Resubmitted Reply to WLB re Journal Headers

This is a reJournalized item, because I suspect that accidentally having g viewspec rather than h truncated the end of the item as previously submitted. 1

I feel that even WLB's possibility 4 doesn't quite answer the needs of knowledge workers. The Journalization of a document should allow the document to appear exactly as the user prepared it if he gave any directives at all. The Journalizer should not have to override the Journal, as Walt too quietly provided for. The Journal formatting should be a default for documents with no directives. A Journalized document should be the same document as it was before Journalizing, with the upper margin adding the information about Journalization, and the right margin, outside the text as prepared, giving the statement numbers. This would be possible by the Journal recognizing a slightly larger page for its own recording purposes. 2

I said essentially the same in (15440,) and for emphasis I quote it here: 3

Allow the journalizing of items exactly as prepared, with the addition only of a notation giving the date of journalization and the initials of the journalizer, as a superheader. Added headers and statement indications should be marginal, with the Journal system assuming the burden of allowing for the widening or lengthening of pages to permit its additions. 4

16031 Distribution
Stanford Research Institute ,

Examples of Journal Header Mutilation

Examples of the Journal screwing up the input: Tables in 15406 and 16017 as delivered by Output Processor. 1

The burden should be on the Journal to take these tables as prepared, the burden should not be on the user to try to anticipate how the Journal will mutilate the tables. 2

16032 Distribution
Stanford Research Institute ,

JBN 20-APR-73 13:08 16033

More on Burchfiel's Statement Number Problem

Marilyn and Charles -- Jerry says he was unsuccessful in making a text file as described in yesterday's item, but that when he used Output Sequential rather than Output Device Sequential it worked to give him the right statement number format. He cannot find Output Sequential documented. -- Jeanne 1

16033 Distribution

Burchfiel, Jerry D. , Auerbach, Marilyn F. , Irby, Charles H. ,
Kudlick, Michael D. ,

MicroLISP paper (1973 IJCAI)

Note: this paper has been accepted for presentation at the International Joint Conference on Artificial Intelligence, to be held in Stanford, Calif., August 1973. Please do not make copies of this paper other than for personal use before the proceedings of this conference have been published. 1

HEADING 2

Title: A LISP Machine with Very Compact Programs 2a

Author: L. Peter Deutsch 2b

Affiliation: Xerox Corporation, Palo Alto Research Center (PARC) 2c

ABSTRACT 3

This paper presents a machine designed for compact representation and rapid execution of LISP programs. The machine language is a factor of 2 to 5 more compact than S-expressions or conventional compiled code, and the compiler is extremely simple. The encoding scheme is potentially applicable to data as well as program. The machine also provides for user-defined data structures. 3a

INTRODUCTION 4

Few existing computers permit convenient or efficient implementation of dynamic storage allocation, recursive procedures, or operations on data whose type is represented explicitly at run time rather than determined at compile time. This mismatch between machine and language design plagues every implementor of languages designed for manipulation of structured information. Neither of the usual software solutions to this problem is entirely satisfactory. Interpretive systems are easy to build and flexible, but intrinsically inefficient; compilers which approach the efficiency of those for conventional languages are hard to write and often force the implementor (and user) to sacrifice valuable but expensive language features for the sake of efficiency. On many machines compiled code also occupies at least as much space as a structured representation of the source program. 4a

An alternative approach to this problem is to design machines whose code structure more closely resembles that of their major programming language(s). This approach of tailoring the machine to the language was first used in the Burroughs B5000

and successor machines, which were designed to execute ALGOL 60 programs [B5500]. In recent years, the availability of microprogrammed processors and the continuing decline in the cost of processor hardware and design have prompted several experiments of this sort at universities [UCB APL] and at least one successful experiment by a large company [Symbol] and one unsuccessful new commercial venture [COI]. 4b

The present paper describes a machine design for efficient representation and execution of BBN-LISP programs. BBN-LISP is an interactive system developed from the LISP language [McCarthy] [LISP 1.5]. Readers unfamiliar with LISP should consult Weissman's excellent primer [Weissman]; some details particular to BBN-LISP appear in the next sections of this paper. A complete and well-maintained but voluminous reference manual for BBN-LISP is also available [BBN-LISP]. The machine design presented here will be referred to as MicroLISP, a name intended to connote both code compactness and possible microprogrammed implementation. 4c

## DATA TYPES 5

LISP has many data types (e.g. list, symbolic atom, integer) but no declarations. The usual implementation of languages with this property affixes a tag to each datum to indicate its type. In LISP, however, the vast majority of data are pointers to lists or atoms, and it would be wasteful to leave room for a full word plus tag (the space needed for an integer datum, for example) in every place where a datum can appear such as the CAR and CDR of list cells. Consequently, in BBN-LISP every datum is a pointer; integers, strings, etc. are all referenced indirectly. Storage is allocated in quanta, and each quantum holds data of only one type, so what type of object a given pointer references is just a function of the object's address, i.e. the pointer itself. 5a

The chief drawback of this scheme is that every built-in function which produces a number as a result (such as PLUS, the addition function) must allocate a word to hold the result. This leads to frequent, time-consuming garbage collections. BBN-LISP circumvents this problem for the most part by permanently storing all the integers from -1536 to +1535 in consecutive cells and just returning a pointer to one of these cells if a numerical result is in this range, rather than allocating a new cell. In MicroLISP, which is intended as a reasonably efficient numerical language, data on the stack (temporary results and variable bindings) carry a type tag identifying them as integers, floating point numbers, or

pointers. In this way, long numerical calculations can take place without any consumption of allocated space. 5b

No existing LISP system permits the user to define his own packed data structures. MicroLISP includes such a facility, since it can be made inexpensive when implemented in the machine language and since its absence from LISP is one of the reasons most frequently cited for choosing other languages for complex symbolic computation. The details are presented in Appendix A, since they are somewhat peripheral to the rest of this paper. It is worth noting that the scheme could be implemented within BBN-LISP and even lends itself to efficient compilation in the usual case. 5c

## CONTROL AND BINDING STRUCTURE 6

MicroLISP uses a single stack structure for both control and variable bindings, essentially as described in a recent paper [B&W]. A function call allocates a "basic frame" for the arguments and a "frame extension" for control information and temporary values. The basic frame contains the function name, the argument values (bindings), and a pointer to the argument names. The frame extension holds a pointer to the caller's frame extension and a variety of other bookkeeping information. The FUNARG capability of LISP 1.5, i.e. the ability to construct a data object comprising a function and a binding environment, is provided through a primitive function which creates an "environment descriptor" pointing to a specified frame. As long as there are accessible references to this descriptor, the frame continues to exist. Environment descriptors also allow the user to construct cooperating sequential processes (coroutines); the stack becomes tree-structured rather than linear, as in the Burroughs B6500 [B6500]. 6a

BBN-LISP, like most programming languages, recognizes two kinds of accesses to variables: "load" and "store". This duality actually exists for data structures as well (CAR-RPLACA, GET-PUT, etc.) but is not treated systematically. MicroLISP systematizes this concept by allowing a function to have, in effect, two definitions, one for the (normal) "load" context, one for the "store" context. The SET function is extended so that if the first argument is a list

    (fn arg1 ... argn)

rather than a variable, the function fn is called in "store" mode with arguments arg1 ... argn and newvalue (the second argument of SET). SETQ is also extended in the obvious way, but is not particularly useful. A more useful function is

(SETFQ (fn arg1 ... argn) newvalue)
which quotes the function name and evaluates everything else. This allows RPLACA, for example, to be defined as
(LAMBDA (X Y) (SETFQ (CAR X) Y)).

6b

The semantics of variables are simple in principle: search the current basic frame, then the caller's frame, etc. for a binding of a variable with the desired name; if none is found, consult the "value cell" of the variable; if this contains the special value NOBIND, the variable is unbound. (In fact, the search follows a chain through an "access link" pointer in the frame extension rather than the caller pointr or "control link", to cover application of FUNARGs.) MicroLISP (and compiled BBN-LISP) actually use three variations of this searching strategy depending on the situation. Searching for the arguments of the current function is pointless: their relative locations in the basic frame are known to the compiler and they can be accessed by indexing. Searching for variables which are set at the top level and never rebound is time-consuming: there is a compiler declaration to force references to specific variables to bypass the search and go directly to the value cell. Repeated searches for a variable referenced more than once in a given function are wasteful: in MicroLISP, the search always occurs at the time of the first reference and is not repeated thereafter.

6c

In both BBN-LISP and MicroLISP, all variable bindings appear in the basic frame. In BBN-LISP half of each word in the basic frame is reserved for the name. In MicroLISP, the basic frame contains a single pointer to a table of names (the LNT; see below). Either scheme requires that any PROG or open LAMBDA which does not constitute the entire body of a function be made a separate subfunction, since PROG variables are bound at the time the frame is created, i.e. when the function is entered. The MicroLISP scheme may slow down free variable searches, since a name table may not be in core any longer when the search wants to scan it. Its advantages are that it is not necessary to insert the name of each variable at function entry time, and that the entire word is available for holding the binding, which (with the help of a few type bits elsewhere in the frame) may thus be a full-word integer or real number.

6d

## CODE DESIGN

7

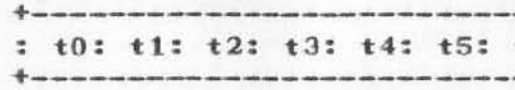
Conventional machines generally take the attitude that it must be convenient for any instruction to reference any word in the overall address space. This approach tends to produce

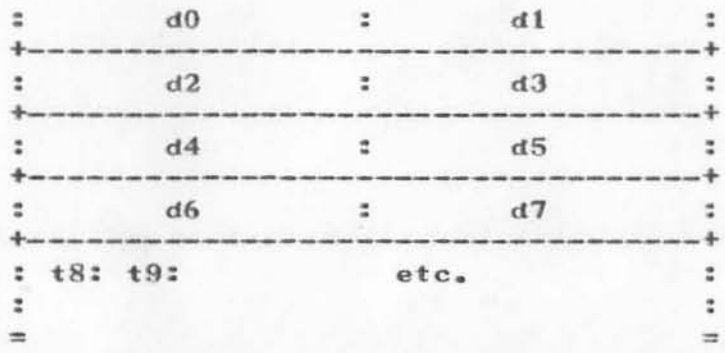
instruction formats in which a large fraction (half or more) of the bits are devoted to a memory address. MicroLISP takes advantage of the observed fact that a given LISP function references rather few functions and variables and therefore can make do with very short addresses which just index a global table (of commonly used functions) or a function-local table (of local variables and less common functions). Furthermore, a given name is usually only used as either a function or a variable, not both. MicroLISP tags each name in the tables with a function/variable flag, which eliminates the need for levels of list structure as a syntactic device, and tags functions with an argument count, which eliminates the need for sublists as scope delimiters. Thus MicroLISP code is essentially a string of byte-sized instructions, representing the original S-expression in postfix form, where most bytes reference either a "global name table" (GNT) or a "local name table" (LNT) as just described. 7a

The LNT actually has additional internal structure: argument names come first, then PROG and free variables, then everything else. This arrangement allows the first part of the LNT to correspond one-for-one with the cells of the basic frame. The "binding" of a free variable is a pointer to the true binding, and the variable searching algorithm uses this knowledge: since all the bindings in a given frame are identified by a single pointer from the basic frame to the associated LNT, the searching process can tell from the tag if the match was on a free variable, and if so, follow the pointer one more step to obtain the value if desired. 7b

MicroLISP programs, like LISP programs, are structured into functions. Each function has a header which gives the expected number of arguments and the length of the LNT. The former determines the size of the basic frame. The latter determines the function's entry point, since the LNT immediately follows the header and precedes the code, and also fixes the range of byte values that addresses the LNT: larger byte values address the GNT, after being adjusted downward by the size of the LNT. 7c

Each GNT or LNT entry consists of a 4-bit tag and a datum (pointer) whose interpretation depends on the value of the tag. To accommodate the usual organization of memories into words, each NT is organized into blocks of entries: the arrangement for a 36-bit memory, for example, appears below.






The algorithm for computing the location of the i'th name in a NT is actually quite simple and only involves addition and shifting. The possible tag values are presented immediately below and discussed in the following paragraphs.

| CON | GVAR | IVAR | FVAR | | | |
|---|---|---|---|---|---|---|
| FN0 | FN1 | FN2 | FN3 | FN4 | FN5 | FN6 |
| FN* | | | | | | |

7d

Function tag values must include the number of supplied arguments; the datum holds the function name. The tags FN0 ... FN6 represent function calls with the most common argument counts. FN* represents a function call with more than 6 arguments: the actual argument count is supplied as the last argument, and the machine removes it before constructing the new frame. The primitive functions APPLY and APPLY* provide the ability to call a function whose name is computed: this ability is not represented directly by an tag value.

7e

The four variable tags represent different strategies for obtaining the value of the variable. All variable references eventually result in pushing the value of the variable onto the end of the current frame extension; a function call severs the appropriate number of arguments from the end of the old frame extension for incorporation in the new basic frame. CON (CONstant) simply pushes the datum itself. GVAR (Global VARiable) pushes the contents of the value cell of the variable whose name is the datum, or traps if the value cell contains NOBIND. IVAR (Indexed VARiable) does not use the datum: it just pushes the N'th value from the basic frame, where N is the actual byte value. FVAR (Free VARiable) works similarly, but takes the value as a pointer to the true binding; if the pointer has not been set up, a stack search occurs first to find the nearest binding and set the pointer to it.

7f

## INSTRUCTION SET

8

A few primitive operations, such as returning from a function, cannot be represented by function calls, so a few byte values are reserved for them. These are the only real "opcodes" in MicroLISP. Some of them are followed by displacements or other parametric information in the next byte or bytes; a few (STORE, DSTORE) are followed by an ordinary variable reference which is interpreted specially. The convention followed in the description of the opcodes, and also in the examples in Appendix B, is that upper-case words like STORE represent opcodes; lower-case words represent parameter bytes; upper-case words in [brackets] represent references to functions; lower-case words in brackets represent references to variables. 8a

Data movement 8b

STORE, [v]
This causes the top value on the stack, Z, to be stored. The interpretation depends on the tag of v: 8b1

IVAR, GVAR:
The value in the binding is replaced by Z. 8b1a

FVAR:
The value in the addressed binding is replaced by Z. 8b1b

CONST:
Error (trap). 8b1c

FN0 ... FN6:
The function is called at its "store" entry point with one more argument than its tag specifies. 8b1d

FN*:
The function is called at its "store" entry point with one more argument than the count (immediately below Z on the stack) specifies. 8b1e

DSTORE, [v]
Performs the same action as STORE followed by POP. 8b2

ADDRX, n1, n2; ADDRXX, n1, n2, n3
These serve to increase the range of addresses. The 2-byte or 3-byte parameter is interpreted as an address in the LNT or GNT as appropriate. 8b3

POP
Removes the top item from the stack. 8b4

COPY
Pushes the top value on the stack onto the stack. Only apparent use is for SELECTQ. 8b5

ARG
If N is the top value on the stack (an integer), replaces N by the N'th argument of the function. 8b6

SETARG
If Z is the top item and N is the next item (an integer), sets the N'th argument of the function to Z and removes N from the stack (but retains Z, squeezing N out). 8b7

## Control 8c

The jump opcodes are followed by a parameter byte, d, which is interpreted as a 2's complement address displacement relative to the opcode itself. If positive, d is adjusted by +3 to eliminate meaningless small values. A few values of d are reserved to indicate extension into a second byte to provide a larger range of displacements. 8c1

JUMP, d
Always jumps d bytes relative to the instruction. 8c2

TJUMP, d
Tests the top value on the stack and pops it; then jumps if the datum was true (not NIL). 8c3

FJUMP, d
The inverse of TJUMP (jumps if NIL). 8c4

NTJUMP, d
Like TJUMP, but pops the value only if the jump fails (value is NIL). This is for COND's with clauses lacking a consequent, where the value of the test becomes the value of the COND if true. 8c5

TYPEJUMP, t, d
The bottom bits of t give a type number; the top bit of t selects jumping on true or false. The top value on the stack is removed, then jump or no jump depending on its type. 8c6

GOTOSELF
Calls the current function recursively by jumping to its entry point after replacing the arguments, i.e. a PROGITER-type call. 8c7

RETURN
Returns the top value on the stack as the value of the current function. 8c8

## CONCLUSIONS AND COMMENTS 9

MicroLISP programs are consistently one-third to one-fourth the size of BBN-LISP compiled programs, and the MicroLISP compiler is about one-third the size of the corresponding part of the BBN-LISP compiler. Some of the former advantage is due to design decisions in BBN-LISP which result in bulky code: ITS LISP [ITS LISP], for example, is rumored to produce code one-third the size of BBN-LISP or only one-third larger than MicroLISP. However, this compactness is achieved at the expense of many of the attractive features of BBN-LISP: recall the observations about compilers in the introduction. Since no MicroLISP machine exists, there are no comparable timing data. However, a microprogrammed implementation and a software interpreter are in preparation. 9a

MicroLISP has been presented as a machine language, but slight additions would permit unambiguous decompilation into the original S-expression for editing. This approach is only feasible in general when the machine language closely resembles the source code: compilers for conventional machines must rearrange and suppress the original program structure extensively to achieve efficient execution. Interpretive systems, of course, generally do reconstruct the source text from an intermediate representation, often using their knowledge of the program structure to advantage (e.g. indenting to indicate depth of logical nesting). 9b

Several factors prompted the author to investigate the type of design just presented. One was the feeling that the constant demands from the Artificial Intelligence community for larger primary memories were based as much on disinclination to spend time contemplating alternatives to traditional machine and program organization as on a real need to deal with larger amounts of information. Another was the hope, based on an earlier experience with a small computer [PDP-1 LISP], that a LISP minicomputer could provide, at a fraction of the cost, the kind of facilities now available only through large, expensive time-shared installations. A recent product

announcement for a desktop BASIC machine [HP 30] is encouraging in this regard. 9c

Realizing this hope for less expensive LISP systems requires compressing the data as well as the program. One approach is to provide facilities for the user to define his own packed data structures; a simple proposal along this line is described in an appendix. Another is to consider "compiling" data in a manner similar to programs. A careful reading of the MicroLISP design reveals that the encoding scheme works on arbitrary lists, not just programs. The essential ideas are: 9d

Eliminating CDR pointers by forcing logically successive data to be physically consecutive; 9d1

Eliminating non-atomic CAR pointers by associating an operand count with each operator, so the end of a sublist (subexpression) is defined implicitly; 9d2

Compressing atoms by use of tables, on the assumption that some few atoms (different for different contexts) will account for most of the references. 9d3

These ideas are applicable, separately or together, to data as well as programs, and offer a partial solution to the "address explosion" problem: the tendency for addresses to become longer and longer as virtual memories become larger, so that one winds up paying for many bits of memory used to hold largely uninteresting links. 9e

ACKNOWLEDGEMENTS 10

The idea of using very short instructions and accessing the entire environment through a table originated in the design of the Burroughs B5000. The author was inspired to contemplate the present design by some suggestions of Butler Lampson and Charles Thacker of Xerox PARC. The idea of a STORE entry to a function is due to Alan Kay, also of PARC. 10a

## APPENDIX A: USER-DEFINED DATA STRUCTURES 11

The data structure definition facility allows the user to define classes of objects which are essentially generalizations of list cells. List cells have two components, which are pointers: user-defined structures may have any (fixed) number of pointers, integers, and reals (floating point numbers). CONS called with fewer than two arguments fills in the missing components with NIL: the user

may specify the default values for his own structures. There are corresponding generalizations of CAR and CDR for extracting components from user structures, and of RPLACA and RPLACD for replacing components. 11a

The user defines a new class of structures by calling
(STRUCTURE number-of-pointers number-of-integers number-of-reals initial-value-list).
STRUCTURE returns (a pointer to) a "template" for objects of the new class. The template serves three purposes. First,
(STRUCPARS template)
returns a list of the arguments to the call of STRUCTURE which created the template. Second, applying the template as a function to a list of component values creates a new object of the class, e.g. if complex numbers are defined by
(PUTD (QUOTE COMPLEX) (STRUCTURE 0 0 2)),
then (COMPLEX 1 -1) would create the complex number 1-i.
Third, there is a function
(STRUCP any-datum)
which returns the template if any-datum is an object from a user-defined class and NIL otherwise. 11b

The generalized extraction function
(ELTR object component-number first-bit number-of-bits)
returns a component selected by position: components are numbered from 0, first pointers, then integers, then reals. First-bit and number-of-bits are only legal if the component is an integer; if omitted, a full word is fetched. The corresponding replacement function is
(SETFQ (ELTR ...) value),
consistent with the MicroLISP notion of "load" and "store" entries to a function. For efficiency,
(ELTFN template component-number first-bit number-of-bits)
returns a function f such that
(f object)
is equivalent to
(ELTR object component-number first-bit number-of-bits)
provided that the object is of the class given by the template, or at least of a class whose components up to and including the specified one all have the same types as the corresponding components of the class given. In MicroLISP, the function f is of a special data type called "selector" which works as efficiently as CAR and CDR; CAR is actually implemented as (ELTFN (STRUCTURE 2) 1) and CDR as (ELTFN (STRUCTURE 2) 0). 11c

APPENDIX B: 16- AND 32-BIT WORDS 12

It is always awkward to implement systems involving pointers on machines with 16- or 32-bit words, since 16 bits is not quite enough for a pointer but 32 is too many. However, a slightly different application of the basic idea of MicroLISP (the use of statistical knowledge about the topology of data structures to reduce the number of bits required to represent them) can produce a useful 256K address space on a 32-bit machine. The idea is to make 4 subspaces, each of 64K (requiring 16-bit pointers), and using global conventions to supply the subspace number when following any given pointer. 12a

The software MicroLISP implementation currently under construction uses the following subspaces: (A) stack; (B) strings, atom print-names, and the atom hash table; (C) arrays and compiled code; (D) lists, atom heads, and other descriptors. The subspace number for pointers from each of these areas is supplied as follows: 12b

Stack
The "control link" and "access link" refer to space (A); the "resumption point" carries an explicit subspace designator, since it may refer to an S-expression (space (D)), compiled code (space (C)), or machine code; all other pointers are to space (D). 12b1

Strings, print-names
There are no pointers in these spaces. 12b2

Atom hash table
All pointers are to atoms, in space (D). 12b3

Arrays, compiled code
All pointers are to space (D). 12b4

Lists
All pointers are to space (D). 12b5

Atom heads
CAR (value cell) and CDR (property list) are to space (D); the definition carries an explicit subspace designator, for the same reason as the resumption point on the stack; the print-name pointer is to space (B). 12b6

String descriptors
These point to space (B). 12b7

Environment descriptors
These point to space (A). 12b8

Array descriptors
These point to space (C). 12b9

This scheme works as long as the number of different arrays, environments with descriptors, and strings is not too large. When these numbers become large, a great deal of space (D) becomes devoted to uninteresting descriptors. 12c

## APPENDIX C: EXAMPLES 13

These examples compare the S-expression, the MicroLISP code, and the PDP-10 code produced by the present BBN-LISP compiler. The MicroLISP code assumes that a pointer occupies 2 bytes and that 4 bytes fill a word. The size figures for the compiled codes do not include 1 word of header for MicroLISP and 2 words for BBN-LISP respectively. 13a

****** REVERSE ****** 13b

S-expression: 36 LISP cells 13b1

```
(LAMBDA (X)                                   13b1a
   (PROG (Y)                                  13b1a1
      LP (COND ((NLISTP X) (RETURN Y)) )      13b1a1a
         (SETQ Y (CONS (CAR X) Y))            13b1a1a1
         (SETQ X (CDR X))                     13b1a1a2
         (GO LP)                              13b1a1a3
      ))                                      13b1a1b
```

MicroLISP: 26 bytes 13b2

Tags: 13b2a

IVAR IVAR [+ padding; 4 bytes] 13b2a1

Names; 13b2b

X Y [total 4 bytes] 13b2b1

Code: 13b2c

```
(lp)                                          13b2d
```

```
      [x]; TYPEJUMP, listp, a; [y]; RETURN                    13b2d1
   (a)                                                        13b2e
      [x]; [CAR]; [y]; [CONS]; STORE, [y]                     13b2e1
      [x]; [CDR]; STORE, [x]; JUMP, lp                        13b2e2
PDP-10 compiled code: 22 words                                13b3
   REV1                                                       13b3a
      (JSP 7 , ENTERF)                                        13b3a1
      (262144 0)                                              13b3a2
      (0 PLITORG)                                             13b3a3
   t1 (PUSH PP , KNIL)                                        13b3b
   LP (HRRZ 1 , X)                                            13b3c
      (PSTN1 LISTT)                                           13b3c1
      (JRST t4)                                               13b3c2
   t5 (HRRZ 1 , Y)                                            13b3d
      (JRST t3)                                               13b3d1
   t4 (HRRZ 1 , X)                                            13b3e
      (HRRZ 1 , 0 (1))                                        13b3e1
      (HRRZ 2 , Y)                                            13b3e2
      (PUSHJ CP , CONS)                                       13b3e3
      (HRRM 1 , Y)                                            13b3e4
      (HRRZ 1 , X)                                            13b3e5
      (HLRZ 1 , 0 (1))                                        13b3e6
      (HRRM 1 , X)                                            13b3e7
      (JRST LP))                                              13b3e8
```

```
        t3 (SUB PP , BHC 1)                                          13b3f
        t2 (POPJ CP ,)                                               13b3g
        LITORG                                                       13b3h
        PLITORG                                                      13b3i
           X                                                         13b3i1
           Y                                                         13b3i2
     ****** SUBST ******                                             13c
       S-expression: 41 cells                                        13c1
          (LAMBDA (X Y Z)                                            13c1a
             (COND                                                   13c1a1
                ((NLISTP Z)                                          13c1a1a
                   (COND ((EQ Z Y) X) (T Z)) )                       13c1a1a1
                (T (CONS (SUBST X Y (CAR Z)) (SUBST X Y (CDR Z))))
                )                                                    13c1a1b
             ))                                                      13c1a2
       Byte LISP: 37 bytes                                           13c2
          Tags:                                                      13c2a
             IVAR IVAR IVAR FN3 [+ padding: 4 bytes]                 13c2a1
          Names:                                                     13c2b
             X Y Z SUBST [total 8 bytes]                             13c2b1
          Code:                                                      13c2c
             [z]; TYPEJUMP, listp, a                                 13c2c1
             [y]; [z]; [EQ]; FJUMP, b; [x]; RETURN                   13c2c2
          (a)                                                        13c2d
             [z]; RETURN                                             13c2d1
```

```
    (b)                                                          13c2e
       [x]; [y]; [z]; [CAR]; [SUBST]                             13c2e1
       [x]; [y]; [z]; [CDR]; [SUBST]; [CONS]; RETURN             13c2e2
  PDP-10 compiled code: 39 cells                                 13c3
    SUBST                                                        13c3a
       (JSP 7 , ENTERF)                                          13c3a1
       (786432 0)                                                13c3a2
       (0 PLITORG)                                               13c3a3
    t1 (HRRZ 1 , Z)                                              13c3b
       (PSTN1 LISTT)                                             13c3b1
       (JRST t3)                                                 13c3b2
       (HRRZ 1 , Z)                                              13c3b3
       (HRRZ 2 , Y)                                              13c3b4
       (CAME 1 , 2)                                              13c3b5
       (JRST t4))                                                13c3b6
       (HRRZ 1 , X)                                              13c3b7
       (JRST t5)                                                 13c3b8
    t4 (HRRZ 1 , Z)                                              13c3c
    t5 (JRST t6)                                                 13c3d
    t6 (HRRZ 1 , X)                                              13c3e
       (PUSH PP , 1)                                             13c3e1
       (HRRZ 1 , Y)                                              13c3e2
       (PUSH PP , 1)                                             13c3e3
       (HRRZ 1 , Z)                                              13c3e4
```

[B&W]
Daniel G. Bobrow, Ben Wegbreit
A Model and Stack Implementation of Multiple Environments
BBN Report # 2334
March 1972 14a

[B5500]
Burroughs B5500 Information Processing System Reference Manual
Burroughs Corporation
1964 14b

[COI]
Computer Operations Incorporated
GEMINI Reference Manual
(distributed internally) 14c

[UCB APL]
J. Moore, D. Steingart, H. R. Zaks
A Firmware APL Time-Sharing System
1971 SJCC 14d

[Weissman]
Clark Weissman
LISP 1.5 Primer
Dickenson Publishing Company
1967 14e

[Symbol]
R. Rice et al.
SYMBOL - A Major Departure from Classic Software-Dominated Von Neumann Computing Systems
1971 SJCC 14f

[PDP-1 LISP]
E. C. Berkeley, L. P. Deutsch
The LISP Implementation for the PDP-1 Computer
in The Programming Language LISP: Its Operation and Applications
M.I.T. Press
1966 14g

[HP 30]
Hewlitt-Packard Corporation
advertisement in Scientific American
Feb. 1973 14h

[McCarthy]

John McCarthy
Recursive Functions of Symbolic Expressions and Their Computation by Machine
Communications of the ACM
April 1960 14i

[LISP 1.5]
John McCarthy et al.
LISP 1.5 Programmer's Manual
M.I.T. Press
1962 14j

[ITS LISP]
M.I.T. Project MAC Artificial Intelligence Laboratory
no available reference 14k

[B6500]
E. A. Hauck, B. A. Dent
Burroughs B6500/B7500 Stack Mechanism
1968 SJCC 14l

[BBN-LISP]
W. Teitelman et al.
BBN-LISP TENEX Reference Manual
Bolt Beranek and Newman Inc.
Cambridge, Mass.

**latest revision: Feb. 1972 14m

[QA4]
J. F. Rulifson, J. A. Derksen, R. A. Waldinger
QA4: A Procedural Calculus for Intuitive Reasoning
Artificial Intelligence Center Technical Note 73
Stanford Research Institute
Menlo Park, California
Nov. 1972 14n

LPD 20-APR-73 14:14 16034

MicroLISP paper (1973 IJCAI)

(J16034) 20-APR-73 14:14; Title: Author(s): Deutsch, L. Peter /LPD;
Distribution: /; Sub-Collections: NIC; Clerk: LPD;
Origin: <DEUTSCH>MINI.NLS;52, 20-APR-73 14:13 LPD ;

LPD 20-APR-73 16:13 16035

Towards a more temperate dialogue

replies to a message of 4/18/73 to be found on
<DEUTSCH>CROCKER.TXT at ISI.

Towards a more temperate dialogue

Dear Steve, 1

I'm sorry you feel I've been wasting your time. I admit I've been excessively concerned with what I see as larger issues in the evolution of the ARPANET, and I realize that I've been trying to approach these issues through what you see as "unproductive trivia". 2

I see a basic difference in viewpoint between us, which I probably should have recognized at the time of our interrupted discussion in Cambridge. As I see it, you feel it is important to have a more rational, effective, and responsive military establishment, one which won't squander money and lives and will provide economically for our legitimate defense needs. On that point, how could I disagree with you? I gather you also believe that we can help bring about this state of affairs by developing the technological tools required for better information flow inside that establishment; that development of such tools, while it naturally benefits the military since they are accustomed to dealing in high technology, also will bring benefits to science and industry through further development (the "D" of "R & D"); and that, in fact, it's better for this research to be done outside the closed military environment so that the rest of the world has access to it. I don't think I agree wholly with any of these. 3

To me it seems that the problems of controlling the military are overwhelmingly social/political, not technical. I don't believe Bob Taylor when he says that the problem is to get better information flow, to get the truth to people inside and outside. That IS a problem, and a severe one, but there is no technical system that cannot be perverted by wilful men. I think particularly of the comment in Halberstam's book (which I hope you'll read) that "the first thing [a certain commander] did when he arrived in Saigon was to set about corrupting the Intelligence reports." There is no technical solution to this problem: the CIA reports throughout the war were of high quality, and the military hierarchy ignored them. 4

I don't entirely believe in the spin-off theory either. While the basic hardware technology for computing (transistors, IC's) was developed largely in response to military needs, the current and future crunch in computing is mostly at higher levels: machine and system architecture (including communications) and software. There hasn't been any spin-off in these areas to speak of: caches and stacks, language and operating system technology, have come from universities and scientifically-oriented manufacturers. It's true that a good deal of this work was ARPA

funded, but in the "good old days" when ARPA was less mission-oriented. I find it hard to imagine the 940 system being funded today, or the equivalent in ARPA's new areas of interest. 5

I agree that it's better for research to be done openly. The question is at what point development becomes sufficiently application-specialized that it's better done by the people who will have to live with the results. The question is also how to get results across that boundary. There is nothing to prevent DCA from building their own ARPANET, just as there was nothing to prevent any military agency from using the 940 system like FCPCP; but they shouldn't count on much help from research sites. To take an example, I think the mammoth data-shuffling job being fielded by the NIC has interfered with their research activities and would be a lot better off at some place like MITRE. (You and I both know that Doug has mixed feelings about his service role and took it on partly for the money.) I can't argue very strongly on this point since it's true that ARPA has remained quite good about not laying development tasks on research sites. 6

None of this touches on our basic disagreement. More important than my specific points of difference, I see the entire military area as irrelevant. There are a lot of problems closer to people's lives that can be eased by information technology. Local and regional government, for example: there are problems of efficiency, internal and external communication, tools for estimating results of decisions; and it's a lot harder to lie or cheat with somebody close to you and to the problems. Law, medicine, and publishing all have information flow problems; architecture and planning have design and modelling problems. ARPA (Larry) seems to be pursuing the "warehouse of PDP-10s" or what I would call the "centralized resources" or "governmental" solution. I believe hardware technology is going in the other direction, towards what I would call the "distributed resources" or "personal" solution. Furthermore, I believe it's important to encourage the latter rather than the former: I think I recognize the value of large organizations in our lives, but I also feel we should try to structure the future in a way that makes us less dependent on them. 7

These beliefs lead me to be saddened and frustrated with the directions I see the ARPANET going. I'm excited by the knowledge that the ARPANET is leading many people to become aware of the potential of communication to augment and restructure computing; I'm glad BBN has worked out one feasible networking scheme; I think some of the work at ARC is relevant to the central problem of learning how to deal with complex information. But I don't like dialing up BBN, or ISI, or ARC, and seeing their machines

crowded with users like MITRE-TIP and RML-AF and NSRDC, because I know that those users are unavoidably changing ARC's and BBN's and ISI's value systems. For a concrete example, ARC has had to choose between many different possible efforts, and one choice I know they had to make was not to investigate an NLS organization based on auxiliary processors. They will get to it eventually, but perhaps 3 years later, and I believe part of the reason is that they have had to serve a large community of outside (mostly government) users via the NIC. 8

In short, I feel that the directions that ARPA seems to be encouraging don't lead to the goals that I see as important; maybe a more logical direction for my frustration is to dissociate myself from the ARPANET effort, rather than trying to change the direction of that effort. At PARC I see more devotion to the goals and directions I find important. 9

I want to continue a dialogue with you on these issues, if only to get a clearer picture of what's in your and Larry's heads. Hopefully I can encourage you to examine your assumptions too. If you think any discussion of this sort wastes your time, I'll oblige you by abandoning it. 10

Peter 11

16035 Distribution
Crocker, Steve D. , Roberts, Lawrence G. ,

RMS 20-APR-73 14:48 16036

Paging Gerard LeLann

We understand Gerard LeLann from the University De Rennes in France is visting ARPA sites this month. If he should happen through your site would you please have him contact Roland Bryan at UCSB ((805) 961-3393). Thanks 1

16036 Distribution

Romanelli, Michael J. , Stoughton, Ronald M. , Owen, A. D. (Buz) , Fink, Robert L. , Meir, Jaacov , North, Jeanne B. , Crocker, Steve D. , Lawrence, Thomas F. , McConnell, John W. , Ollikainen, Ari A. J. , White, James E. (Jim) , Hathaway, A. Wayne , Foulk, Patrick W. , Winter, Richard A. , Van Zoeren, Harold R. , McKenzie, Alex A. , Winett, Joel M. , Bhushan, Abhay K. , Pyke, Thomas N. , Wilber, B. Michael , Feigenbaum, Edward A. , Braden, Robert T. , Pepin, James M. , Wessler, Barry D. , Melvin, John T. ,
Merryman, Robert G. , Tveitane, P. , Stokes, Adrian V. , Retz, David L. , Martin, Reg E. , Leichner, Gene , Falk, Gil , Iseli, Jean , Donnelley, Jed E. , Kantrowitz, William , Wolfberg, Michael S. , Feinroth, Yeshiah S. , Hurt, James , Hearn, Anthony C. , Stein, James H. , Shoshani, Arie , Harslem, Eric F. , Metcalfe, Robert M. (Bob) , Reussow, Bradley A. , Reins, E. R. (Dick) , Kadunce, Daniel L. , McCutchen, Samuel P. , Petregal, George N. , Madden, James M. , Young, Michael B. , Padlipsky, Michael A. , Stevenson, Schuyler , Deutsch, L. Peter , Davidson, John , O'Sullivan, Thomas , Seroussi, Sol F. , Bradner, Scott , Thomas, Robert H. , Thomas, John C.

RMS 20-APR-73 14:59 16037

Users of UCSB's RJS???

John,
I don't know of any real users of our RJS. NIC has tried it and are contemplating using RJS to do their journal cataloging here. If you know of any potential users we would like to have a shot at them. Nearly all use of RJS so far has been game-playing.
Ron 1

16037 Distribution
Postel, Jonathan B. ,

RWW 20-APR-73 08:25 16038

Reply to WLB on Journal Header

Walt, with respect to the Journal Header question, I think we want to be able to guarantee that Journal items are printed with the appropriate information; therefore I favor alternative 3 in your discussion. If there is a really strong reason why someone must have it really different he can always make a copy and set the directives as he pleases. 1

16038 Distribution

Bass, Walt , White, James E. (Jim) , Meyer, N. Dean ,

Meeting Summary with ARPA Representatives on Energy Project

Meeting Summary with Ruddy Black, Dave Russell (ARPA NMRO), Carl Birshner (Navy ) Spelling of names may be wrong 1

At the meeting were RWW, PR, JFV, DCE (part of meeting) Dave BERg, Lynn Spragg, Dick Schmidt, Bob Rodden and two other people unknown to me. 1a

Meeting on April 5-73. 1b

The meeting opened with Ruddy Black describing his conception, which is very big of an ultimate energy information system. 1c

He wants to be able at the end of six months to be able to sell he concept of such a system to DOD management who would then provide the funding to actually build such a system. He sees a definite need, but his conception is still rather unclear of just what he wants. After much discussion and attempts by Dave Berg and myself to pin down what he wants my interpretation is the following. 1d

He wants to create an energy community (none existts now) in the DOD. He wants to service this community with very sophisticated information handling tools. He wants something at the end of six montths which would demonstrate the concept and turn on the appropriate DOD management to support an ongoing effort. 1d1

He wants to use NLS and has (had?) the mistaken impression that NLS already has the capabilities he thought were needed to achieve a significant demonstration. They clearly want to use NLS. 1d2

Dave Russell has a different interest. 1e

Dave is primarily interested in Utility support for the VELA community. 1e1

16039 Distribution

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

JBN 20-APR-73 22:26 16040

Status of ARPANEWS; Notice of Lost SNDMSG

Jean - I had a message from you this morning about the USERFORUM, which flashed by too fast on my display, so I sent it to the printer, but it got lost on someone else's printout apparently, and now the message is gone. I am leaving in the morning for a week, without even getting an update prepared. And I am not clear on what was the first part of the FORUM information. Hope it can wait another week at this point. If all our readers have as much else to do as we, perhaps they will give us a little longer to get on a weekly schedule. Hope you are successful in getting good feature articles for May - there'll be something from the NIC but I haven't any inspirations for great circulation-builders at this time. I'm whipping up an annual report tonight, tomorrow I take the train to Aspen. See you. 1

16040 Distribution
Crocker, Steve D. , Iseli, Jean , North, Jeanne B. ,

KIRK 20-APR-73 22:32 16041

The BUGS and NP files have been moved to <DOCUMENTATION> and renamed BGS and NPS so that they can recieve journal mail as individuals and people can still send mail to BUGS and NP as groups.

These links should get you there: (documentation, BGS, 0:xn) (documentation, NPS, 0:xn)

KIRK 20-APR-73 22:32 16041

The BUGS and NP files have been moved to <DOCUMENTATION> and renamed BGS and NPS so that they can recieve journal mail as individuals and people can still send mail to BUGS and NP as groups.

1

16041 Distribution

Lane, Linda L. , Engelbart, Douglas C. , North, Jeanne B. , McConnell, John W. , Deutsch, L. Peter , Mitchell, James G. , Kay, Alan C. , Auerbach, Marilyn F. , Hardy, Martin E. , Irby, Charles H. , Jernigan, Mil E. , North, Jeanne B. , Norton, James C. , Van Nouhuys, Dirk H. , Watson, Richard W. , Crocker, Steve D. , Lawrence, Thomas F. , Heafner, John F. , Murphy, Dan L. , Foulk, Patrick W. , Winter, Richard A. , Van Zoeren, Harold R. , McKenzie, Alex A. , Madden, James M. , Bhushan, Abhay K. , Karp, Peggy M. , Lee, Susan R. , Hathaway, A. Wayne , Barnett, Barbara , Lee, Susan R. , Michael, Elizabeth K. , Moore, Julie B. , Petell, Marcelle D. , Stone, Duane L. , Slottow, Joan E. , Peters, Jeffrey C. , Jones, William P. , Feinler, Elizabeth J. (Jake) , Kelley, Kirk E. , Prather, Ralph , Byrd, Kay F. , Pucine, Gino , Merry, Diana L. , Gray, Thomas B. , Rosich, Raynor K. , Knowlton, Prentiss H. , Graham, Marvin L. , Meir, Jaacov , Grossman, Gary R. , Bouknight, W. Jack , Sher, Michael S. , Madden, James M. , Slotnick, Daniel L. , Beaman, Kathy , Day, John D. , Crocker, David H. , Hardeman, Beauregard A. , Roistacher, Richard C. , Ferguson, Ferg R. , Forman, Ernest H.

KIRK 20-APR-73 22:32 16041

The BUGS and NP files have been moved to <DOCUMENTATION> and renamed BGS and NPS so that they can recieve journal mail as individuals and people can still send mail to BUGS and NP as groups.

(J16041) 20-APR-73 22:32; Title: Author(s): Kelley, Kirk E. /KIRK ; Distribution: /TU ; Sub-Collections: SRI-ARC TU; Clerk: KIRK ;

KIRK 20-APR-73 22:34 16042

The BUGS and NP files have been moved to <DOCUMENTATION> and renamed BGS and NPS so that they can recieve journal mail as individuals and people can still send mail to BUGS and NP as groups.

These links should get you there: (documentation, BGS, 1:x) (documentation, NPS, 1:x)

KIRK 20-APR-73 22:34 16042

The BUGS and NP files have been moved to <DOCUMENTATION> and renamed BGS and NPS so that they can recieve journal mail as individuals and people can still send mail to BUGS and NP as groups.

1

KIRK 20-APR-73 22:34 16042

The BUGS and NP files have been moved to <DOCUMENTATION> and renamed BGS and NPS so that they can recieve journal mail as individuals and people can still send mail to BUGS and NP as groups.

(J16042) 20-APR-73 22:34; Title: Author(s): Kelley, Kirk E. /KIRK ; Distribution: /SRI-ARC ; Sub-Collections: SRI-ARC; Clerk: KIRK ;

ADO 22-APR-73 20:48 16043

ident changes

Due to the the fact that we have recently gotten a slight change in our official name (from Seismic Array Analysis Center to Seismic Data Analysis Center), it would be nice if you could change our group ident from SAAC-TIP to SDAC-TIP. I have already made the name change in the Ident file. I would also like to have the idents EAF2 and EBM changed to TF and EBMC respectively if this presents no particular problem. 1

ADO 22-APR-73 20:48 16043

ident changes

(J16043) 22-APR-73 20:48; Title: Author(s): Owen, A. D. (Buz) /ADO;
Distribution: /MLK; Sub-Collections: NIC; Clerk: ADO;

Ihanks --

Doug, 1

thanks for giving me a little insight about NSRDC. My immediate concern was that they weren't contributing to ARC's progress and learning, and I'm glad to hear you feel they are. 2

My other reasons for being uneasy about NSRDC (and RADC) aren't really coherent yet. I guess I feel that, aside from my belief that there are people whom it is more important to augment than the military, military attitudes and values and ways of doing things don't constitute a desirable paradigm or benchmark against which to measure the progress of your work. 3

Peter 4

Thanks --

(J16044) 21-APR-73 19:16; Title: Author(s): Deutsch, L. Peter /LPD;
Distribution: /DCE; Sub-Collections: NIC; Clerk: LPD;
Origin: <DEUTSCH>DCE.NLS;2, 21-APR-73 19:15 LPD ;

DHC 23-APR-73 12:19 16045

tnx and a note

Thanks for links and info on change to NP and BUGS. I gather sthat I should continue to send mail to np and bugs, but may now reaad from nps and bgs.

I noticed that expansion for np includes nps, but bugs does not yet include bgs. 1

DHC 23-APR-73 12:19 16045

tnx and a note

(J16045) 23-APR-73 12:19; Title: Author(s): Crocker, David H. /DHC;
Distribution: /KIRK; Sub-Collections: NIC; Clerk: DHC;

DHC 23-APR-73 12:47 16046

This is an old com;ain and I am re-stating it because I keep encountering it as a dificulty with people learning NLS:

Some commands take effect AFTER the specified, NOT AT the address.
Insert is the major offender.

PLEASE, PLEASE, PLEASE fix this up. It causes incredible hassles for people not familiar with NLS concepts and it is such an easy change to make. 1

(J16046) 23-APR-73 12:47; Author(s): Crocker, David H. /DHC;
Distribution: /BUGS BGS; Sub-Collections: NIC BUGS; Clerk: DHC;

DHC 23-APR-73 12:50 16047

Grabby directive

There should be an OP directive, much like Grab, which
automatically takes effect for every statement on a given level.
The format would be:

  LevGrab[ interval ]=#-of-lines
It would work exactly as if Grab had been typed in for each
statement of the sepcified levels. 1

DHC 23-APR-73 12:50 16047

Grabby directive

(J16047) 23-APR-73 12:50; Title: Author(s): Crocker, David H. /DHC;
Distribution: /NP; Sub-Collections: NIC NP; Clerk: DHC;

IMLOAD for Imlacs attached to TIPS

The IMLOAD program should be able to reload an imlac attached to a TIP port, just as SENDPRINT can divert output to a TIP port (ostensibly a printer). This way, a crashed imlac could be reloaded , using another trminal, without having to put a standard
editor into the imlac.

TIP Divert Output doesn't work. I have tried it many times and apparently too much dirty data get into the loader stream. 1

DHC 23-APR-73 12:54 16048

IMLOAD for Imlacs attached to TIPS

(J16048) 23-APR-73 12:54; Title: Author(s): Crocker, David H. /DHC; Distribution: /NP; Sub-Collections: NIC NP; Clerk: DHC;

DHC 23-APR-73 12:56 16049

Foreign site TNLS class, locally

Maralyn -- Sorry this is late. We are very interested in having a INLS class here, but don't yet know when.

We are in the process of hiring someone to rplace our secretary and expect the new person to use nls heavily. Also, another person (1/2-time) will probably be hired. and we want several other people in the department to benefit from the tool.

A preliminary list has 8 or 9 names on it. 1

DHC 23-APR-73 12:56 16049

Foreign site TNLS class, locally

(J16049) 23-APR-73 12:56; Title: Author(s): Crocker, David H. /DHC;
Distribution: /MFA; Sub-Collections: NIC; Clerk: DHC;

DLS 23-APR-73 06:09 16050

Comments on current and planned journal service

Dirk, I'm not sure who this should go to--will leave it up to you to disseminate further. Also, yes we would like a monthly index for RADC submitted/received journal items; online would be fine if a notice could be placed in each RADC user's initials file.

DLS 23-APR-73 06:09 16050

Comments on current and planned journal service

I have been reading the recent dialogue on FTP and Journal overhaul. I have a couple of questions and comments. 1

When is your target date for the network wide mail delivery system? 1a

Is RADC a legitimate group ident--recent attempts to use RADC as a group ident have not seemed to work. There is also a RADC directory, which may be the cause of the confusion. 1b

I would like to see an option available (either on a site basis or on an individual basis) for remote hardcopy delivery. 1c

I have found hardcopy useful in a couple of cases--when the network or NLS is down, overloaded or otherwise unavailable and when I want to read a document that has been archived but do not know until I read it whether or not I can use it online. 1c1

Would it be possible to have the journal create a print file containing all the articles sent or received by RADC troops each day? We could then print out at least one master copy here each morning when the traffic on the net is relatively low. This would not require a printer to be on standby and would put the burden of printing journal hard copy on the user(RADC). 1c2

If in addition to this, if we could get indcies to the the RADC journal items built say-once a month, we would have the beginning of a hardcopy backup system here at RADC see--offer to this effect from DVN (MJOURNAL, 15437, 4:w). 1c2a

In some of the discussion on FTP I noticed an @ was used in addressing the document to a foreign host. Is this a TIP/network command or a literal that is transmitted to NIC? If its a Network command this is bad because IMLAC users who are using NDNLS cannot talk to the TIP once they have gotten into NLS. If this is a literal that has to be transmitted to NIC, this is also bad, since the NTNLS user has to remember to type a double @ to have the TIP transmit the text that follows--a small point but one which can cause a lot of grief. 1d

DLS 23-APR-73 06:09 16050

Comments on current and planned journal service

(J16050) 23-APR-73 06:09; Title: Author(s): Stone, Duane L. /DLS;
Distribution: /dvn jhb ; Sub-Collections: RADC; Clerk: DLS;

comments on ftp document of 18 april 73. 1

i still disagree about the method of indicating continuation lines of a reply. i suggest that there be a specific continuation code (say code 001) then the example on page 32 would be:

```
100 first line
001 continuation line
001 another line
001 last line
```

thus there would be no need to look for a minus sign or to have reply lines without a code, both of these being execptions to the rules. also this would not have any implications about the use or non use of the telnet GA mechanism. 1a

on page 45 the 5th line from the bottom has an extra F. 1b

basically i like the document there are some things in the protocol i dont like but i wont fight about (e.g. dont care bits). i do hope that this much can be accepted by the comittee and community. it does appear that some of the stuff that john day at illinois is talking about will have to be incorporated eventually. please keep me posted on developments. 1c

-- jon. 1d

JBP 23-APR-73 15:12 16051

ftp comments

(J16051) 23-APR-73 15:12; Title: Author(s): Postel, Jonathan B. /JBP; Distribution: /NJN; Sub-Collections: NIC; Clerk: JBP;

# Privacy in Journal Dialog -- Initial Thoughts

## INTRODUCTION 1

We first recognize the fact that individuals and groups within the Network often need to conduct dialog whose substance (or even existence) is not known to the Network community at large. We also recognize the power of the Journal as a dialog support aid (because of group idents, the fact that the sender needn't know the recipient's address, etc.). Finally, we admit that the Journal in its current state is useless as a mechanism for conducting non-public dialog, and ask ourselves what changes might be made to support this type of communication. 1a

All phases of non-public dialog -- creation of documents to be mailed, delivery and long-term storage and cataloging of the documents -- need to be safeguarded if the safeguarding of any phase is to be meaningful. It's of little consolation that access to the delivered, permanently-recorded document is properly controlled if a curious or malicious user can intercept a draft of the document while the author is composing it. 1b

## PRIVACY DURING COMPOSITION 2

### Avoiding Explicit Access Violations 2a

The creation of a document to be mailed via the Journal can be a lengthy process, spanning a period of days, weeks, or months. Throughout this period -- however long -- the document in various draft stages exists on-line as a file in the author's directory. If the document is part of some non-public dialog, access to the draft, as well as to the final document, must be properly restricted. 2a1

[We are assuming here that the author has chosen to compose the document in NLS. He may, of course, choose to perform that task elsewhere (e.g., in his home host), but then responsibility for safeguarding the document during construction is his, not ours.] 2a1a

For documents authored by a single individual, this kind of safeguarding requires that read- and write-access to the file be limited to the author (an NLS ident, not a TENEX directory). But when the document is authored by more than one user, or when the author wishes other users to critique a draft of the document, then the ability to extend read- and write-access to a group of users (idents) is desirable. Hence, the following proposal: 2a2

P1: - Assign to each NLS file three ident lists designating, respectively, those sets of individuals or groups to be granted read, write, or access-modification access to the file. 2a2a

- Enforce these access controls within NLS. 2a2b

- Provide commands within NLS to modify the access lists. 2a2c

[Note: The whole notion of building an access scheme anywhere but in the monitor is fraught with pitfalls. Implementing access controls in NLS works fine provided that ALL access to the file system is made through NLS. EXEC commands such as DELETE, and assembly language programs which employ file system JSYSs can be used, obviously, if allowed to the user, to break the protection mechanisms] 2a2c1

Basing access controls on idents requires that a mechanism be provided to prevent their faudulent use. Hence: 2a3

P2: - Assign to and store in the ident system a password for each ident. 2a3a

- Require the user's ident and NLS password, rather than his directory name and TENEX password, as login parameters (in all forms of login -- EXEC, FTP, etc.). That is, let the system infer directory name from ident, rather than the converse, as is currently the case. 2a3b

- Provide a command within NLS to change the user's NLS password. 2a3c

Avoiding Subtle Access Violations 2b

The TENEX link mechanism admits of a rather subtle form of read-access violation. While a user is in the process of listing a non-public file on his terminal or submitting it (particularly if it's a message, rather than a file) to the Journal, an unexpected link from another user may cause the system or the user to disclose sensitive information before the link is noticed and work is suspended. Hence: 2b1

P3: Modify NLS to refuse links whenever a non-public file is opened or while a non-public item is being submitted to the Journal. Re-enable links when the file is closed or the submission process complete. 2b1a

Privacy in Journal Dialog -- Initial Thoughts

PRIVACY DURING JOURNALIZATION 3

Non-public journal items need to be protected against access during the journalization process, i.e., from the time of submission to the time of delivery and cataloging. This requirement simply forces the Journal to exploit TENEX access mechanisms to safeguard working files and citations. 3a

PRIVACY IN THE CATALOG AND IN LONG-TERM STORAGE 4

The author of a non-public journal item requires by definition that read-access be restricted to a subset of the Network community: 4a

P4: - Allow the author of a non-public journal item to specify the read-access ident list (which is distinct from the distribution list) for the file in which the item is to be permanently stored. This list, of course, in general, will be different than it was during the composition process, limited probably, in the latter case, to the author(s) and those consulting on the item, and in the former to the recipients of the item and anyone else the author chooses. 4a1

- Allow the author to specify also the access-modification access list. He may choose to reserve that priviledge for himself, allowing subsequent, secondary distribution to users outside of the initial distribution list; he may choose to transfer it to the recipients, allowing them to initiate secondary distribution to other users of their choosing; he may transfer it to some third party; or he may decline it altogether (with a null access list). 4a2

- The Journal should automatically set the write-access list to null (that's kind of the definition of the Journal). 4a3

At submission time, the author specifies those subcollections to which the non-public item belongs. A catalog -- an on-line file -- is generated periodically for each subcollection. [I'm guessing about this; I assume that's what subcollections are all about]. 4b

P5: Allow the creator of a subcollection to specify a read-access list for the file that contains the subcollection catalog. Thus knowledge of the existence of

the dialog and of its progress and contributors can be limited as desired. 4b1

The author may desire that no record of a dialog be made -- no copy of the item placed in long-term storage and no catalog entry made. This case has gone by the name of "unrecorded dialog" and should be supported. Each user on the distribution list is given his own copy of the item and no access lists exist. 4c

P6: The Journal should support unrecorded dialog. 4c1

PRIVACY IN DELIVERY 5

Non-public Journal items must be safeguarded in the recipients' mailboxes. The mailbox for a user whose home host is SRI-ARC is the JOURNAL branch in his initial file, which contains citations to large items and the text of smaller ones. Probably, the most straightforward way to insure the integrity of non-public Journal items in the user's initial file is to restrict read access to the entire initial file (TENEX does that with MESSAGE.TXT files). Given P1, the user can do that if he chooses. 5a

For those users receiving delivery through the Network, the receiving host must assume responsibility for insuring that access restrictions are honored. All the Journal can do is tag the delivered citation as private: 5b

P7: The Journal should employ what means the Network mail protocol provides to inform the recipient's host that a piece of mail is private. 5b1

JEW 23-APR-73 11:53 16052

Privacy in Journal Dialog -- Initial Thoughts

(J16052) 23-APR-73 11:53; Title: Author(s): White, James E. (Jim) /JEW; Distribution: /JDH DSK CHI MDK JCN RWW; Sub-Collections: SRI-ARC; Clerk: JEW;
Origin: <WHITE>PRIV.NLS;7, 23-APR-73 11:16 JEW ;

JHB 23-APR-73 05:25 16053

EVALUATION PLAN FOR AHI

This file is being submited to retain on-line access...directory file space as well as entire system space urgently needed. Uncertain why this file was never achived; will be deleted now.

# . EVALUATION OF THE AUGMENTED HUMAN INTELLECT SYSTEM: A PLAN

1

Introduction: The Augmented Human Intellect System (AHI) has been described in theoretical and philosophical terms by its originator, Dr. Douglas Englebart, Stanford Research Institute, in a series of lengthly documents presented over the past decade. This introduction is a brief description of AHI based on the practical implications of the system. This description is probably limited by the environment in which the system is being evaluated, a government research and development center. In addition to providing the unfamiliar with some concept of what AHI is, these first paragraphs should provide a basis for comparing our preconceptions to actual operation in a working environment. 1a

The general purpose of the AHI system in one statement: to increase the effectiveness of individuals and groups through the use of on-line computer technology in the routine performance of their jobs where these jobs are primarily the generating and recording of ideas, notes, plans, correspondence, etc. in an organizational environment. 1b

Thus an individual user sits down at an interactive terminal and creates, stores, organizes, manipulates, written textual material that he is concerned with. 1c

Entering written text into computer storage is very much like it would be on an automatic typewriter. 1c1

Once text of any kind is entered, however, it is available for a whole host of operations, not the least of which is a powerful text editing capability. This capability is similar to commercially available text editing packages such as those on the Honeywell GECOS III Time Sharing System. 1c2

Some important advantages of AHI in this area are the full duplex echo or instant feedback. Commands are recognized by the first character and then displayed in full automatically. The rich and powerful command language enables a user familiar with the syntax and vocabulary to do almost any conceivable editing. The command language includes many shortcuts such that a user can communicate with the system about as fast as he can type and think. 1c3

Text editing is greatly aided by hierarchically structured statements. Every statement is automatically numbered and assigned a user determined level in the hierarchy, which determines the relationship to the text. This structure consists of entities such as plexes, branches, groups and statements. Using this structure any specific amount of text can be moved anyplace in the system, and changed or deleted in any amount. 1c4

The "tree" structure is then usable by a set of commands called viewspecs. These facilitate viewing specified levels in the hierarchy thus controlling the level of detail or whatever the user wants displayed or printed. 1c5

The tree structure works within files which are something like documents or books which are the storage unit for the executive software. These provide a means of further structuring text. Commands exist such that files can be combined, in part or in whole, with any other file, and the user can "jump" around his various files. AHI is similar to a library where a person merely types his request and all books are presented to him for instant composition into a report or other new textual entity. 1c6

It is of great importance that not only are the files in his own library available to him, but all system users' files are available if access is permitted. 1c7

Additional capabilities of AHI are beyond the most sophisicated text editor. They include communicating with other users, sending documents and correspondence, coordinating work, joint and even simultaneous preparation of text, etc. 1d

This capability permits the system to act as the medium for handling all the paperwork of an organization. Rather than the traditional writing or dictatiing, typing, reviewing, typing, mailing or hand carrying, and repeating the process to incorporate the changes of reviewing personnel, the whole process, no matter how many revisions, may be done through AHI. The paperwork would be prepared at the terminal, entered into the system which would transmit it to the specified person(s). Their changes, recommendations, or approval would then be entered at their terminal, and then be made available to the next appropriate person. The system has a means of alerting a user when he has a message (some new paperwork to act on). In specific cases SOPs (standard operating procedures) would be devised to guide the process. 1d1

There are numerous specialized packages within AHI including tabulation methods, management tools, computation devices, distribution systems, etc. For the details see the user manuals for DNLS and TNLS. 1d2

Perhaps what is necessary for those who are interested is to come to grips with the concept of a system that does almost anything computer technology can do with typewritten English language information. Consequently, in any particular environment a person or group of persons can sit down and do the written portion of their jobs using this sophisticated computer rather than pencil, paper, typist, more paper, pencil, ..... 1e

## The Evaluation Plan 2

PURPOSE: The purpose of this plan is to propose a methodology for evaluating the utility of the tools and procedures that are part of the AHI technology for potential Air Force users. 2a

DISCUSSION: The investigation will be divided into two phases based on the two major areas of concern, (Phase I) the individual's use of the system and (Phase II) an organization's use of the system. 2b

THE INDIVIDUAL: This phase entails finding out what improvement occurs in the individual's performance when he uses the AHI system to accomplish his daily activities. This will include the effect of having other's work available on-line (eg. plans, meeting notes, documents, etc.) but will not involve specific attempts to compare management structures. Management will be involved through the receipt of communications via the system and the use of the system to repond to these communications. (Details will be presented below.) The evaluation will be based on a comparison between groups of individuals that are as similar as possible. 2b1

THE ORGANIZATION: This part of the effort will be concerned with how an organization such as a branch performs when augmented by the individual's use of the system and procedures and techniques that have implications for how individuals work together and with a management hierarchy. This investigation will follow that of the individual primarily because of the increased disruption of normal working routines and the much larger population required. The effects of this kind of study warrant a great deal of caution and preparation due to the massive changes and the concommitant psychological reactions. 2b2

Implications for Organizational Augmentation: There are two areas of concern, the changes in group processes and the changes in management techniques. 2b3

Implications for Group Process: Currently there is little planned interaction amoung individuals beyond meetings and some distribution of meeting notes. AHI technology includes specific methods for increasing this interaction resulting in more of a team effort. It promotes communication among persons working on the same or similar efforts and opens channels of communication where ever this would facilitate the accomplishment of the jobs. In order for this to work, groups must be more than some individuals working on different aspects of the same thing. They must have a group indentity to which they are willing to relinquish some of their personal needs and goals for the betterment of the group. The goal of the team is more important in a given task context than the goals of the individual. In a team, all aspects of a task are shared and all members must contribute positive and negative feedback and ideas. ("Brainstorming" should be a common activity.) Unless this happens a team effort is much less likely to evolve. Where this does not evolve naturally, training (group dynamics laboratory, human relations training) is available to promote group process. 2b3a

Changes in Management Techniques: 2b3b

Vertical communication within the branch organizational unit would be increased. Decisions would be made at the branch level with much more consultation with concerned workers, and most of the planning information, guidelines, and goals that managers use would be available to workers. Although this is not the modis operandi in many management structures, this is the case at the ARC (SRI). Recent research shows that improved morale, devotion to job, commitment, productivity of individuals, etc., results from these changes in the conduct of business. 2b3b1

The tradeoff from these increases in communication has historically been a loss of efficency. However, a very important product of AHI has been the implementation of modern, "open" management techniques without loss of overall efficiency. 2b3b2

Some of the specific effects in a branch are that decisions are made at the branch and section level with more inputs from all branch workers. All guidelines, policies, rationales, political expedients, etc., are made available to the workers who then have the opportunity to question for increased understanding and to provide relevant feedback to the managers. The worker follows his work through all levels of approval and has the opportunity to defend his position if need be. Managers become more facilitators than in the past and are responsible to see that all personnel understand current activities. They are pushers in the sense that they coordinate and inquire about developments. 2b3b2a

## PHASE I: INDIVIDUAL USAGE OF AHI 3

In order to assure meaningful results, all available techniques for gathering evaluative data are being used. Phases one and two will use the 2 generic kinds of measures available, psychometric and performance. There are five psychometric techniques, (1) an experimentally controlled attitude questionnaire, (2) a content questionnaire, (3) interviews for job profiles, (4) supervisor interviews for comparative job quality, and (5) comments. Performance will be measured using time records and by comparing two groups using a standardized test job in an experimental format. The results in each case will be collated, analyzed statistically, and intercorrelated. 3a

(Tech1) Experimental Design for the administration of the "T" Questionnaire: 3b

This is a standardized attitude questionnaire which is designed to measure subjects general attitude toward the AHI concept BEFORE actually contacting the system and then after full use of it. A four position scale is used. (See appendix). 3b1

Hypothesis: AHI can be shown to be effective by measuring user attitudes toward the general concept of job automation aids. 3b2

Independent Variable: Use of the equipment (Treatment) 3b3

Dependent Variables: 3b4

Time necessary to complete job tasks 3b4a

The attitude toward computer technology in general, text editing, file storing and sharing, file presentation, and systemized team activity. 3b4b

Independent Variables held constant: 3b5

Job Task Type (see Population) 3b5a

Personnel characteristics and type of positon 3b5b

Training time and instructions 3b5c

Terminal availability and type. 3b5d

Design format for the "T" Questionnaire: 3b6

The "T" questionnaire will be given to 1 group of users before use and 1 group of non-users as a control. This will constitute a pretest, and will provide the basis for comparison with the results of the same questionnaire after full usage of system. The split group pretest is a control for test effects. 3b6a

Groups: (1) users with pretest (T(1)), (2) users without pretest, (3) non-users with pretest, (4) non-users without pretest. All groups will receive the posttest (T(2)). 3b6b

| | | PRETEST | TREATMENT | POSTTEST |
|---|---|---|---|---|
| USERS | 1 | T(1) | X | T(2) Q |
| | 2 | | X | T(2) Q |
| NON-USERS | 1 | T(1) | | T(2) |
| | 2 | | | T(2) |

3b6c

TIME FRAME

```
[ training   ][<-- use------>          ]
 1   2   3   4   5   6   7   8   9  10
```

months 3b6d

This is a nonrandomized Solomon four-group design with a small N. The N of approximately 36 (4 groups of 9 each) necessitated the nonrandom selection of subjects for the groups. See the section on population. 3b6e

Population (as large as possible) (36). 3b7

Subjects will be assigned to groups based on de facto use or non-use of the system and the following criteria: age, length of service time, rank, job task type profile, and type of position (manager, engineer, administrator, clerical, and experience with computers). 3b7a

Subjects:
User group 1 User group 2 Non-users 1 Non-users 2
[See listing of groups and data below (3d2:m)] 3b7b

Training: 3b8

Training should be controlled, that is as nearly the same for each subject as possible. A list of the commands to be presented in a predetermined order will be constructed along with practice exercises for each. The time spent on the initial presentation of commands should be standardized. See file on training effort: (Lawrence,TRAEFT,:m) . 3b8a

Learning curves are based on a straight forward record of time spent in the learning situation. The learning situation is defined as any usage off the system prior to the point at which no significant increase in skill is observable, ie. when the learning curve levels off. The skill level that is being plotted against time will be acsertained through a combination of direct and unobtrusive tests. 3b8b

The interview technique is being used to record the amount of time each subject spends in the learning situation, rounded off to the half hour. These records will be maintained through Phase II, about a year and a half. Whenever possible, the records will be maintained from the first training/experience with the system. 3b8c

Data Collection Devices for technique 1: 3b9

Test Questionnaire ("T"): see file quest (QUEST,:m) 3b9a

(Tech2) Reaction questionnaire ("Q"): 3c

"Q" will be be administered only at the end of the experiment to determine specific reactions to use of AHI. Two types of questions will be used: 3c1

Attitude scale questions dealing specifically with AHI. 3c1a
In particular the: 3c1a1
1. equipment itself 3c1a1a
2. required use of equipment 3c1a1b
3. change in job habits 3c1a1c
4. service provided 3c1a1d
5. paperwork with AHI as opposed to before augmentation 3c1a1e
6. language and syntax. 3c1a1f

Multiple choice questions and open ended questions to gather information about system availability, terminal characteristics, service quality, language, problems not addressed in the daily log, etc. 3c1b

(Tech3) Interview to determine jobs of the population: 3d

Subject Profile by Job Task Type: 3d1

A semi-structured interview has been accomplished by a Utica College contractor. The subjects were asked to determine the percent of time spent in each job task type. The list of task types has been established by the experimenter intuitively, and is presented below. Information such as qualifications on the task selection was recorded as open ended data. The resultant data for each individual has been used to assign him to the appropriate group. This facilitates group similarity based on job type (see listing below). 3d1a

A group profile will be compiled from the job task type data. This will take the form of a graph showing the respective job types for the each group. A correlation will be computed between the user group and the control group based on the mean percentages in the job task types for each group. This will be an indicator of any differences between groups which would act as a spurious variable. 3d1b

Job task types (general catagories of job activities): 3d1c
1. Programming 3d1d
2. Project engineering , including: 3d1e
   Contract paperwork (forms memos, etc.) 3d1e1
   reviewing proposals and reports 3d1e2
3. Writing plans and/or reports 3d1f
4. Software operation (incl. evaluation, debugging of software packages) 3d1g
5. Briefings 3d1h
6. Demonstrations 3d1i
7. Managing other personnel 3d1j
8. Administrative paperwork 3d1k
9. Study, review of the state-of-the-art, reading, literature search, etc. 3d1l
10. Secretarial work. 3d1m

Groups and Data 3d2

## Job Task Type Population Profile Data

| JOB TASKS*: | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SUBJECTS: | | | | | | | | | | | |
| USERS 1 | | | | | | | | | | | 3d2a |
| McNamera | 0 | 10 | 0 | 0 | 10 | 5 | 55 | 10 | 10 | 0 | 3d2a1 |
| Lawrence | 0 | 50 | 20 | 0 | 5 | 0 | 0 | 5 | 20 | 0 | 3d2a2 |
| Bucerrio | 0 | 0 | 0 | 0 | 20 | 0 | 30 | 50 | 0 | 0 | 3d2a3 |
| Iuorno | 5 | 15 | 20 | 0 | 15 | 5 | 25 | 0 | 15 | 0 | 3d2a4 |
| Rzepka | 20 | 5 | 20 | 5 | 10 | 5 | 5 | 5 | 20 | 5 | 3d2a5 |
| Sliwa | 0 | 45 | 12 | 5 | 10 | 2 | 0 | 1 | 25 | 0 | 3d2a6 |
| Bergstrom | 10 | 70 | 5 | 0 | 5 | 5 | 0 | 0 | 5 | 0 | 3d2a7 |
| Daughtry | 50 | 5 | 10 | 0 | 5 | 5 | 0 | 5 | 20 | 0 | 3d2a8 |
| Petell | 0 | 0 | 0 | 20 | 0 | 0 | 0 | 30 | 0 | 50 | 3d2a9 |
| USERS 2 | | | | | | | | | | | 3d2b |
| Panera | 0 | 10 | 65 | 5 | 3 | 5 | 0 | 0 | 12 | 0 | 3d2b1 |
| Bair | 0 | 15 | 25 | 20 | 3 | 2 | 5 | 15 | 10 | 5 | 3d2b2 |
| VanAlstine | 60 | 20 | 0 | 0 | 0 | 5 | 0 | 5 | 10 | 0 | 3d2b3 |
| Luizzi | 25 | 25 | 10 | 10 | 10 | 5 | 0 | 5 | 10 | 0 | 3d2b4 |
| Cavano | 15 | 45 | 5 | 15 | 5 | 5 | 0 | 5 | 5 | 0 | 3d2b5 |
| Stone | 0 | 20 | 40 | 0 | 10 | 5 | 5 | 5 | 10 | 5 | 3d2b6 |
| Tomaini | 5 | 5 | 10 | 0 | 20 | 4 | 35 | 1 | 20 | 0 | 3d2b7 |
| Calicchia | 50 | 10 | 10 | 10 | 5 | 5 | 0 | 0 | 10 | 0 | 3d2b8 |
| Lamonica | 10 | 2 | 2 | 10 | 1 | 1 | 0 | 1 | 72 | 1 | 3d2b9 |
| NON-USERS 1 | | | | | | | | | | | 3d2c |
| Vito | 29 | 15 | 15 | 3 | 2 | 0 | 5 | 6 | 25 | 0 | 3d2c1 |
| Dinitto | 10 | 40 | 10 | 0 | 5 | 0 | 5 | 10 | 20 | 0 | 3d2c2 |
| Trad | 29 | 5 | 15 | 5 | 5 | 5 | 20 | 1 | 15 | 0 | 3d2c3 |
| Nelson | 1 | 20 | 5 | 5 | 8 | 1 | 40 | 15 | 5 | 0 | 3d2c4 |
| Patterson | 25 | 4 | 1 | 25 | 0 | 0 | 0 | 5 | 40 | 0 | 3d2c5 |
| Williams | 50 | 5 | 5 | 10 | 0 | 5 | 5 | 10 | 5 | 5 | 3d2c6 |
| R Stillman | 5 | 25 | 25 | 0 | 15 | 0 | 0 | 5 | 25 | 0 | 3d2c7 |
| Robinson | 10 | 20 | 10 | 30 | 5 | 0 | 5 | 10 | 5 | 5 | 3d2c8 |
| Defiore | 4 | 4 | 15 | 4 | 4 | 3 | 0 | 5 | 59 | 2 | 3d2c9 |
| NON-USERS 2 | | | | | | | | | | | 3d2d |
| Normand | 20 | 15 | 10 | 40 | 5 | 1 | 0 | 2 | 5 | 2 | 3d2d1 |
| N Stillman | 15 | 5 | 20 | 20 | 5 | 5 | 0 | 5 | 15 | 10 | 3d2d2 |
| Klayton | 10 | 35 | 0 | 10 | 5 | 0 | 0 | 40 | 0 | 0 | 3d2d3 |
| Cellini | 20 | 10 | 10 | 20 | 0 | 0 | 10 | 10 | 20 | 0 | 3d2d4 |
| Previte | 13 | 2 | 20 | 0 | 15 | 0 | 20 | 5 | 25 | 0 | 3d2d5 |
| Bauer | 50 | 0 | 0 | 15 | 0 | 0 | 0 | 15 | 20 | 0 | 3d2d6 |
| Reimann | 0 | 40 | 15 | 5 | 10 | 5 | 0 | 0 | 20 | 5 | 3d2d7 |
| Landes | 10 | 20 | 25 | 0 | 5 | 0 | 0 | 5 | 30 | 5 | 3d2d8 |
| Marcoccia | 0 | 0 | 0 | 5 | 15 | 0 | 0 | 20 | 0 | 60 | 3d2d9 |

The task types will be rated by a team of judges as to the intellectuality, ie. the amount of thought required. 3d3

Scale to rate the intellectual nature of the tasks: 3d3a

Scale:
1....2....3....4....5....6....7....8....9....10
least intellectual most intellectual 3d3a1

eg. routine paperwork (a form) = least intellectual,
creating a plan or report = most intellectual. 3d3a2

(Tech4) Interview of supervisors: 3e

In a semistructured interview, supervisors of the user groups will be asked to estimate change in quality of work due to use of AHI (compared to without AHI). 3e1

(Tech5) Comments: 3f

Each user will be asked to establish a file called "comments" in his directory where he can place reactions or problems when they occur during usage. To help determine the causes of problems, he should retain the hardcopy of the difficulty (TNLS) and prefix the date and time to each comment. 3f1

Performance Measurements: 3g

Performance Experiments: In order to obtain more objective data for Phase I and to pilot the experiments in Phase II, performance tests will be run. 3g1

The relative effectiveness of AHI compared to conventional methods and Text editors will be measured more directly by determining the respective performance parameters such as throughput time (total time necessary to complete a specific task) and manhours required. 3g1a

A primary concern will be to control for experience with computers, and to measure the effect of the system on group or "team" performance. The first samples will be at the group level of organization (N= approximately 5), the lowest level of management. This coincides with the number of persons trained at the time and the number of terminals. When a section (or a branch) is trained and equipped the evaluation will be based on the section's (or a branch's) performance . 3g1b

Method: 3g2

The section comparison will include program call which will be judged on overall quality and timeliness. Identical requests will be made of the sections with a short response time and the ability of the sections to respond within the specified period will be judged on timeliness and quality by the division and branch chiefs. Interruptions, personnel present, and other spurious variables will not be directly controlled or compensated for. These variables will be considered experimental conditions in order to realize the effect of normal everyday working conditions on respective performance. Compensation should be facilitated through the repetition of specific requests throughout the experimental period. This should equalize the effect of spurious variables between groups. 3g2a

Measurements: 3g2b

Manhours required to complete a task must be recorded in order to acquire meaningful data. Subjects will be given simple forms to record the clock time spent on the task being measured. Each time the subject sits down to work on the particular task ( test task) he will log the time, and when he leaves the test task to do anything else he will log that time. (Note: this procedure is the least disruptive of timing methods but will require management support to obtain accurate records consistantly.) The experimenter will then calculate the manhours from these logs. 3g2b1

Sample Time Log: 3g2b1a

Name:... Date:...
Enter time from clock that you begin and end work on the test task each time you work or are interupted for more than five minutes.
Time begin column: Time stop column:
(Elapsed time, will be calculated for you.) 3g2b1a1

Throughput or total time will also be recorded. This is simply the time in days and hours, including delays and inactive periods, from the beginning of a job to its completion. 3g2b2

Spurious variables: See statement above, .3g2a . 3g3

The Chronicle-- Serendipity Inputs: 3h

Valuable data other than that obtained through the above methods will be available. The end result will be a Chronicle or diary of experiences with the system. 3h1

The two groups, users and non-users, will be aligned so that the same management structure will be responsible to them. The same section chief (ISIM) and branch chief (ISI) will handle paperwork from these groups, in the case of the users this will be through AHI. The managers will be trained as system users and consequently will act on the work of their subordinates through AHI. This can provide valuable insights to operation with AHI compared to traditional procedures. 3h2

The managers will access the users work through their own terminals, make comments and suggestions, approve or disapprove, and return or send forward as the case may be. 3h3

This will not be a controlled investigation. Interviews will be used throughout phase I to record the reactions of the users. These comments will be valuable as a preliminary insight to the Phase II problem of augmenting a branch organizational entity. The managers must keep a log of their experiences with users vs. non-users, and hopefully will do so using the system. Note that each manager will act as both a user and a non-user. (For the controlled portion of this phase, they will be considered users.) 3h4

System Usage: 3i

Terminal usage: The time indivduals spend at respective terminals as a confounding variable will be correlated with attitude and other measures of that individual's usage of the system. Additional explanation of this recording process was covered in the section above on Training and learning curves; the same data will be used. It will be possible to have AHI record some of this data automatically. 3i1

AHI records use for each user by CPU console time, and file storage 24 hours a day. There is a TENEX set of accounting summary commands which have not been made operational yet (May, 1972). 3i2

Text Editor vs. AHI: 3j

A significant capability of AHI is powerful text editing. There are many text editing packages available on the commercial market at less cost. In order to determine the advantages of AHI a direct comparison to a commercially available package is necessary. The in-the-house computing facility here at RADC includes the GECOS Text Editor and Runoff subsystems on the Honeywell 635 TSS, which are representative of commercial packages. 3j1

The comparison will involve 2 parts: a comparative listing of the features of each system, that is what can be done on each, and a comparison of the performance of groups using the respective systems. 3j2

In addition to the planned use of AHI, a section unit will exploit Text Editor to its full capacity. The clock time and total time necessary to complete various routine tasks will tabulated and compared to that recorded for AHI; for example, the times necessary to send a finished report of 15 pages forward from the Division. This includes the reviewing managers inputs that routinely must be included before anything leaves the Division hierarchy. (Note: ISIS is already using Text Editor on a section level.) This does not include training managers other than the section chief. Managers will act on hardcopy drafts of paperwork sent forward. 3j2a

The difficulties encountered using Text Editor are numerous and substantial as shown in an in-the-house study of March, 1971, by Bair. These seem to center around GECOS Executive software and are due in part to an overload on the 635-45 processors. Poor response time, errors, lost files, and system unavailability are a few of the problems. These may be corrected by the using section, but whatever the case, they will be considered an integral part of Text Editor and NO compensation will be made for them. 3j2b

EVALUATION PLAN FOR AHI

PHASE II: ORGANIZATIONAL USAGE OF AHI. (For milestone chart, see file (EFFORT,6:m). 4

PURPOSE 4a

The purpose of the second phase of the Evaluation of AHI is to determine system effectiveness when used to augment an organizational entity, in this case a branch (ISI), and compare its performance to that of another branch. 4a1

METHODOLOGY:

4b1 There are two general ways in which system effectiveness can be measured: (1) sociometric techniques that will provide significant data about the effect the systen has on the individuals within a team environment, (2) performance measurements that will show the comparative amount of time necessary to complete jobs with and without the system.

4b2 Sociometric techniques:

4b2a The "T" QUESTIONNAIRE developed in Phase I will be administered to half of both branches to determine attitude toward computer technology in general. The non-test groups will act as a control for testing effects and time lapse. The same design used in Phase I will be expanded to the branch populations.

4b2b The "Q" QUESTIONNAIRE will answer specific questions about AHI at the end of the evaluation period (approximately 1 yr.). This test developed in Phase I will not be givin a second time to those who participated in Phase I.

4b2c The ORGANIZATIONAL CLIMATE INDEX (OCI) (Stern, Syracuse Univ.) will be employed to measure the way personnel function in this working environment and to determine the causal factors statistically. This commercially available questionnaire will be administered in a controlled format with the non-using branch acting as a control. Both branches will receive pretest and posttest of the same questionnaire to determine the effect AHI has on a team structure, while controlling for the effects of testing and time lapse between tests. (See appendix.)

4b2d The ACTIVITIES INDEX (AI) (Stern) is a commercially available questionnnaire integrated with the OCI that measures generalized personality characteristics. This will be administered to both branches to determine what significant differences in personnel exist between groups. This will permit control of personality differences, the significant spurious variable. The results of the AI are a score for each individual based on what activities he prefers (selected from a representive list of 300 generalized activities).

4b2e Phase II Design Format :

| | PRETEST | TREATMENT | POSTTEST |
|---|---|---|---|
| USER BRANCH | (1) T, AI | X | T, Q, OCI |
| | (2) OCI, AI | X | T, Q, OCI |
| NON-USER BRANCH | (1) T, AI | | T |
| | (2) OCI, AI | | T, OCI |

4b2f The above design is constructed to control for test effects and to provide as similiar an experience as possible for the control group during the experimental period. Since the AI is being used to control for personality differences between the test branch and the control branch, it will be administered only as a pretest. Since we cannot change the group S membership due to a fixed organizational structure, any significant personality differences will be used in the final analysis to correctly interpret the results of the OCI.

4b2g The difference between the pretest OCI and posttest OCI is the key measure of difference due to the treatment. However, the nature of the OCI may cause strong test effects after the pretest thus confounding the postest. Consequently, each group will be subdivided to control for this variable. Differences between posttest OCI for subgroups (1) and (2) can be attributed to pretest OCI effect since the subgroups will be matched on all other known variables. The key test effect is predicted to be an increased awareness of the subjects environment and a perceptual cuing to organizational and interpersonal activities. The same rational applies to the non-user OCI. The consistant administration of the AI should compensate for AI test effects.

4b2h The statistical analysis of the data collected with the OCI and the AI will be done by the Syracuse University Psychological Research Center using preprogrammed computer routines. These are described in the reference (Richman, 1969).

4b2i The "T" questionnaire will be administered as in Phase I to control for test effects.

4b3 Phase II Performance Testing: Approx. dates: Mar. 73-dec. 73.

4b3a Time Records:

4b3a1 Theoretically, if each subject recorded the amount of time necessary to complete routine jobs, we could compare the times to complete comparable jobs done with and without AHI. We are attempting to do this with the WPS (Word Processing System). At this point the problem is twofold, engineers are not keeping accurate records, if any, while they work, and we have not yet devised a way to determine what jobs are comparable. A comprimise method of logging time for particular tasks is described below (4b3b1:).

4b3a2 The reasons for difficulty in obtaining records are empirically obvious. It is a tremendous nuisance and interrupts the engineer's train of thought. Other approaches must be employed.

4b3a3 Time keepers could be hired to observe and record times, although this does not appear to be feasiable at present. As an alternative SRI will be asked to devise a program to monitor system usage.

4b3b Performance Measurements:

4b3b1 The relative effectiveness of AHI compared to conventional methods and Text editors will be measured more directly by determining the respective performance parameters such as throughput time (total time necessary to complete a specific task) and manhours required, as in Phase I.

4b3b2 A primary concern will be to control for experience with computers, and to measure the effect of the system on organization performance. This requires that a branch be trained at the time and that over 30 of terminals be available. When the branch is trained and equipped the evaluation will be based on the branch performance as a single entity.

4b3b3 Method:

4b3b3a The branch comparison will include program call which will be judged on overall quality and timeliness. Identical requests will be made of the branches with a short response time and the ability of the branches to respond within the specified period will be judged on timeliness and quality by the division chiefs. Interruptions, personnel absent, and other spurious variables will not be directly controlled or compensated for. These variables will be considered experimental conditions in order to realize the effect of normal everyday working conditions on respective performance. Compensation should be facilitated through the repitition of specific requests throughout the experimental period. This should equalize the effect of spurious variables between groups.

4b3b3b Measurements:

4b3b3b1 Manhours required to complete a task must be recorded in order to acquire meaningful data as opposed to system usage time. Subjects will be given simple forms to record the clock time spent on the task being measured. Each time the subject sits down to work on the particular task (test task) he will log the time, and when he leaves the test task to do anything else he will log that time. (Note: this procedure is the least disruptive of timing methods but will require management support to obtain accurate records consistantly.) The experimenter will then calculate the manhours from these logs as in Phase I.

4b3b3b1a NOTE: The division chiefs must identify the test tasks to the experimenter with enough lead time to ensure that all measurements can be made.

4b3b3b2 Throughput or total time will also be recorded. This is simply the time in days and hours, including delays and inactive periods, from the beginning of a job to its completion.

4b4 Communications Analysis: (To begin in Phase I).

4b4a One of the most important effects of implementing AHI in any environment is on the interpersonsonal communications amoung those who are "on" the system. It is hypothesisized that a significant increase in the level of interaction will occur and this will facilitate improved team performance.

4b4b To determine the actual changes in communication and evaluate them, it is necessary to establish current activities and then use the same measures to acsertain changes after the AHI system has been operational for a significant period of time. For this analysis we turn to the techniques available in the areas of interpersonal communication and group dynamics.

4b4c Analytical Instruments:

4b4c1 Communication Network Analysis:

4b4c1a Networks are the quantitative representation of interaction. A model will be created showing the individuals involved in interaction which are the nodes of the net. The nodes are linked by lines or "channels" where comunication exists. The channels are quantified by number and duration of interactions. Duration is noted by a nominal scale where long represents the maximum length and short the minimum length interaction with not more than 5 categories between these end points. Of particular interest will be what communications are mediated by the system v. traditional channels (face to face, meetings, letters, memos, etc.). Thus, the net will have two channels between each node. The system channel will be divided into messages, Journal documents, and file sharing, to account forthe different subsystems available (note the Document Control System). The detail to which data is collected will depend upon a number of logistics factors, but we will at least attempt to analyze a representative sample time period.

4b4c2 Content Analysis:

4b4c2a Also of importance is the nature of the interactions of those in the net. Content anaysis techniques can be employed here to get at this elusive variable. A simple examination of written communications will reveal what kinds of information are being communicated in this way (eg. task oriented, proceedure oriented, process maintenance, etc.). However, it is much more difficult to examine the content of oral messages or system messages (dialogue linking) neither of which are permanently recorded.

4b5 The combination of psyhometric and performance techniques should overcome the deficiencies and difficulties encountered and provide enough rigor for an accurate evaluation. Cost and other factors make it imperative that a sizable significant improvement be realized with AHI. This plan is surely sensitive enough for that. The results of Phase I will be vital to Phase II methodology. We anticipate learning a great deal that will probably result in modification of the Phase II plan. The success of the psychometric techniques and the validity of the performance experiments, including the logistics of running such experiments in a non-labortory environment, will be particularly enlightening.

4b6 REFERENCES:

4b6a Isaac, S. & Michael, W.B., HANDBOOK IN RESEARCH AND EVALUATION, San Diego: R.R. Knapp, 1971.

4b6b Richman, J.L., Consultant, Psychological Research Center, Syracuse Univ., (PhD Psychological measurement).

4b6c Richman, J.L., & Stern, G.G., "An Analysis of the Psychological Characteristics and Environment in Remote Industrial Sites", Psychological Researcch Center, Syracuse Univ., 1969.

4b6d Selltiz, Jahoda, Deutsch, Cook, RESEARCH METHODS IN THE SOCIAL RELATIONS, N.Y.: Holt, Rinehart,& Winston, 1965.

4b6e Stern, G.G., PEOPLE IN CONTEXT: Measuring Person-Environment Cogruence in Education and Industry, N.Y.: Wiley & Sons, 1970.

4b6f Williams, F., REASONING WITH STATISTICS, N.Y.: Holt, Rinehart, and Winston, 1968.

5 APPENDIX : The ORGANIZATIONAL CLIMATE INDEX (OCI)

5a The OCI indirectly measures the needs of the subject as expressed in terms of his working environment. "Needs refer to organizational tendencies which appear to give unity and direction to person's behavior." (page 8) Needs may be classified in a taxonomy where the clasification criterion is "... the tendency to actions of a certain kind." (8) In order to indentify these tendencies the concept of PRESS is established. "...press may be defined (like needs) as a taxonomic classification of characteristic behaviors manifested by aggregates of individuals in their mutual interpersonal transactions." (8)

5b This model of needs being manifested in characteristic behaviors identified as press is well substantiated by experimentation. "The model can be used to predict, amoung other things, the effects of selection and of organizational change on morale and output (grades or production)." (9) This includes the effect of installing equipment and/or new procedures in the working environment.

5c Ideally, to determine the effect of any change in a working environment we would make direct observations of the subject's on-the-job performance. This is at best costly and disrupts the modis operandi thus negativily affecting the validity of the observations. Although men are often best judged by their deeds, they are better understood by their desires.... To understand the effect of a given change is to understand the subject's reaction to it, since deeds are the results of a person's intentions and perceived activities. It would be misleading to rely solely on intentions because these usually include a significant amount of fantasy.

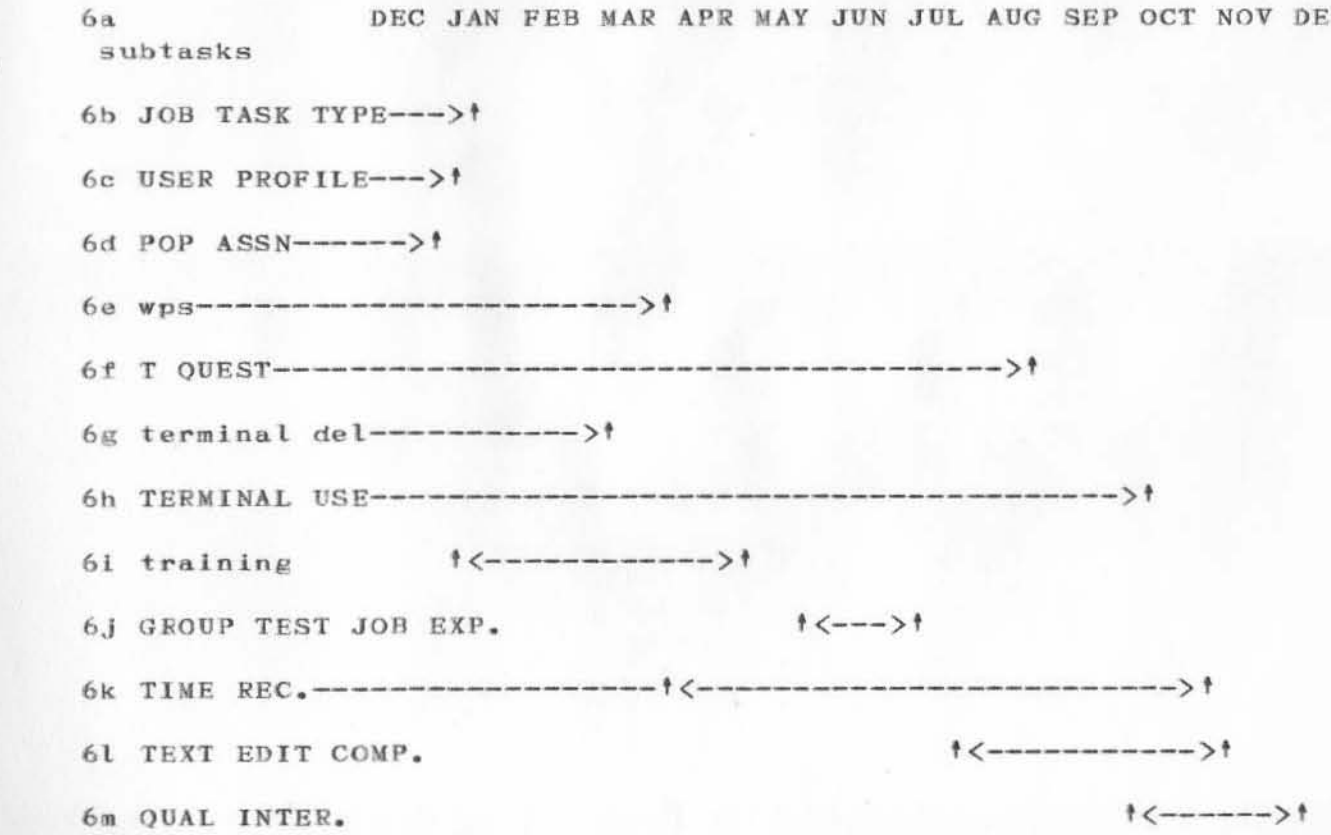
5d The remaining alternative, which is quite adequate, is to be concerned with the preferences that the individual himself expresses in response to verbal descriptions of various possible activities in his environement. The OCI, then, elicits choices associated with a suggested working situation. The choices themselves are equally acceptable and focus on behavior rather than motive, ie. the activity in the environment. (10) If the activity is real, then the perception of it must be real. (11) To wit, if a subject perceives an activity as real , then it is real to him and will affect his behavior accordingly, whether or not this perception is precise.

5e The OCI presents 300 brief descriptions of activities in a generalized working environment. These are correlated with degrees of performance from previous experiments where quantitative data was readily obtainable, such as in a factory. The large number of items compensates for the inappropriateness of a few. The items are clustered into factors on which an individual is given a score. The factors represent two generic kinds of results, those associated with performance quality and those with the nature of the performance. These are intercorrelated to measure the level of performance relative to other previous experiments and/or previous administrations of the OCI to the same population.

5f A significantly large population combines the responses of enough persons (N= >30) to compensate for individual differences and assure validity.

5g Footnote: Stern, G.G., PEOPLE IN CONTEXT: Measuring Person-Environment Cogruence in Education and Industry, N.Y.: Wiley & Sons, 1970.

6 APPENDIX: MILESTONES, PHASE I:



6n Q QUEST.....†<--->†

6o TOOLS-SOP----------->†

6p PHASE II †-->

6p1 Lower case tasks above indicate that they are not part of this effort, but this effort is dependent upon their completion.

6q Phase ii milestones cannot be proposed until some firm estimate of terminal delivery is available. Hopefully, it would begin in the fall of CY72.

EVALUATION PLAN FOR AHI

(J16053) 23-APR-73 05:25; Title: Author(s): Bair, James H. /JHB;
Sub-Collections: RADC; Clerk: JHB;
Origin: <BAIR>REVPLAN.NLS;3, 12-JUL-72 14:59 JHB ;

RWW 23-APR-73 16:16 16054

Demonstratation of the Journal

This is a message input to demonstrate the Journal 1

RWW 23-APR-73 16:16 16054

Demonstratation of the Journal

(J16054) 23-APR-73 16:16; Title: Author(s): Watson, Richard W. /RWW; Distribution: /jcn mdk ; Sub-Collections: SRI-ARC; Clerk: RWW;

VGC 23-APR-73 12:03 16055

inwg list update

marcia and jeanne, inwg mailing list as given in inwgmemlist is rather out of date. vern dettwiler is listed twice; missing are abhay bhushan, peter kirstein, eric aupperle. please update and send mea msg when these changes have been made. thanks much.
vint 1

VGC 23-APR-73 12:03 16055

inwg list update

(J16055) 23-APR-73 12:03; Title: Author(s): Cerf, Dr. Vinton G. /VGC; Distribution: /JBN; Sub-Collections: NIC; Clerk: VGC;

WLB 23-APR-73 17:40 16056

Proposal for the Launching of a Marketing/Review Process

This suggestion is submitted in the spirit of helping to launch a Marketing Activity within ARC that can maintain relevance to the existing Operations and Development Activities while fostering an integrated and harmonious growth of the ARC organism. Your comments and counter-proposals in this dialog will be appreciated. -- Walt

Proposal for the Launching of a Marketing/Review Process

I have noticed with interest the growing "heat" of our discussions with the "outside world" in recent months -- ARPA Energy Project, ARPA Office, VELA, etc. -- and am concerned that we provide an interface between these "Marketing" thrusts and the existing Development and Operations thrusts that will contribute to the healthy growth of ARC as an integrated organism. 1

(Of course, as long as all management authority is vested in as few people as it is now -- and assuming that there is no need for formal integration of non-management knowledge and perception in the decision-making process -- we can get along with the current system; however, we all realize that we need to be constantly gearing up to handle future growth -- which will occur to some extent in response to this gearing-up -- and it seems that now is a good time to begin dialog in this area.) 1a

It occurs to me that the Design/Review Process that is in effect for Development provides, at least in the abstract, a good model for what we need in Marketing. 2

A Marketing Team could consist of those individuals -- from Operations, Development, Analysis, Marketing, or whereever -- who are "pushing" a given marketing thrust (project, community, or single-source orientation). The head of the Marketing Team would be the person with chief responsibility for liason with the potential sponsor(s). 2a

The "Review Team" would consist of a group of persons from various areas which would be affected by the success or failure of the marketing thrust. There should be ample opportunity for individuals to volunteer for "Review Teams" for marketing thrusts which particularly interest them (assuming they are not sufficiently interested to be on the Marketing Team), as well as for Management to appoint individuals to represent interests that particularly need representation. 2b

The Marketing/Review teams could be set up: 3

(1) in response to a contact FROM a particular potential client 3a

(2) in anticipation of initiating contact with a potential client 3b

(3) to create and pursue a marketing strategy seeking support

for specific projects for which no potential clients are visible. 3c

It would be the responsibility of the Marketing Team to provide and keep current a Marketing Framework document which would provide the basis for negotiations with the potential clients. This Marketing Framework document would function somewhat as a "charter" for the marketing thrust and would contain such as: 4

(1) a statement of goals -- what ARC hopes to accomplish from this particular marketing thrust in terms of money, increased visibility, cooperation, furthering of ARC global goals, evolution of ARC as an organism and of individuals within ARC and without, etc. 4a

(2) an "impact statement" -- what would be the effect on ARC with varying levels of success of the proposed marketing thrust in terms of reorientation of various projects and activities, temporary and long-term overload on ARC facilites and personnel, requirements for management evolution to accommodate a larger or more complex organism, etc. 4b

(3) an outline of the plan or strategy to be used in the marketing thrust -- who is to be (or is being) contacted, how much personnel (time and travel) and facilities (space, machine time for demos and trial runs) will be expended, criteria to be used in judging interim (before a contract is signed) success or failure of the thrust. 4c

(4) a "justification statement" indicating why the Marketing Team feels that the goals set forth justify the projected impacts and proposed expenditure of resources in the marketing thrust itself. 4d

After approval of the Marketing Framework document (first by the "Review Team" and then by Management) the Marketing Team would be responsible for carrying out negotiations with the potential client(s) with the ultimate goal (for this team) being the acceptance of a contract by both ARC and the sponsor(s). 5

The Review Team would be responsible for reviewing the activities of the Marketing Team, particular as regards written proposals and contract drafts. The Review Team would have no real line management authority but would act as a check and balance on the Marketing Team; any time that the Review Team (all, most, or any member?) judged that the activities of the Marketing Team violated the Marketing Framework agreed upon or felt that a proposed (or evolved) Marketing Framework violated the global ARC

Framework, a "higher authority" would be invoked to make appropriate decisions and adjustments. 6

WLB 23-APR-73 17:40 16056

Proposal for the Launching of a Marketing/Review Process

(J16056) 23-APR-73 17:40; Title: Author(s): Bass, Walt /WLB;
Distribution: /sri-arc ; Sub-Collections: SRI-ARC; Clerk: WLB;

MLK 1-JUN-73 20:09 16057

TRANSMITTAL TO: John Leung

TRANSMITTAL TO: John Leung
SRI

FROM: Marcia Keeney (NIC)
Station Agent 1

At your request, I am sending NIC 15341 and NIC 15344 (Packet Radio Note #40 and 37). 1a

16057 Distribution 1
Station Agent, 1a

Transmittal to Station Agents -- 82 NIC 16058
Jeanne North 4 JUN 73 1

1a

Enclosed: 1b

NIC 15359 *NWG/RFC #494 Availability of MIX and MIXAL in the Network; David C. Walden (BBN-NET) 1b1

NIC 15357 *NWG/RFC #492 RESPONSE TO RFC 467; Edwin Meyer (MIT-MULTICS) 1b2

1c

*sent to Liaisons 1d

MLK/kk 2

16058 Distribution
Station Agent, Michael D. Kudlick, James E. (Jim) White,

Transmittal to Station Agents -- 82

(J16058) 31-MAY-73 14:48; Title: Author(s): Jeanne B. North/JBN ;
Distribution: /SA MDK JEW ; Sub-Collections: NIC ; Clerk: KIRK ;

MLK 31-MAY-73 17:09 16059

TRANSMITTAL TO: David Retz

TRANSMITTAL TO: David Retz
800 Miramonte Drive
Santa Barbara, California 93109

FROM: Marcia Keeney (NIC)
Station Agent 1

Enclosed is your Network Resources Notebook (NIC 6740). You will receive updates to it as they are issued. 1a

16059 Distribution
Station Agent,

MLK 31-MAY-73 17:09 16059

TRANSMITTAL TO: David Retz

(J16059) 31-MAY-73 17:09; Title: Author(s): Marcia Lynn Keeney/MLK ; Distribution: /SA ; Sub-Collections: NIC ; Clerk: KIRK ;

MLK 1-JUN-73 20:07 16060

TRANSMITTAL TO: Nancy Thies

TRANSMITTAL TO: Nancy Thies
800 Miramonte Drive
Santa Barbara, California 93109

FROM: Marcia Keeney (NIC)
Station Agent 1

Enclosed is your Network Resources Notebook (NIC 6740). You will receive updates to it as they are issued. 1a

16060 Distribution 1
Station Agent, 1a

MLK 1-JUN-73 20:10 16061

TRANSMITTAL TO: Prof. John M. Bennett

TRANSMITTAL TO: Prof. John M. Bennett
Basser Dept. of Computer Science
School of Physics
University of Sydney
Sydney N.S.W. 2006
AUSTRALIA

FROM: Marcia Keeney (NIC)
Station Agent 1

At the request of Larry Roberts, I am sending a copy of the Network Resources Notebook (NIC 6740). 1a

16061 Distribution 1
Station Agent, 1a

MLK 1-JUN-73 20:08 16062

TRANSMITTAL TO: Paul Baran

TRANSMITTAL TO: Paul Baran
701 Welch Road, Suite 326
Palo Alto, California 94304

FROM: Marcia Keeney [NIC)
Station Agent 1

Enclosed is your Network Resources Notebook (NIC 6740). You will receive updates to it as they are issued. 1a

16062 Distribution 1
Station Agent, 1a

MLK 1-JUN-73 20:12 16063

TRANSMITTAL TO: Prof. D. J. Doole

TRANSMITTAL TO: Prof. D. J. Doole
University of Bristol
Computer Center, School of Mathematics
University Walk
Bristol IIW
ENGLAND

FROM: Marcia Keeney (NIC)
Station Agent 1

At the request of Larry Roberts, I am sending a copy of the Network Resources Notebook (NIC 6740). The Protocol Notebook (NIC 7104) is not yet available; I will, however, send it as soon as it is ready. 1a

16063 Distribution 1
Station Agent, 1a

MLK 31-MAY-73 16:59 16064

TRANSMITTAL TO: Robert Lieberman

TRANSMITTAL TO: Robert Lieberman
Code 1830
Bethesda, Maryland 20034

FROM: Marcia Keeney (NIC)
Station Agent 1

Enclosed is your Network Resources Notebook (NIC 6740). You will receive updates to it as they are issued. The Protocol Notebook (NIC 7104) is not yet available; I will, however, send it as soon as it is ready. 1a

16064 Distribution
Station Agent,

MLK 31-MAY-73 16:59 16064

TRANSMITTAL TO: Robert Lieberman

(J16064) 31-MAY-73 16:59; Title: Author(s): Marcia Lynn Keeney/MLK ; Distribution: /SA ; Sub-Collections: NIC ; Clerk: KIRK ;

MLK 31-MAY-73 17:12 16065

TRANSMITTAL TO: Philip Enslow

TRANSMITTAL TO: Philip Enslow
Office of Telecommunications Policy
Executive Office of the President
Washington, D.C. 20504

FROM: Marcia Keeney (NIC)
Station Agent 1

Enclosed is your Network Resources Notebook (NIC 6740). You will receive updates to it as they are issued. 1a

16065 Distribution
Station Agent,

MLK 31-MAY-73 17:12 16065

TRANSMITTAL TO: Philip Enslow

(J16065) 31-MAY-73 17:12; Title: Author(s): Marcia Lynn Keeney/MLK ; Distribution: /SA ; Sub-Collections: NIC ; Clerk: KIRK ;