is we are developing and the best of the display NLS. we can show him the IMLAC, too, of course. 1

I have read your tonorton file and will respond next week when I get out from under the load of work that has piled up in my absence (the 30 sdnmsgs and 10 journal items I got since Monday has not cleared up my desk, I'm afraid. 2

I still think that the journal is the best way for you to get your ideas, suggestions, questions to me , for I can then keep control of them even if they ae informal or preliminary..but the tonorton file as an "under development" storage place is still ok for me to peek in. If we don't move stuf into the journal it eventually goes away or becomes forgotten or buried in large files.... or was the journal ue what you intended all along?? 2a

17092 Distribution
Robert N. Lieberman,