SEP 30 - OCT 6, 1973: A WEEK IN REVIEW

WEEKLY ANALYSIS REPORT: 1

                                                                     2

WEEK: SEP 30 - OCT 6, 1973 (24 HOURS/DAY)   3

                                                                     4

TOTAL SYSTEM CPU: 53.717 HRS   5

                                                                     6

  (ARC)   6a

IDENT	CPU HRS	CON HRS	CPU/CON	% SYS	CON/CPU:1	
						6a1
						6a2
(STAFF)						6a3
(JMB)	.444	14.193	.031	.827	31.966	6a3a
(DCE)	.755	22.067	.034	1.406	29.228	6a3b
(SRL)	.312	7.070	.044	.581	22.660	6a3c
(NDM)	.211	15.726	.013	.393	74.531	6a3d
(JCN)	1.160	24.453	.047	2.159	21.080	6a3e
(DVN)	.681	18.854	.036	1.268	27.686	6a3f
(PR)	.023	.494	.047	.043	21.478	6a3g
(RWW)	.255	9.517	.027	.475	37.322	6a3h
	-----	-----		-----		6a3i
(TOTAL)	3.841	112.374		7.152		6a3j
						6a3k
(PSO)						6a4
(JML)	.069	4.787	.014	.128	69.377	6a4a
(BAH)	.363	15.549	.023	.676	42.835	6a4b
(MEJ)	1.135	74.558	.015	2.113	65.690	6a4c

(KIR)	1.712	46.199	.037	3.187	26.985	6a4d
	-----	-----		-----		6a4e
(TOTAL)	3.279	141.093		6.104		6a4f
						6a4g
(NIC)						6a5
(JDC)	.048	4.591	.010	.089	95.646	6a5a
(EJF)	.691	24.079	.029	1.286	34.847	6a5b
(CBG)	.010	.100	.100	.019	10.000	6a5c
(MDK)	.346	7.320	.047	.644	21.156	6a5d
(MLK)	.434	16.371	.027	.808	37.721	6a5e
(JBN)	.670	32.178	.021	1.247	48.027	6a5f
	-----	-----		-----		6a5g
(TOTAL)	2.199	84.639		4.093		6a5h
						6a5i
(HARDWARE)						6a6
(RDB)	.008	.259	.031	.152	32.375	6a6a
(MEH)	.018	.397	.045	.034	22.056	6a6b
(JR)	-	-	-	-	-	6a6c
(EKV)	-	-	-	-	-	6a6d
	-----	-----		-----		6a6e
(TOTAL)	.026	.656		.186		6a6f
						6a6g
(TENEX)						6a7
(DIA)	.057	2.093	.027	.106	36.719	6a7a
(WRF)	1.153	24.989	.046	2.146	21.673	6a7b

(KEV)	.726	20.653	.035	1.352	28.448	6a7c
(DCW)	1.625	54.849	.030	3.025	33.753	6a7d
	-----	-----		-----		6a7e
(TOTAL)	3.561	102.584		6.629		6a7f
						6a7g

(NLS)						6a8
(CFD)	1.737	46.637	.037	3.234	26.849	6a8a
(JDH)	.961	27.790	.035	1.789	28.918	6a8b
(CHI)	1.306	31.851	.041	2.431	24.388	6a8c
(DSK)	.099	6.212	.016	.184	62.747	6a8d
(HGL)	.331	10.633	.031	.616	32.124	6a8e
(EKM)	.997	36.970	.027	1.856	37.081	6a8f
(JEW)	.801	45.015	.018	1.491	56.199	6a8g
	-----	-----		-----		6a8h
(TOTAL)	6.232	205.108		11.601		6a8i
						6a8j

(GROUP) TOTALS   6b

GROUP	CPU HRS	CON HRS	CPU/CON	% SYS	
					6b1
					6b2
(STAFF)	3.841	112.374	.034	7.152	6b3
(PSO)	3.279	141.093	.023	6.104	6b4
(NIC)	2.199	84.639	.026	4.093	6b5
(HARDWARE)	.026	.656	.040	.186	6b6
(TENEX)	3.561	102.584	.035	6.629	6b7
(NLS)	6.232	205.108	.030	11.601	6b8

SEP 30 - OCT 6, 1973: A WEEK IN REVIEW

	-----	------		-----		6b9
(TOT)	19.138	646.454		35.765		6b10
						6b11
(STATS)						6c
HIGHEST CPU: KIR 1.712 hrs			LOWEST CPU: CBG .010 hrs			6c1
HIGHEST CON: MEJ 74.558 hrs			LOWEST CON: CBG .100 hrs			6c2
HIGHEST CPU/CON: CBG .100			HIGHEST CON/CPU:1: JDC 95.646			6c3
						6c4
(OVERHEAD)						6d
PETERS	1.951	54.493	.036	3.632	27.931	6d1
BACKGROUND	1.131	57.767	.020	2.105	51.076	6d2
CAT	.634	5.260	.121	1.180	8.297	6d3
CATALOG	.330	2.071	.159	6.280	6.276	6d4
DOCB	-	-	-	-	-	6d5
DOCUMENTATION	.278	8.995	.031	.518	32.356	6d6
GILBERT	-	-	-	-	-	6d7
NETINFO	.076	2.806	.027	.141	36.921	6d8
NIC-WORK	-	-	-	-	-	6d9
OPERATOR	.752	31.956	.024	1.400	42.495	6d10
PRINTER	7.754	113.587	.068	14.435	14.649	6d11
SYSTEM	1.278	125.519	.010	2.379	98.215	6d12
SYSTEM	.787	136.836	.006	1.465	173.870	6d13
SYSTEM	6.419	124.877	.051	11.950	19.454	6d14
	-----	------		-----		6d15
(TOTAL)	21.390	664.167		45.485		6d16

6d17

(XEROX)   6e

                                                                             6e1

NAME	CPU HRS	CON HRS	CPU/CON	% SYS	CON/CPU:1	
						6e2
						6e3
COWAN	.017	.924	.018	.032	54.353	6e4
GESCHKE	.004	.426	.009	.007	106.500	6e5
SATTERTHWAITE	.295	14.029	.021	.549	47.556	6e6
SWEET	.009	1.581	.006	.017	175.667	6e7
	-----	-----		-----		6e8
(TOTAL)	.325	16.960		.605		6e9

                                                                             6e10

(RADC)   6f

                                                                             6f1

NAME	CPU HRS	CON HRS	CPU/CON	% SYS	CON/CPU:1	
						6f2
						6f3
BERGS	.250	17.397	.014	.465	69.588	6f4
BETHK	.167	7.633	.022	.311	45.707	6f5
CAVAN	.204	25.876	.008	.380	126.843	6f6
IUORN	.082	5.538	.015	.153	67.537	6f7
KENNE	.301	15.908	.019	.560	52.850	6f8
LAMON	.348	9.249	.038	.648	26.578	6f9
LAWRE	.127	9.897	.013	.236	77.929	6f10
MCNAM	.311	15.407	.020	.579	49.540	6f11
PANAR	.279	14.633	.019	.519	52.448	6f12

RADC	.024	2.014	.012	.045	83.917	6f13
SLIWA	.010	.488	.020	.019	48.800	6f14
STONE	.440	20.212	.022	.819	45.936	6f15
THAYE	.004	.215	.019	.007	53.750	6f16
TOMAI	.229	12.683	.018	.426	55.384	6f17
	-----	-----		-----		6f18
(TOT)	2.776	157.150		5.597		6f19
						6f20

(NETUSERS) TOP FIVE   6g

                                                                                      6g1

NAME	CPU HRS	CON HRS	CPU/CON	% SYS	CON/CPU:1	6g2
						6g3
TORBETT	1.733	25.396	.068	3.226	14.654	6g4
NSRDC	.744	39.706	.019	1.385	53.368	6g5
BBN-NET	.616	23.827	.026	1.147	38.680	6g6
GUEST	.567	28.264	.020	1.056	49.848	6g7
UCSB	.521	22.210	.023	.970	42.630	6g8
	-----	-----		-----		6g9
(TOTAL)	4.181	139.403		7.784		6g10
						6g11

(NET)	CPU HRS	CON HRS	CPU/CON	% SYS	CON/CPU:1	6h
						6h1
TOTAL	7.085	293.475	.024	13.170	41.667	6h2
						6h3
(OTHER)	CPU HRS	CON HRS	CPU/CON	% SYS	CON/CPU:1	6i

						611
BAIR	.231	8.726	.026	.430	37.775	612
JIMB	.312	12.021	.026	.581	38.529	613
MARRAH	.002	.078	.026	.004	39.000	614
ACCOUNT O	1.570	12.030	.131	2.923	7.662	615
	----	------		----		616
TOTAL	2.115	32.855		3.938		617
						618
						7

19730 Distribution
    Susan R. Lee, Beauregard A. Hardeman, Douglas C. Engelbart, Don I.
Andrews, Charles F. Dornbush, Elizabeth J. (Jake) Feinler, Martin E.
Hardy, J. D. Hopper, Charles H. Irby, Mil E. Jernigan, Diane S. Kaye,
Kirk E. Kelley, Michael D. Kudlick, Elizabeth K. Michael, Jeanne B.
North, James C. Norton, Jeffrey C. Peters, Paul Rech, Dirk H. Van
Nouhuys, Kenneth E. (Ken) Victor, Donald C. (Smokey) Wallace, Richard
W. Watson, James E. (Jim) White, Duane L. Stone, Thomas F. Lawrence,
James H. Bair, L. Peter Deutsch, James G. Mitchell,

Decisions in the help database for Oct 16

1. Fixed Recognition Mode will be used in Examples.   1

2. Name delimiters in the Syntax and Example branches will be <NULL>
left delimiter and <EOL> right delimiter. In the rest of the
database, name delimiters will be <NULL> left delimiter and colon
right delimiter. In special cases where a clarifying word follows
the name, the right delimiter may be made a space.   2

3. Because the link search algorithm will not search level by level,
syntax, and example statements in the function branch should be
unnamed so that links that start with SYNTAX or EXAMPLE will go to
the right place.   3

19732 Distribution
   Kenneth T. Pogran,

Ken.
I sent the first copy to "KP"since that was the "Ident" printed at
the top of RFC 561. When the NIC told me that my note was filed in
"Subcollections NIC, KP" I got suspicious, looked up your ident, and
found it was KTP.
Alex

1

(J19732)   16-OCT-73 20:50;   Title: Author(s): Alex A. McKenzie/AAM;
Distribution: /KTP; Sub-Collections: NIC; Clerk: AAM;

This document is being Journalized at this time to make it referenceable from the Xerox PARC 1972-73 ARPA Final Technical Report.

MPS Segmentation System Overview   1

   All data in MPS are stored in segments. There are three kinds of
   segments: file, data, and window.   1a

      A file segment is simply the addressable version of a file in
      the 10X system.   1a1

      A data segment is the analogy of private data in the 10X
      virtual memory.   1a2

      Window segments provide direct, linear addressing of objects
      composed of pages selected from one or more file segments.   1a3

   At any given moment some set of segments is present in the user's
   VM ("swapped in").   1b

      If the user wants to directly access a segment, it must be
      swapped in. Also, if a stack (a type of data segment) needs to
      be lengthened, it may have to be moved in VM. this is
      equivalent to swapping it out, and then swapping it back in
      with a different length. Whenever a segment is being
      considered for swapping or is swapped, a strategy procedure
      (either system or user supplied) is called to decide whether to
      swap the segment, or to fix up any addresses which may be
      necessary (when the segment is actually swapped).   1b1

   In general, addresses manipulated by MPS programs are in segmented
   form and require an entire word on the PDP-10 (or two words on a
   NOVA).   1c

      A segmented address contains a segment number, possibly an
      indirect or index register designator, and a VM address.   1c1

         Bits   Function
         ----   --------
         0   0 if in memory, 1 if swapped out
         1-12   Segment number
         13   Indirect flag
         14-17 Index designator
         18-35 Address in Virtual Memory (if swapped in), [some
         invalid,
                trap-causing address otherwise]   1c1a

   At any given moment, it must be possible to map any VM address
   into a segmented address and to map any segmented address into a
   VM address if the segment is swapped in.   1d

      When a segment is swapped out, any VM addresses pointing to it

must be converted to "swapped-out form." In swapped-out form,
any use of a segmented address will cause a
segment-out-of-memory signal (signal in the MPL sense) to be
generated.   1d1

The area of virtual memory in which stack segments may reside is
quantized at the 10X page level (512 words). Any private pages in
this segmented virtual memory (SVM) are actually pages in a file,
called the DATAFILE, created at the beginnning of an MPS session
by the segmentation machinery.   1e

A file or a window segment or a data segment of at least one
page resides in as many whole VM pages as are needed to hold it
while it is swapped in.   1e1

Data segments which are less than one page long are grouped
together in pages. If one such small segment is swapped in, a
request to swap in a small data segment which co-resides in the
same page (called a "cosegment") requires only that the segment
be marked as swapped in. If a small data segment is moved (as
a side effect of lengthening it, for instance), no attempt is
made to reclaim the space previously occupied by it in the
current implementation (this may very well change).   1e2

An empty page slot in SVM may mean one of two things: 1f

(a) it is an unoccupied slot of a window segment currently
covering that page;   1f1

(b) it is a genuinely free page of the SVM.   1f2

Since the segmentation system is a software administered
discipline, swapping of segments in and out of the SVM requires
advice from programs outside of the segmenting machinery itself,
in general. Such strategy procedures are invoked whenever   1g

(a) a segment is being considered for swapping: if the strategy
procedure returns the value FALSE, the segmenting machinery
will not swap the segment;   1g1

(b) the segment is about to be swapped out; or   1g2

(c) the segment has just been swapped into SVM.   1g3

The section on swapping below outlines these interfaces in detail. 1h

Segments have names, either user specified or system supplied,and
are hierarchically related. The only inviolable rule on segment

2

naming is that no two segments with a common immediate parent may
have the same simple name;   this prevents ambiguous naming .   1i

(ucalls)   2

Routines for Manipulating the Segmentation System   3

   Creating and Destroying segments: 3a

     SegNum ← NewData(Nwords, owner)   3a1

Creates a new data segment of the specified length and
returns the segment number. If owner is a valid segment
number, then MakeParent(new segment, owner) will be done as
a side effect of creating the new data segment.   3a1a

   The segment initially contains only zeroes.   3a1a1

   The segment is given an internal name   3a1a2

     SegNum ← NewWindow(Npages, owner)   3a2

Creates a new window segment with the given number of page
slots and returns the segment number assigned to it.   If
owner is a valid segment number, then MakeParent(new
segment, owner) will be done as a side effect of creating
the new window segment.   3a2a

   All the page slots are initially empty   3a2a1

   The segment name is internal as for NewData   3a2a2

     SegNum ← NewFile(Name, Options, owner)   3a3

Opens the file with the given name (string), with options as
given (this is just currently passed to the 10X system, and
is thus highly system dependent), and assigns it a segment
number, which is returned. The Options will hopefully be
separated from the specifics of the 10X system in a future
version of the segmenting machinery. If owner is a valid
segment number, then MakeParent(new segment, owner) will be
done as a side effect of creating the new file segment.   3a3a

   The segment name is the same as the file name.   3a3a1

   DestroySeg(SegNum)   3a4

Destroys the given segment and releases the segment number.   3a4a

If the segment is a data segment, it is obliterated, and the segment number is released.   3a4a1

If the segment is a file segment, the file is deleted (in the 10X sense) and the segment number is released.   3a4a2

If the segment is a window segment, its private pages are destroyed, its directory data segment is destroyed, and the segment numbers of both the window and the directory segment are released.   3a4a3

ReleaseSeg(SegNum)   3a5

Behaves like DestroySeg except when SegNum represents a file segment, in which case, the file is deleted from the segmented address space but is not deleted as a 10X file.   3a5a

Changing Attributes of Segments   3b

DelPage(SegNum, Page)   3b1

Destroys the given page in the given segment.   3b1a

Cannot be used to delete pages from data segments. These must be contiguous memory -- use SetLength to delete tail of data segment.   3b1a1

If the segment is a file segment, the page is actually destroyed. (However, if the segment is later mapped in, a zeroed page is created in this position).   3b1a2

If the segment is a window segment and the page belongs to another segment, the page is removed but not destroyed. If the page is private to the window segment, it is destroyed.   3b1a3

CreatePage(SegNum, Page)   3b2

Creates the given page in the given segment, which must be a window segment. The page must be within the current length of the window. (Use SetLength to adjust the number of pages in the window).   3b2a

MapPage(SegNum1, Page1, SegNum2, Page2)   3b3

Puts page Page1 from segment SegNum1 into the slot at Page2 in segment SegNum2, which must be a window segment.   3b3a

The same actual page will appear in the two places, not a

copy.   (this has implications for the NOVA MPL
implementation, of course)   3b3a1

If the destination page is occupied, then the prior contents
are deleted (via DelPage).   3b3b

If the source is a data segment, then it must be at least a
page long.   3b3c

SetLength(SegNum, Nentries)   3b4

Sets the length of the designated segment as given. It may
be necessary to "move" the segment if its length is being
increased, in which case it will first be swapped out (by
SetLength) and then later swapped in.   3b4a

Nentries is the number of pages for a window segment or
the number of words for a file or data segment.   3b4a1

Lengthening a data segment appends zeroes to it.   3b4a2

Lengthening a file or window segment appends empty
pages(slots).   3b4a3

IncLength(SegNum, Nentries)   3b5

Increments the length of the designated segment as given.   3b5a

The effect is exactly:
SetLength(SegNum, ReadLength(SegNum)+Nentries).   3b5a1

Swapping segments and User Control of Swapping   3c

Addr ← SwapIn(SegNum)   3c1

The specified segment is swapped into VM and its base
address in segmented form is returned as value.   3c1a

If the segment cannot be swapped in, a signal is generated
and passed to the caller.   3c1b

A strategy procedure is invoked (as described below under
SegStrategy, SpSegStrategy, and Lock)   3c1c

(a) to determine whether it is ok to swap the segment
into VM; and   3c1c1

(b) to perform any necessary housekeeping for the segment
after it has been swapped in.   3c1c2

SwapOut(SegNum)   3c2

    The given segment is removed from VM. If the segment cannot
    be swapped out, a signal is generated.   3c2a

    A strategy procedure (as described below under SegStrategy,
    SpSegStrategy, and Lock) is invoked to decide whether the
    segment is allowed to be swapped out, and if so, the
    strategy procedure is invoked again just before the segment
    is actually removed from VM.   3c2b

Lock(SegNum)   3c3

    The given segment is locked into place. If it is currently
    swapped out of VM, it will not be able to be swapped in
    until an Unlock is performed for it. If it is currently in
    VM, it will remain at the same VM address until Unlocked.   3c3a

    Locking overrides any other user-defined or system-supplied
    strategy procedures for the given segment.   3c3b

    Any attempt to lengthen a locked segment will cause a signal
    to be generated by the system.   3c3c

Unlock(SegNum)   3c4

    Allows the given segment to be moved or swapped or
    lengthened. It does not in any way affect the swapped state
    of the segment.   3c4a

SegStrategy(SegType, ProcAddr)   3c5

    The procedure p pointed to by the ProcAddr parameter will be
    invoked if a request is made to swap any segment S of type
    SegType and the following conditions hold: 3c5a

        (a) S is not locked;   3c5a1

        (b) either no special strategy procedure has been
        specified for the particular segment S being swapped, or
        the value FALSE was returned by the current special
        strategy procedure for S when called with the ReallyGoing
        parameter = TRUE (see description of parameters to
        strategy procedures following).   3c5a2

    Whenever invoked, p will be called as
    p(SegNum, GoingOut, ReallyGoing), where: 3c5b

        SegNum identifies the segment being swapped,   3c5b1

GoingOut=TRUE means the segment is to be swapped out
(GoingOut=FALSE means it is being swapped in),   3c5b2

ReallyGoing=FALSE means the segment is being considered
for swapping; if p returns TRUE, the segmentation system
assumes that the segment may actually be swapped; if p
returns FALSE, the segment will not be swapped.   3c5b3

If ReallyGoing=TRUE, then p should perform whatever
pre-swapout or post-swapin housekeeping is required,
the direction being indicated by the GoingOut
parameter.   3c5b3a

If ProcDescriptor=0, the strategy for segments of type
SegType reverts to the system default strategy. Presently,
this strategy procedure does no housekeeping and simply
returns the value TRUE.   3c5c

SpSegStrategy(SegNum, ProcAddr)   3c6

The procedure p pointed to by the ProcAddr parameter will be
invoked if a request is made to swap some segment S and S is
not Locked, as described above. The arguments to p are as
described under SegStrategy.   3c6a

If some segment S with special strategy procedure Ps is
being swapped, and Ps is called with the ReallyGoing
parameter = TRUE, Ps may choose to let the strategy for
segments of the same type as S be called also. It does this
by returning the value FALSE. If the ReallyGoing parameter
is FALSE, the value returned by Ps is used to decide whether
or not the segment may be swapped, and no call on the
current strategy procedure for
segments of S's type will be made.   3c6b

Reading Attributes of Segments   3d

SegNum2 ← ReadWindow(SegNum1, Page1: Page2)   3d1

Returns the segment and page address of the page (of a data
or file segment) residing in the window segment slot, or 0
if the slot is empty.   3d1a

A returned value of -1 means the page is a data page private
to the window segment.   3d1b

Nentries ← ReadLength(SegNum)   3d2

Returns the length of the given segment.   3d2a

The length of a data or file segment is measured in
machine words, and of a window segment in pages.   3d2a1

class ← ReadSegmentClass(seg)   3d3

The class of the given segment is returned. The class is
one of   3d3a

free: an unassigned segment number (or segment number out
of range),   3d3a1

file: the segment is a TENEX file,   3d3a2

data: the segment is private virtual memory,   3d3a3

window: the segment is a window segment,   3d3a4

system: the segment is in use by the segmentation
machinery for internal purposes.   3d3a5

Programs wishing to know the integer values corresponding to
the segment classes should INCLUDE the DATA module
(mps,segdefs,), in which the classes are defined as the
identifiers freebt, filebt, datbt, windbt, and sysbt,
respectively.   3d3b

SetSegmentType(seg, type)   3d4

The type field for the segment, seg, is set to the given
type, which must be an integer in the range $[0,maxmt]$. The
type of a segment is distinct from its class; its type
denotes is use in terms of MPS and may be one of the
following: 3d4a

freemt: MPS usage not specified, or unassigned,   3d4a1

codemt: MPS code segment, containing the code and symbol
tables for an MPS object module (PROGRAM or DATA),   3d4a2

processmt: a PROGRAM module's static data -- it is
segments of this type which correspond to MPS routines,   3d4a3

datamt: a DATA module's static data, corresponding to an
instance of a DATA module in the same way as a segment of
type processmt does for a PROGRAM module,   3d4a4

stkmt: a stack for a routine,   3d4a5

   wsdirmt: (non-MPS use) a segment which acts as a
   directory for a window segment.   3d4a6

  The integer values for the segment types are contained in
  the DATA module (mps,segdefs,) mentioned above.   Their names
  are those given.   The identifier maxmt is also defined
  therein.   3d4b

  type ← ReadSegmentType(seg)   3d5

  Returns the MPS type of the specified segment.   The type
  will be one of the values defined under SetSegmentType
  above.   3d5a

  SegNum2 ← NextSeg(SegNum1)   3d6

  Returns the number of the next higher segment above the
  given one which actually exists, or zero if none.   3d6a

  Page2 ← NextPage(SegNum, Page1)   3d7

  Returns the number of the next higher page above the given
  one which actually exists in the given segment, or -1 if no
  higher page.   3d7a

Address conversion and analysis   3e

  SegAddr ← VToSAddr(VMAddr)   3e1

  Given a virtual memory address, returns corresponding
  segmented address or 0 if location is not part of any
  (swapped in) segment,   3e1a

  Addr ← MakeAddr(SegNum, WordNum)   3e2

  Creates a segmented address from a segment and word number. 3e2a

  SegNum ← SegNumPart(Addr)   3e3

  Extracts the segment number from a segmented address.   3e3a

  WordNum ← WordPart(Addr)   3e4

  Extracts the word displacement from a segmented address.   3e4a

  Flag ← SwappedIn(SegNum)   3e5

  Returns 1 if the segment is in VM, or 0 if not.   3e5a

Naming Segments   3f

   The segmentation machinery supports an hierarchical naming
   scheme for segments: a name conflict exists if and only if two
   segments with a common immediate parent have the same simple
   name. SetSegName enforces this rule.   3f1

   FindSegName(String, ContextSeg)   3f2

      Returns the segment number of the segment with the given
      string as name, within the context of the specified segment,
      or 0 if no match is found. The following rules are used to
      determine if there is such a segment: 3f2a

         (a) if one of the segments owned by the given segment has
         a name which matches the given string, that segment's
         number is returned;   3f2a1

         (b) if no segment is found which matches under rule (a),
         then a search is made starting at ContextSeg and
         proceeding from parent to parent until a name match is
         found or the top of the ownership tree is encountered.   3f2a2

   SetSegName(SegNum, String)   3f3

      Sets the name of the given segment to the string. If any
      sibling of SegNum already has the name String, a signal is
      generated.   3f3a

   nchar ← ReadSegName(SegNum, String, FirstChar, LastChar)   3f4

      Reads the name of the given segment into the string starting
      at position FirstChar. If more than (LastChar-FirstChar+1)
      characters are needed to contain the name, a signal is
      generated; as many characters as will fit will already have
      been placed in the string by the time the signal is
      generated.   3f4a

      A segment which has not been assigned a name by a previous
      call on SetSegName (or NewFile, which calls SetSegName) has
      a system supplied name of the form '# .NUM where .NUM is the
      segment's number.   3f4b

      The number of characters in the name is returned.   3f4c

Segment Parentage and Associations   3g

   MakeParent(SegNum, ParentSegNum)   3g1

Make ParentSegNum the parent of SegNum. SegNum will be the
"first" child of ParentSegNum. Checks for possible naming
conflicts among siblings.   3g1a

ParentSeg(SegNum)   3g2

Returns the segment number of SegNum's parent segment, or 0
if there is none.   3g2a

ChildSeg(SegNum)   3g3

Returns the segment number of the first child of segment
SegNum, or 0 if the segment has no children.   3g3a

SiblingSeg(SegNum)   3g4

Returns the segment number of SegNum's sibling, or 0 if he
has none. The children of a given segment are "ordered" so
that one can sequence through them by acquiring the segment
number of the parent's first child using ChildSeg and then
moving from one child to the next using SiblingSeg until the
family is exhausted.   3g4a

SetSegLink(fromseg, toseg)   3g5

A "link" to toSegNum will be placed in the segment table
entry for fromSegNum (which must not represent a file
segment for implementation reasons). This has the following
uses: 3g5a

(a) if fromSegNum represents a stack segment, and
toSegNum a process data segment, then the stack segment
will be linked to the data segment of the process (in the
MPL sense) to which it belongs;   3g5a1

(b) if toSegNum is a code segment, and fromSegNum is a
process data segment, then this associates the code
segment with the process.   3g5a2

ReadSegLink(fromseg)   3g6

Returns the segment number to which SegNum contains a "link"
(set by SetSegLink).   3g6a

Implementation   4

Tables   4a

Core allocation table   4a1

Entry per virtual memory page giving: 4a1a

 caseg -- segment number if occupied, 0 otherwise.   4a1a1

 casa -- address of segment on data file.   4a1a2

When try to swap in a segment, use this table to find an
adequate number of adjacent free pages.   4a1b

Also used to map virtual memory addresses to segmented
memory addresses.   4a1c

Segment table   4a2

One entry per segment, containing: 4a2a

 sttype -- type of segment, (free, data, file, window)   4a2a1

 stloaded -- true if segment swapped in to the virtual
 memory   4a2a2

 staddr -- if stloaded then VM address of segment, else
 datafile address.   4a2a3

 stsize -- size of segment in pages for window segment, in
 words for all other types   4a2a4

 stfile -- handle on segment in file system if file
 segment, segment number of associated segment if stack or
 data seg, of directory if window segment   4a2a5

 plus several other fields, most of which are used to show
 relationships between segments and are used by the symbol
 table machinery.   4a2a6

Symbol table   4a3

Data file   4b

Management of storage on the file   4b1

Large segments -- size >= one page   4b1a

19734 Distribution
   Jeanne B. North,

1

protocol documents on-line?

alex:
i am preparing to send out an rfc making three points.
1) my address is changed to mitre.
2) telnet options with subnegotiation now must use SE and double IAC
if it occurs as a parameter byte.
3) that new protocols must be submitted as on-line documents. the
value of this requirement is pointed up by the editing job required
by fixing up the existing telnet options.
do you have any comments?
--jon.   1

19735 Distribution
    Alex A. McKenzie,

MSP ?

nancy:
i hear that you might be expermenting with the message switching host
to host protocol in a few months. i hope it is true. the msp should
be tested and compared to the existing protocol. i will be very
interested in the results, and may even be able to participate in th
experments.   1

19736 Distribution
   Nancy J. Neigus,

MITRE-TIP Network Participants (In your IDENT Subsystem)

Marcia,

Pursuant to your most recent SNDMSG note to me, the following
information should be useful.

In keeping with the NLS philosophy, we maintain the Ident record for
MITRE-TIP in a current state. If individuals in MITRE-TIP do not
indicate mailing address, it is because they desire the default
mailing address of MITRE-TIP to which they belong. In some instances,
a different address is indicated (as in the case of John
Morgenstern).

The MITRE-TIP record in your indent submode has no "dead-wood", that
being a concept that I am not familiar with. I will continue to
maintain this record in a current state so that you may simply use it
for your compilation of the Participants Directory (or is that
somehow an independent process?)

Incidentally, several weeks ago, I added Jon Postel to MITRE-TIP
ident record and it mysteriously vanished; how can that happen? I
have re-inserted his ident therein where it belongs.

Hope this helps,   Jean   1

19738 Distribution
    Marcia Lynn Keeney, Jonathan B. Postel, Susan S. Poh,

The week in review for the 7-13 shows that you used 6.3 hours CPU in 31 hours connect, nearly 10% of the system with a ration of cpu to connect of 4! Can that be true? If so how did you do it?!   1

19739 Distribution
    N. Dean Meyer, Beauregard A. Hardeman,

(suggestion)

1

This is a formal suggestion that I would invite you to consider. I notice that often when journal mail is delivered, that at least the following attributes are prevalent:

1a

When I employ the RD subsystem at ISI (this subsystem is employed by a number of people) that journal forwarded mail appears as one message. That is, several journal items are amalgumated into a single message. This is undesirable since through RD, an index to messages is provided for selective management of the messages. It would be better to format each as an individual message.

1a1

For some items of journal mail, forwarded through the net, the subject associated with the mesage is not present; if you could somehow manufacture a subject(and this could be done), it would facilitate management of the messages by a large number of users who employ RD and use the indexing feature as a way of selectively administering their messages.

1a2

Some forwarded journal items consist only of links (pointers) to the actual text. This makes such submissions of dubious value to the user who has his Journal mail forwarded for convenience. I believe there may be reason to consider a user option to forward the "pointed to text".

1a3

To ensure better user utility from NLS, I would strongly recommend your adding a viewspec for Journal Items such that when the viewspec were invoked, a printout of initial file branch .1 or .2 with added viewspecs "xmb" would result in an index to items where each one were augmented with a subject. I believe this would render a real service to users.

1b

Thank you for your consideration of these suggestions,   Jean

1c

19740 Distribution
    Douglas C. Engelbart, Jim O. Calvin, James C. Norton, Mil E.
    Jernigan, James E. (Jim) White, Susan S. Poh, Jonathan B. Postel,

Superwatch Average Graphs for Week of 10/8/73

TIME PLOT OF AVERAGE IDLE TIME FOR WEEK OF 10/8/73
x axis labeled in units of hr:min, xunit = 30 minutes   1
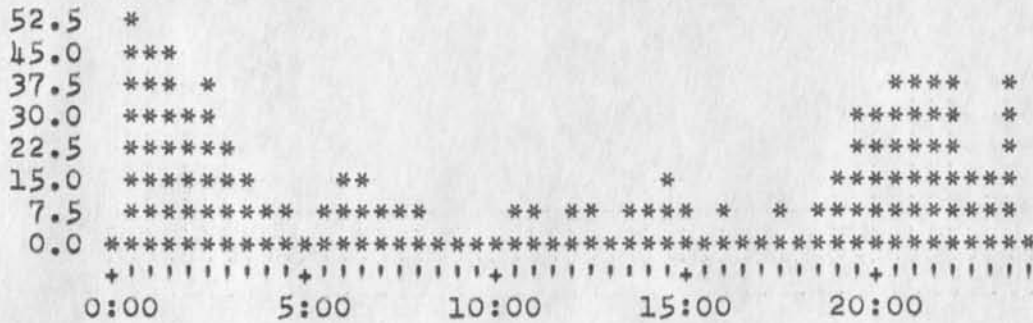
```
52.5  *
45.0  ***
37.5  *** *                                    **** *
30.0  *****                                  ****** *
22.5  ******                                 ****** *
15.0  *******       **                 *     **********
 7.5  ********* ******      ** ** **** *  * **********
 0.0  *******************************************************
      +!!!!!!!!!+!!!!!!!!!+!!!!!!!!!+!!!!!!!!!+!!!!!!!!!
      0:00      5:00     10:00     15:00     20:00
```
                                                                               1a

TIME PLOT OF AVERAGE NUMBER OF USERS FOR WEEK OF 10/8/73
x axis labeled in units of hr:min, xunit = 30 minutes   2

```
16                           *
15                       * ******** *
14                      ********** *   **
13                    * *************** **
12                 ** **********************
11                 ***************************
10                 ****************************
 9                 **************************
 8               ****************************
 7               ****************************   *
 6             ****************************
 5             ****************************** ***
 4   * **  ************************************************
 3   *************************************************
 2   **********************************************************
 1   **********************************************************
 0   **********************************************************
     +!!!!!!!!!+!!!!!!!!!+!!!!!!!!!+!!!!!!!!!+!!!!!!!!!
     0:00      5:00     10:00     15:00     20:00
```
                                                                               2a

1
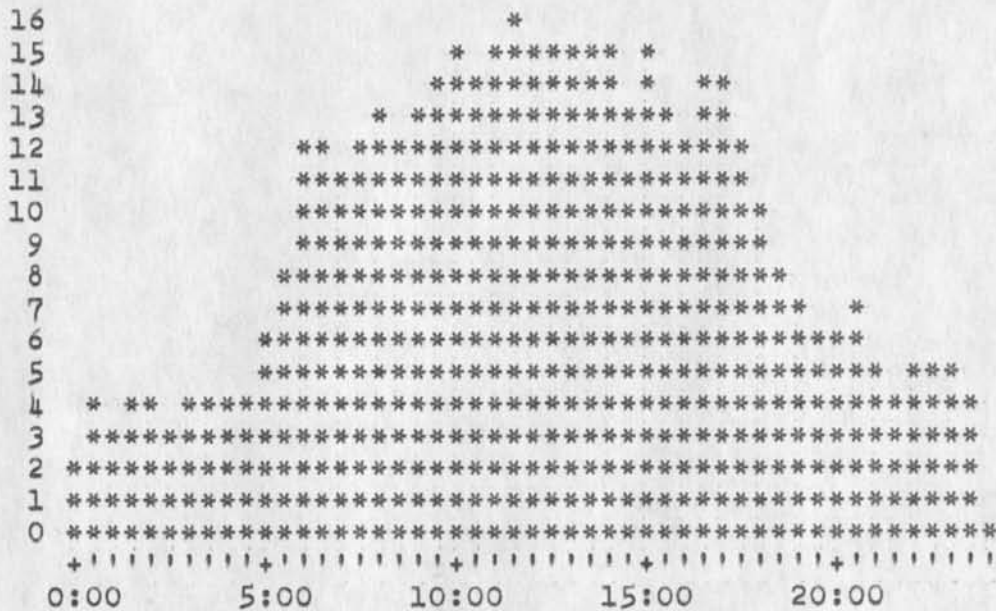
TIME PLOT OF AVERAGE NUMBER OF NETWORK USERS FOR WEEK OF 10/8/73
x axis labeled in units of hr:min, xunit = 30 minutes   3
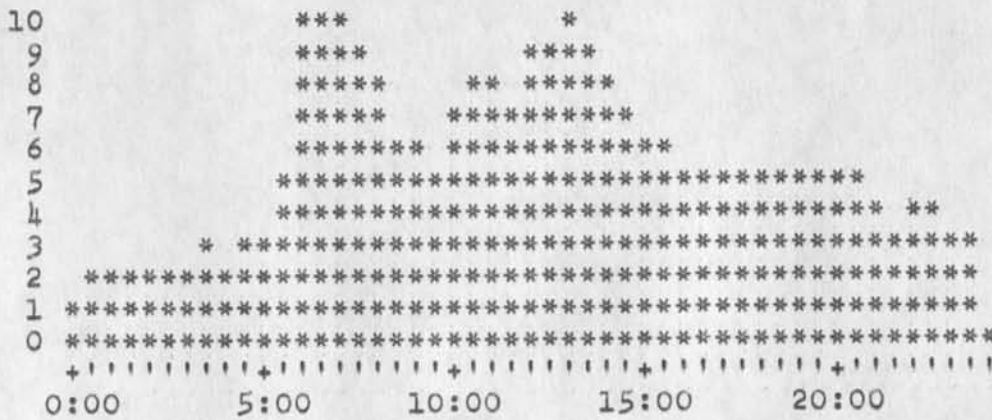
```
10                    ***              *
 9                    ****            ****
 8                    *****       ** *****
 7                    *****      ***********
 6                   ******** *************
 5                   ***********************************
 4                   *********************************** **
 3             * *********************************************
 2      **********************************************************
 1      ***********************************************************
 0      ************************************************************
        +!!!!!!!!!+!!!!!!!!!+!!!!!!!!!+!!!!!!!!!+!!!!!!!!!
       0:00      5:00     10:00     15:00     20:00
```
                                                                         3a

TIME PLOT OF AVERAGE NUMBER OF GO JOBS FOR WEEK OF 10/8/73
x axis labeled in units of hr:min, xunit = 30 minutes   4
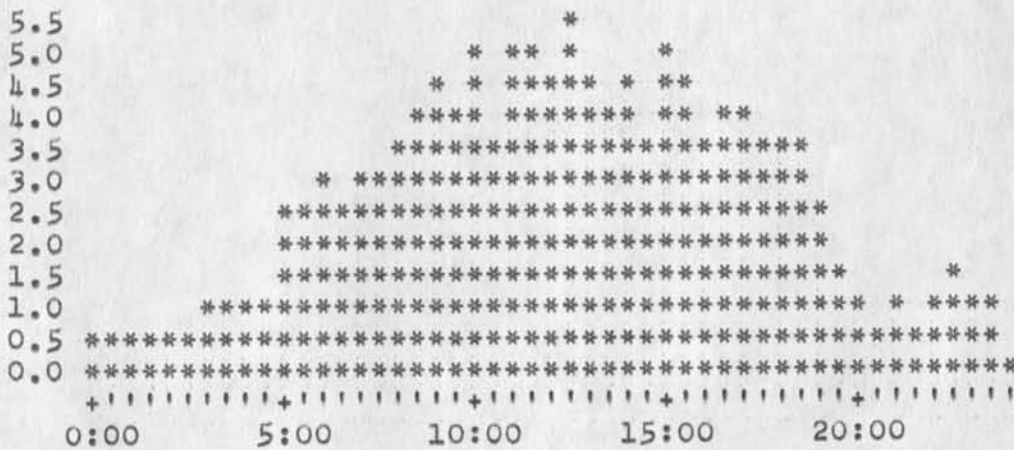
```
5.5                         *
5.0                    *  ** *        *
4.5                   *  *  ***** *  **
4.0                  **** ******* ** **
3.5                  ***********************
3.0            * **************************
2.5           ********************************
2.0           *****************************
1.5           ****************************       *
1.0       ***************************************  * ****
0.5      *********************************************
0.0      *************************************************
        +!!!!!!!!!+!!!!!!!!!+!!!!!!!!!+!!!!!!!!!+!!!!!!!!!
       0:00      5:00     10:00     15:00     20:00
```
                                                                         4a

Superwatch Average Graphs for Week of 10/8/73

TIME PLOT OF AVERAGE PER CENT OF CPU TIME CHARGED TO USER ACCOUNTS
FOR WEEK OF 10/8/73
x axis labeled in units of hr:min, xunit = 30 minutes   5
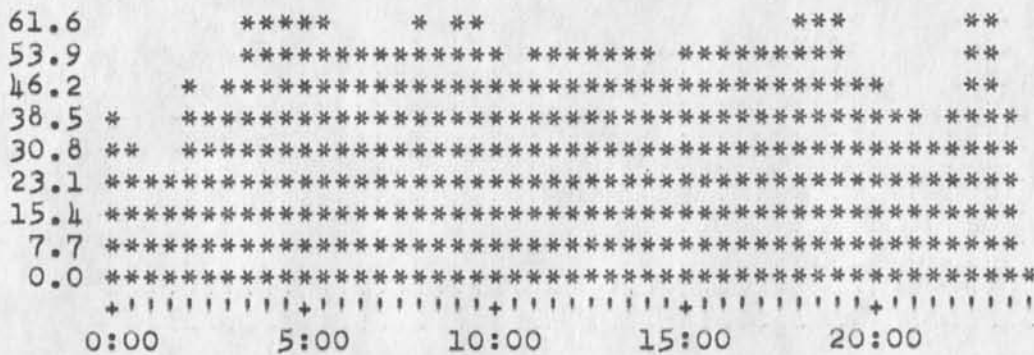
```
61.6           *****     * **                    ***        **
53.9           ****************** ******* *********          **
46.2        *  **********************************************    **
38.5 *       *******************************************************  ****
30.8 **      *********************************************************
23.1 ********************************************************************
15.4 ********************************************************************
 7.7 *****************************************************************
 0.0 ********************************************************************
     +''''''''''+''''''''''+''''''''''+''''''''''+''''''''''
     0:00      5:00      10:00     15:00     20:00                        5a
```

TIME PLOT OF AVERAGE PER CENT OF SYSTEM USED IN DNLS FOR WEEK OF
10/8/73
x axis labeled in units of hr:min, xunit = 30 minutes   6

```
16.0                     *            **
14.0                     ****       ******
12.0                     **** *     *********
10.0                     ********   *********
 8.0                     ********* ************
 6.0                     **********************
 4.0                     ************************         *
 2.0                  *************************************
 0.0 ********************************************************************
     +''''''''''+''''''''''+''''''''''+''''''''''+''''''''''
     0:00      5:00      10:00     15:00     20:00                        6a
```

3
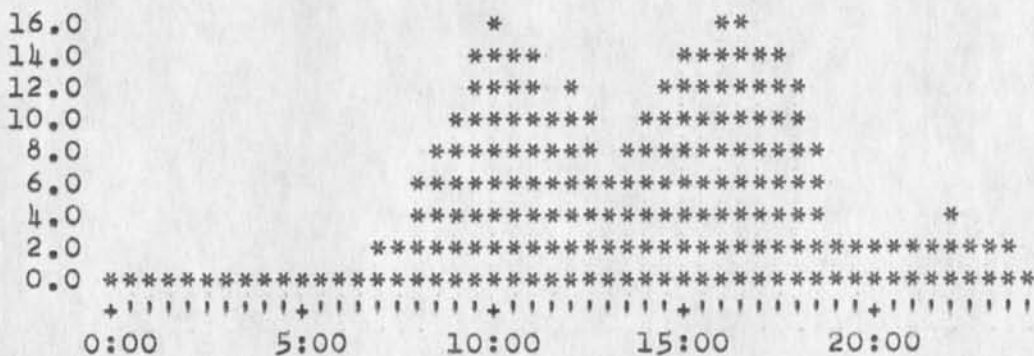
19741 Distribution
    James C. Norton, Richard W. Watson, Douglas C. Engelbart, Paul Rech,
    Donald C. (Smokey) Wallace, Jeffrey C. Peters, Dirk H. Van Nouhuys,
    Elizabeth J. (Jake) Feinler, Charles F. Dornbush, Kirk E. Kelley,
    Duane L. Stone, Beauregard A. Hardeman,

System Utilization/Efficiency

Maybe I'm just super-frustrated today or maybe this is a valid item
for HOTACTION.

System Utilization/Efficiency

"The time has come," the Walrus said, "to talk of many things."   One
of these things is system use. We are walking a fine line between
getting people on the system and the problem of getting the system to
the people who need to use it. It is time to start thinking of the
system for what it really is.... a very scarce resource that is
limited and therefore must be used with care. We can no longer afford
to let people use the system in any fashion just as long as they use
it. If AKW is to really augment our effectiveness, it must be used in
the right way (and not just as an on-line replacement for paper and
pencil).   1

I would like to see some brainstorming done on ways to get the
maximum out of the resource that we have ... my whole point being
that the way we presently use the system is not very optimal. In any
case some of my ideas follow and I would like to know what you think
of them (not realistic, not necessary, etc.).   2

  (1) Review the way RADC users work with the system - not with the
  goal of minimizing their use but rather with the viewpoint of
  maximizing their throughput on the system.   2a

    This should be a natural extension to any training program
    anyway. I've seen many people stumble around for tens of
    minutes trying to do something with the commands they knew that
    could have been done with one instruction if they only knew it.
    It might well be worth the effort to have some 'expert' sit
    down with the new users and maybe suggest better ways to do
    things. I'm sure we could all profit by something like that.   2a1

    It would also pay to have USER-GUIDES Manuals available and
    encourage people to try out new things, like the different
    forms of addressing. I, for one, don't know where I could get
    my hands on one of those user manuals and it becomes pretty
    difficult to refresh your memory or try to find a better way to
    do something.   2a2

  (2) Revamp the use of output processing (which I think is widely
  misused and inefficient).   2b

    Limit its use to relatively smaller files during the week,
    saving the larger ones for nights or weekends.   2b1

    Promote the use of ODT which I think is faster and places less
    of a drain on the system. Besides, if we are supposed to be
    on-line, I would think we shouldn't have to rely on hardcopy so
    much.   2b2

    Create the ability to specify what files you want to make
    sequential but delay the actual processing until a later time

during non-peak hours and without the stipulation that the
person be logged in.   2b3

Allow use of the printer at night or on weekends - maybe even
automatically; that is, without the person having to be logged
in.   2b4

(3) Promote Expanded (or rather initial) use of DEX   2c

(4) Set up an internal time-limit policy so that when a potential
user is refused a LOGIN he can link to the person on the top of
the connect time queue and ask him to log out. A policy like this
might help force people to make better use of the time that they
will have on the system and at the same time insure that people
won't be locked out completely as happens today.   2d

19743 Distribution
    Edmund J. Kennedy, Duane L. Stone, James C. Norton, Roger B. Panara,

DNLS Users Beware!!!!

After another day of asking people to use the command GUFS, there has been response from four people, and I don't think this will give us a reasonable look at command frequency.   1

Unless an enormous amount of negative feedback (or other such good thing) is directed my way tomorrow (Friday), I plan to add the code to NLS which will automatically create QBVM files for everyone every time they quit NLS.   2

It will take longer to quit, logout, etc. but this test will only be run for a short time and I hope this will not be too great an inconvenience.   3

I will collect the data so the individual user has to do only 2 things: 4

    (1) Do not delete the QBVM files unless its absolutely necessary   4a

    (2) Whenever possible, end a DNLS session by using the command Execute Logout rather than logging out of the exec.   4b

Your cooperation will be appreciated (assuming I get it!) and if you have any problems or questions let me know.   5

19745 Distribution
    Donald C. (Smokey) Wallace, Richard W. Watson, Don I. Andrews,
    A. Jim Blum, A. Analysis, Meredith(Reddy) E. Dively, Jeanne M.
    Leavitt, Rodney A. Bondurant, Jeanne M. Beck, Mark Alexander Beach,
    Judy D. Cooke, Marcia Lynn Keeney, Carol B. Guilbault, Susan R. Lee,
    Elizabeth K. Michael, Charles F. Dornbush, Elizabeth J. (Jake)
    Feinler, Kirk E. Kelley, N. Dean Meyer, James E. (Jim) White, Diane
    S. Kaye, Paul Rech, Michael D. Kudlick, Ferg R. Ferguson, Douglas C.
    Engelbart, Beauregard A. Hardeman, Martin E. Hardy, J. D. Hopper,
    Charles H. Irby, Mil E. Jernigan, Harvey G. Lehtman, Jeanne B. North,
    James C. Norton, Jeffrey C. Peters, Jake Ratliff, Edwin K. Van De
    Riet, Dirk H. Van Nouhuys, Kenneth E. (Ken) Victor

DCE   17-OCT-73 17:35   19746
NP for SNDMSG, User Program INMES, and round-trip conversion between
NLS and sequential files

Time for more dialogue re improved facilities for NLS support of
composng, sending, and managing SNDMSG traffic?

DCE   17-OCT-73 17:35   19746
NP for SNDMSG, User Program INMES, and round-trip conversion between
NLS and sequential files

NP for SNDMSG, User Program INMES, and round-trip conversion between
NLS and sequential files

I regularly use INMES, and appreciate it very much. Have one
thought about improvement, as discussed below, but also think general
dialogue about further NLS support for SNDMSG traffic is relevant
now.   1

My Need/Possibility (NP) item stems from the way I have come to deal
with my own SNDMSG traffic: 2

   I compose many of my SNDMSG transmittals in NLS, do Output
   Sequential, and send the resulting XMES.TXT file using ↑B in
   SNDMSG. I usually set my NLS viewspecs at wynB -- I like the
   paragraphing and between-paragraph line gaps that result. (Also,
   from DNLS I often set Goto Display Format Charactersize 2, to get
   short lines that won't later wrap around.) Many of these
   transmittals are addressed to myself, to give me a record -- and
   thus get ingested back into NLS with the next INMES batch.   2a

My questions come from looking at the resulting format in NLS after
INMES operates on the MESSAGE.TXT file; the format niceties are
destroyed. I also notice that the paragraph formats are messed up in
the other SNDMSG items brought in through INMES. Are we ready now to
consider some further refinements in the NLS/SNDMSG coordination,
perhaps in INMES?   3

   Can INMES, for instance, do statement breaks when it finds
   blank-line separations?   3a

   Could we perhaps recommend best VSPEC settings for outputting to
   Sequential, perhaps then reasonably provide new conventions in
   INMES processing such that the roundtrip through SNDMSG and INMES
   would preserve the "paragraphing" structure?   3b

   How soon will "Execute Journal" have a form of "submit SNDMSG"
   that uses more or less standard Journal submission procedures
   (including use of a Command Form statement)?   3c

   Might a special version of Output Sequential (e.g. Output
   SNDMSG?) be provided, to help the round-trip process?   3d

We might usefully consider some of the tricks that were once used
when we had the equivalent "round trip" need for NLS material on the
CDC 3100. Good-quality printout then was done by outputting to paper
tape, and running the tape through a paper-tape-reading modified
Selectric typewriter. We wanted to use the paper tapes as backup
storage, so we could read them back in later if the online file got
messed up.   4

   We established conventions for having the "output to paper tape"

DCE   17-OCT-73 17:35   19746
NP for SNDMSG, User Program INMES, and round-trip conversion between
NLS and sequential files

process artfully insert non-printing characters in the paper tape,
that didn't affect the printed page, but that removed ambiguities
for the read-in processor. For instance, page headers and footers
were tagged this way, to be ignored by read-in; also, any EOL
characters that formatted within a statement were differentiated
from EOLs that marked inter-statement separation; and leading-SP
characters in a line that were only for indentation were
differentiated from leading SPs that were included in the NLS
statement's formatting.   4a

It wouldn't hurt to have some SNDMSG text be shipped around with
a few extra non-print characters to provide us with such tagging.   4b

[General Note: Guess round-trip from NLS to any sequntial form
might similaraly consider using special conventions of this
sort.]   4c

It might be appopriate now to canvas other SNDMSG/NLS users, who want
to compose and manage their SNDMSG traffic in NLS, for other ideas
and possibilities to improve the process; any development and
experimentation that experienced parties can get done, before we face
the problem of moving Utility clients onto NLS, would be worth
considering.   5

19746 Distribution
    Nps Np, Richard W. Watson, Charles H. Irby, Richard W. Watson, N.
    Dean Meyer, Duane L. Stone, James H. Bair, James C. Norton,

Jeanne,

Please, at your earliest convenience, insert: (mitre-tip,protocol,)
and (jernigan,aloha,) in the October ARPANET Newsletter update.
Branch .1 in the former is unfortunately in Output Processor format
as it was submitted; I would appreciate your reformatting it (thanks
jeanne).   1

19747 Distribution
    Jeanne B. North, Mil E. Jernigan, Jonathan B. Postel, Nancy J.
    Neigus, David H. Crocker,

When I came to ARC I inherited a number of files from the
previous technical writer, Dave Csares. This was the most
interesting.

AN ESSAYE ON BEANS AND RICE, BEING AN ORGANICK EXPRESSION OF A
PATCHWORK HERITAGE ROOTED IN LATIN AMERICA AND REFLECTING THE
NUTRITIONAL VALUES   THEREOF AS AFFECTED BY THE NORTH-AMERICAN
EXPERIENCE; OR, SYNCRETISTIC FRIJOLOGY REVEAL'D   1

The discussion is restricted to black beans. Needless to say
there are many other kinds, but as each must be prepared in a
different manner, a complete discussion will have to be done by
someone else with more time and a greater catholicity of culinary
experience. The black bean, with rice, is a major staple of the
Costa Rican and Brazilian diets and is also used in other
countries. The Chinese make a preparation of fermented black
beans with capsicum, but that is a horse of a different garage;
likewise, the Japanese sell heavily salted black beans in plastic
bags, but this practice must, for the moment, remain inscrutable. 2

The important thing to remember about black beans is that they
have a lot of flavor and will soak up a lot more from whatever
you cook them with. Accordingly, you want the flavors you add to
be strong ones. Another thing to remember is that cooking time
is highly unpredictable, being a function of the particular crop
of beans, the hardness or softness of the cooking water, and the
other things in the pot with the beans. The best cooking method
is to start by soaking the beans overnight.   3

Get the following ingredients together (all measurements are very
rough-- good luck):   4

    2 pounds of dried black beans   4a

        This is enough to make a big cauldron of beans. Co-op has
        them in the Palo Alto area; elsewhere, try a Mexican or
        Puerto Rican market or bully your local supermarket into
        getting some.   4a1

    2 or 3 onions   4b

    3 or 4 leeks   4c

        (Optional; use another onion if you can't get leeks.)   4c1

    4 or 5 tomatoes   4d

    3 or 4 large ribs of celery   4e

    celery tops   4f

        (Just the leaves, from 1 bunch of celery).   4f1

3 or 4 leaves of mustard greens   4g

   (Optional)   4g1

half a bunch of parsley   4h

fresh garlic   4i

   (Anywhere from 5 to 15 good fat healthy cloves.)   4i1

basil   4j

other herbs according to your idiosyncrasies   4k

red chili peppers   4l

   (You can use the little dried ones -- anywhere from 1 to 3
   broken up with a mortar and pestle).   4l1

2 cups orange juice   4m

sherry (NOT cooking sherry, just cheap sherry)   4n

   (Optional)   4n1

beer   4o

   (Optional)   4o1

meat   4p

   The traditional Brazilian formula for feijoada calls for
   "19 different kinds of pork" -- ham, hog jowls, various
   sausages, pigs' ears, chitlins, bacon, salt pork, etc. You
   will probably want to simplify this, using the general
   principal of adding strong flavors to the beans. I
   recommend salt pork, bacon ends, ham hocks or butt ends
   (smoked if possible) Italian pork sausage (sweet or hot or
   both), and linguica. Don't omit linguica.   4p1

   Use anywhere from 2 to 4 pounds of meat, including the
   bones, if there are any.   4p2

The night before you plan to eat the beans, put them in a BIG
cauldron and add enough water to cover them, plus another 2 or 3
inches. Cover and set aside. Cut all the vegetables into small
pieces and put them in another big cauldron. Add the garlic and
red pepper. Don't peel the garlic, cut it up, mash it, or
otherwise mutilate it. These are French practices. Just

separate the garlic into individual cloves, cut off the tough,
fibrous ends, and throw it in. The flavor develops much better
this way. Also, don't soak the peppers or any of that nonsense.
Add some water to this cauldron, put it on the fire, and boil
hell out of it until you are ready to go to bed.   5

In the morning, you will find that the beans have soaked up a lot
of water. Reheat the vegetables, adding a couple tablespoons each
of oregano and basil and other herbs if you're using them (bay
leaves are good, preferably fresh ones). Add the vegetables to
the beans, add water to cover if necessary, and bring to a boil.   6

While the beans are coming to a boil, cut the meat into
appropriate-size pieces--bite-size where possible (BIG bites).
When the beans boil, put the meat in. Add the orange juice, plus
enough water to cover everything. Bring to a boil again, reduce
heat, cover loosely (if you cover beans tightly they may boil
over), and simmer.   7

The simmering will take serveral hours. Check the water level
from time to time; add water as necessary to keep the level about
half an inch above the beans. Stir occasionally.   8

After a couple of hours, add some salt and taste the liquid.
Salt until it tastes about right. It takes a lot of salt. From
here on out, keep tasting. Flavors are mixing and developing and
you may have to add still more salt as the beans cook. When the
beans begin to be about half-tender, you may start including some
sherry and/or beer in the liquid that you add. When the beans
are almost completely tender,

dip out about a cup of them, mash them with a fork, and put them
back in. This will thicken the liquid. The beans will be done
within about half an hour, if you have guessed right.   9

Serve with rice and sliced oranges.   10

(ERRORSTRINGS)   11

4

19748 Distribution
    Kirk E. Kelley, Jeanne M. Leavitt, Jeanne M. Beck, Elizabeth J.
    (Jake) Feinler, Nancy J. Neigus, David H. Crocker, Ferg R. Ferguson,

Next Week a Mysterious File Will Appear In Your Directory if You Use
DNLS

Next week Susan Lee is going to employ a system in NLS which
automatically creates a file that lists the commands enterd by each
display user. (ljournal,19745,) She is surveying what commands
people use in the hopes, for example, of changing the code to run
most-used command smost efficiently.   1

To record the use, the system creates in your drectory a file named
QBVM+your ident.   2

Althought we are not including network users in the survey, such a
file will appear in your direcotry if you use DNLS. This jounral item
is to tell you not to worry about it. You are welcome to print it to
discover what you have done, or to delete it, or both.   3

The QBVM file is a little hard to interpret. If you do want to read
it <ijournal,14170,> provides guidance.   4

19749 Distribution
Roberta J. Carrier, Donna R. Robilotta, David L. Daughtry, Richard H.
Thayer, Frank J. Tomaini, Mike A. Wingfield, Edmund J. Kennedy, Ray
A. Liuczi, Richard Calicchia, John W. Johnson, Donald Van Alstine,
Dean F. Bergstrom, William P. Bethke, Frank S. LaMonica, William E.
Rzepka, Rocco F. Iuorno, Frank P. Sliwa, Thomas J. Bucciero, Robert
E. Doane, David A. Luther, Roger B. Panara, John L. McNamara, Joe P.
Cavano, Duane L. Stone, Marcelle D. Petell, Josephine R. Stellato,
Robert K. Walker, Thomas F. Lawrence, James H. Bair,

Jean,   I just read ul of the 10/73 arpanet news: how could you give
that big discussion to Telenet, without mentioning that Larry Roberts
is its new President?   maybe in u2??   Mike Leavitt   1

1

19750 Distribution
    Jean Iseli,

Jean: Regarding your SNDMSG:
18-OCT-73 0057-EDT JC at CASE-10:   Link
   cc: norton at NIC, victor at NIC   1

The substantive content of your memo is just the sort that we want
to see, with respect to "collaborative dialogue" with knowledgeable
users about system evolution. I'll let Ken and others respond to the
content.   2

What I want to say here concerns the communications means for this
type of dialogue. Collaborative dialogue, to support distributed
participation in complex-system evolution, is exactly what we had in
mind when building the Journal the way we did -- e.g. why we make a
permanent, catalogued, retrievable and accessible copy -- that this
sort of contribution would not be lost, that subsequent dialogue
could be free to cite it knowing that any reader could get access to
the cited reference, etc.   Similar considerations here as for
professional Journals, where careful attention to reference citation
is urged, but where it is only cricket to cite articles that are
accessible.   3

I urge you to contribute more often, and to feel free to browse
through our Journal indexes and memo content wherever you find
interest -- but please make your contributions through the Journal,
o.k.?   4

And if you really want to be cooperative, please re-transmit your
abovementioned (see, no linking possible to a SNDMSG??) memo via the
Journal. Then if we want to reply, we can use links to cite specific
passages, other interested parties in our design community can follow
the dialogue, etc.   5

Thanks in advance; your participation is both solicited and
welcomed.   6

Best regards, Doug   7

19751 Distribution
    Jean Iseli, Richard W. Watson, Mil E. Jernigan, James C. Norton,
    Kenneth E. (Ken) Victor,

Response to your query on NIC and Mailbox Idents.

In response to your message, Marcia, Chris Reeve is CLR@70, Bill Long
is WJL@70. Rich Guida has left organization, and
Allan Oppenheim doesn't have a network mailbox here yet. Rest of the
people are bonafide. Also Ed Fredkin doesn't have a Mailbox at our
site.

1

Response to your query on NIC and Mailbox Idents.

(J19752)   18-OCT-73 17:23;   Title: Author(s): Abhay K. Bhushan/AKB;
Sub-Collections: NIC; Clerk: AKB;

Your name has been added to FTPIG.

1

(J19753)   18-OCT-73 17:26;   Title: Author(s): Abhay K. Bhushan/AKB;
Sub-Collections: NIC; Clerk: AKB;

Keeping the EXAMPLE section of Help and the command summary current

To Dean,   1

Because of recent changes (per CHI) in commands, there will have to
be some changes in the structure of the EXAMPLE section of Help. I
am listing them here for you to make because they will screw up your
hardcopy. There will be equivalent changes in the FUNCTION section,
but I will make those.   2

    Delete (Locked) from under (Jump)--command will not be
    implemented.
                                                                                                            2a

    Move (Temporary) from under (Terminate) to be under
    (Reset)--syntax has also changed. This leaves only one thing for
    (Terminate), so move the example for Terminate Record UP one level
    to follow a CR after (Terminate).
                                                                                                            2b

    Move (Modifications) from under (Retrieve) to be under (Undelete).
    This leaves only one thing for (Retrieve), so move the example for
    Retrieve Archived UP one level to follow a CR after (Retrieve),
    and change the second word "Archived" to "File".
                                                                                                            2c

I will continue to send you any changes to the structure of the
EXAMPLE branch for you to make, until you tell me you're done with
this round. As of 5 p.m. Thursday I will no longer make changes
[syntax or anything else] to (userguides, commands)* [Your hardcopy
of Tuesday is outdated), but will copy it to the SYNTAX section of
HELP and then keep up with all syntax changes in that branch. After
you finish your first pass through the exampls you could do a "SINCE"
content analysis on SYNTAX in HELP to see what new changes are to be
made. How will this work for you? Severe objections should get to
me ASAP.
                                                                                                            3

* Note to DIRT people:
Version 93 should be the last version of the file (userguides,
commands). Don't anybody make new ones. Save all edits you wish to
do until after I copy it to the SYNTAX branch of (userguides, help)
on Friday morning.   4

19754 Distribution
    N. Dean Meyer, Dirk H. Van Nouhuys, Kirk E. Kelley,

Analysis: Re (19745,2), throw the switch, invoke automatic QBVM
recording

SPECIAL ATTENTION REQUESTED BY EVERY MEMBER OF ARC

Analysis: Re (19745,2), throw the switch, invoke automatic QBVM recording

Susan: Your data collection is an important function. I'm quite sure that the unresponsivenss to your requests is more because people are absent-minded about remembering to save their QBVM data than because of any possible feeling of rebellion or antipathy. Please do take the step of invoking automatic record keeping, without any qualms whatsoever. In fact, I'd guess that your resulting data would be worth a lot more by not being limited to the select work sessions where the user happened to remember.   1

PR, RWW, JCN, CHI: If there is any reasonable way for the systems programers to make the record taking entirely automatic, so that Analysis can collect data no matter how the NLS user disengages from the system, I would explicitly and strongly urge this to be done.   2

I feel that it is dumb to waste valuable Analysis time trying to use awkward and limited means for gathering its data. There is far too large an investment of public resources in this AKW experiment (like about $10 million in ARC over the last decade) to curtail the value derived due to unwarranted delicacy about any participant who objects to having his online behavior monitored. It would be like not being able to observe and record the astronauts' behavior as they did their work in their unique, experimental environment.   3

It would seem to me that the monitoring data would be more meaningful if taken when the user wasn't aware -- i.e., when his behavior is not specially affected by any concern about whether or not he is being monitored.   4

Therefore, I hand to Analysis the mandate to monitor the working behavior of ARC staff, within the ARC working environment, whenever and however it feels the need. ARC staff should assume that their working behavior, within our "Knowledge Workshop environment," may be being monitored by our Analysis group at any time.   5

Everyone working in ARC is assumed by me to have volunteered, when he joined us, to be part of the bootstrapping experiment. If anybody on the ARC staff seriously objects to the foregoing practise, I want him to straighten out the matter with me immediately?   6

NOTE: Non-ARC users are not assumed to have such a working agreement. If we would want personal monitoring data from their online work, we will have to make appropriate agreements with them.   7

19755 Distribution
Donald C. (Smokey) Wallace, Richard W. Watson, Don I. Andrews, Duane
L. Stone,
Bonnar Cox, A. Jim Blum, A. Analysis, Meredith(Reddy) E. Dively,
Jeanne M. Leavitt, Rodney A. Bondurant, Jeanne M. Beck, Mark
Alexander Beach, Judy D. Cooke, Marcia Lynn Keeney, Carol B.
Guilbault, Susan R. Lee, Elizabeth K. Michael, Charles F. Dornbush,
Elizabeth J. (Jake) Feinler, Kirk E. Kelley, N. Dean Meyer, James E.
(Jim) White, Diane S. Kaye, Paul Rech, Michael D. Kudlick, Ferg R.
Ferguson, Douglas C. Engelbart, Beauregard A. Hardeman, Martin E.
Hardy, J. D. Hopper, Charles H. Irby, Mil E. Jernigan, Harvey G.
Lehtman, Jeanne B. North, James C. Norton, Jeffrey C. Peters, Jake
Ratliff, Edwin K. Van De Riet, Dirk H. Van Nouhuys, Kenneth E. (Ken)
Victor

I-D-S in the RADCMIS

    There is a file entitled <bethke>radcmis that you should read
in your spare time. I have a hard copy if you desire it. Also you
may attempt to print <bethke>ppmis.1;1 , that way you get your own
hard copy or "hard" he-he-he.   Note .. the file is not repeat not
complete.   1

19766 Distribution
  Frank J. Tomaini, Joe P. Cavano, Edmund J. Kennedy, Roger B. Panara,

I-D-S in the RADCMIS

(J19766) 19-OCT-73 05:07;   Title: Author(s): William P. Bethke/WPB;
Distribution: /FJT JPC EJK RBP; Sub-Collections: RADC; Clerk: WPB;

Protocol Documents Online?

Jon,
My only objection to your "three things" is the point about protocol
documents required to be on line. I probably shouldn't object,
since there are obvious advanages, but I suspect that such a decision
will take me out of the protocol business, since I can only type with
one finger and the secretaries here either can't or won't use
computer systems much. There is also the problem of putting
"pictures" on line. Finally, even if I were to try typing in the
TELNET documents (say), its just about impossible to get a connection
to the NIC opened, and kept open; This morning I amm in at 8:30 and
got only an "offquota" login, and if I leave my TTY for more than 5
minutes they will log me out, giving me my next chance to do anything
useful tomorrow.
Regards,
Alex

1

19767 Distribution
    Jonathan B. Postel, Jeanne B. North,

Protocol Documents Online?

(J19767) 19-OCT-73 05:55;   Title: Author(s): Alex A. McKenzie/AAM;
Distribution: /JBP JBN; Sub-Collections: NIC; Clerk: AAM;

Alex,
The confusion stems from the fact that long, long ago I
discovered that I had a NIC Ident of KP, without anyone aksing me
what my NIC Ident should be. It seems that I once showed
up at a Network meeting, and signed a piece if paper
"Ken Pogran"; it took me two years to get the NIC to change my
long-form name to "Kenneth T. Pogran" and my IDENT to KTP.
But Marcia Keeney tells me that they are winning in that
both the old and new Idents work. Don't ask me how!
Regards,
Ken   1

19768 Distribution
    Alex A. McKenzie,

(J19768) 19-OCT-73 06:48;   Title: Author(s): Kenneth T. Pogran/KTP ;
Distribution: /AAM ; Sub-Collections: NIC; Clerk: KTP;

Reference: #19750

Mike: JBN inserted the article you mentioned. In a discussion with Jeanne, we decided that since we had, through the on-line interview with Dr. Larry Roberts previously announced his new appointment, that it would possibly be inappropriate to alter the article that JBN extracted to form the referenced update. If you feel the jusdgement should be reconsidered, I am sure that we would be pleased to reflect that in the update.

Thank you very VERY much for your interest in the Newsletter and contribution towards its improvement.   Jean   1

19769 Distribution
    Jeanne B. North, M. R. Leavitt

1

(J19769) 19-OCT-73 07:41; Title: Author(s): Jean Iseli/JI;
Distribution: /JBN (thought this is the response we should give, hope
you agree) MRL; Sub-Collections: NIC; Clerk: JI;

Response to (19743,) NLS Crunch

Some comments on (19743,)...NLS is a scarce resource, but also an
experimental one. It's unstable and inconsistent from a service
standpoint, which just adds to the limitations on available connect
time. Hopefully the utility will clear up this part somewhat, but
with the increased user population we will soon be faced with the
same problem again. Now seems a good time to start a dialogue on the
subject.   1

(1) Review the way RADC users work with the system - not with the
goal of minimizing their use but rather with the viewpoint of
maximizing their throughput on the system.   2

  Your suggestions in this area deal with "advanced" training and
  system documentation, both a necessity if users are going to
  improve their proficiency in using the system. Of course,
  improving a person's proficiency may lead to INCREASED use of the
  system, rather than reduced use. We should find some way to pass
  on goodies we have learned to others. One possiblility is to have
  a regular (weekly??) NLS users meeting, in which users would
  exchange discoveries they have made.   2a

(2) Revamp the use of output processing (which I think is widely
misused and inefficient).   3

  My understanding of the output processor is that the CPU resources
  are about the same, regardless of whether it is ODT or ODP. The
  connect time is less for ODT, providing the file is only a couple
  of pages. I'm sure there is a crossover point for total connect
  time required to print a file, and eventually the ODP method would
  win. We could make a few runs and find out where this is for
  different load conditions.   3a

  I have found theat the need for paper grows as the file grows. I
  have to stop and print things out every once in a while when the
  doc gets over 4-5 pages, to see if the flow and continuity are
  still there. Also scanning for typos, misspellings etc is easier
  on paper (and probably reduces system connect time compared with
  doing it on-line).   3b

  We now have a user program which can produce print files from
  journal items (JPRINT) submitted the previous day. We could run
  this early each morning and give hard copy to the author. For
  drafts which the author is unwilling to submitt to the Journal, we
  could work out a similar procedure, where they would leave the
  file name they wished printed in some common/open file. Bobbie or
  Anne could then have the job each morning of runing JPRINT and of
  making hard copy of the additional files in the open file. This
  might be a good first step toward a PSO (People Support
  Organization) like SRI has.   3c

I think the best we can do with the line printer on weekends and
at night is to post istructions on the 8090 on how to fire up the
tape unit, line printer and 8090. Its not really that
complicated. When the new line printer gets here, this problem
should go away. If you know you will be here at night now, see
Red Moran, and he will keep the 8090 and tape unit up for you.   3d

(3) Promote Expanded (or rather initial) use of DEX   4

I agree!! Until a couple of weeks ago there was no DEX available
over the network. I'm still not sure that there is, but Dirk sent
me a message to try it again. I will try to do this soon.   4a

(4) Set up an internal time-limit policy so that when a potential
user is refused a LOGIN he can link to the person on the top of the
connect time queue and ask him to log out. A policy like this might
help force people to make better use of the time that they will have
on the system and at the same time insure that people won't be locked
out completely as happens today.   5

I'm not really in favor of setting up a time limit policy. At
what level would you set the limit? I would support the idea of
internal barginning, however. One should not "give up" when he
gets the "NO NEW LOGINS ALLOWED" if he has legitimate work to do
(particullarly if he has time constraints). Barginning should b
encouraged and expected--the rule, not the exeception.   5a

19770 Distribution
    Joe P. Cavano, Edmund J. Kennedy, Roger B. Panara, Edward F. LaForge,
    Frank J. Tomaini,

Response to (19743,) NLS Crunch

(J19770) 19-OCT-73 07:50;   Title: Author(s): Duane L. Stone/DLS;
Distribution: /JPC EJK RBP ELF FJT; Sub-Collections: RADC; Clerk: DLS;
Origin: <STONE>WALRUS.NLS;1, 19-OCT-73 07:48 DLS ;

Reference: #19751

Doug: Thank you very much for your considerate esponse. It will be my destinct please to use the Journal for the type of collboration indicated.I have begun to do that /recent submission of some recommendations for SNDMSG augmentation and NLS augmentation is an example/ and very much appreciate the opportunity to comment in this fashion.

As a positive suggestion on how such collaboration might be further encouraged, it might be worth some consideration in assuring that all submitted journal items are acknowledged in some form. I do not mean, in any way to be picky or snippy, but I have noticed in the past that submitted items have gone unanswered....As I am sure you will agree, this acts as a negative incentive to future submissions.

Thank you again Doug, I hope that the on-going dialog will be of some small assistance in the evolution of NLS.   ....Jean   1

19771 Distribution
    Douglas C. Engelbart, James C. Norton,

NLS Collaboration, et al

(J19771) 19-OCT-73 07:50; Title: Author(s): Jean Iseli/JI;
Distribution: /DCE JON (fyi); Sub-Collections: NIC; Clerk: JI;

INCREASING THE PRODUCTIVITY OF THE KNOWLEDGE WORKER

Prepared this paper under some time pressure, in three nights. I stole heavily from Cavano, Bair, Norton, etc.

INCREASING THE PRODUCTIVITY OF THE KNOWLEDGE WORKER

INTRODUCTION

The importance of managers to the American economy and society has
been emphasized in countless articles and books. He has been
observed, studied, analyzed, synthesized, and counseled by experts in
every field from theology to computer sciences. Yet his unique
characteristics are hard to find. A good manager, it seems, can be
identified but cannot be quantified. Likewise, his job and his
manner of accomplishing it defy detailed description. Despite this
lack of rigorous definition, information scientists and managers
alike have felt for the past 10-15 years that the productivity of
managers, and hence of those he manages, could somehow be improved by
the application of a marvelous new tool called the computer.

This paper examines some of the initial attempts to automate the
manager, the problems encountered, and current trends in machine
aided management. A specific combination of philosophy and emerging
technology; which the author believes has the greatest chance of
revolutionizing the managers' job, is briefly described. Some
preliminary findings are reported from a study of a government R&D
office where the technology was implemented; along with their
potential impact on the manager, his workers and their relationship
within the organization.

BACKGROUND

During the Industrial Revolution businesses were small enough to be
run by one individual who did all the necessary jobs of buying,
selling, planning, and accounting. All the basic data and
information needed for the successful completion of these duties was
assimilated by the individual entrepreneurs and any problem that
emerged could usually be handled by him alone.

In essence, each individual was an integrated data processing system
who was the central source of information[2]. Based on his
interpretation of his data, he established policies, made plans and
arrived at decisions. As organizations grew ever larger and more
complex and competition became keener, the amount of information
became too big for one person to handle. It became necessary to
involve additional people and delegate authority. Employees were
hired and given responibilities in the functional areas such as
finance, production, and engineering. Soon the entrepeneur had to
rely on colleges and universities to train his people. The result of
this process was the construction of walls, both visible and
invisible, about the various functions that made up the organization.
The walls around a function such as planning not only served to keep
people from production or engineering out but also made prisoners of
the planners themselves, isolating them from the very people they
were planning for. Differences in jargon further served to isolate

the people from each other, and communication became more difficult
at a time when it was necessary for people of differing specialities
to work together on the same problem. Sometimes this caused
functions to lose sight of their original purpose of serving the
total organization and they began to see themselves as complete
entities independent of everyone else.

Today these functional boundaries are a vital part in any
organization structure (a glance at any organization chart shows how
prevalent this is). Ironically, these boundaries are not necessarily
logical but simply evolved from the way they were originally
perceived in the organization. Too often we find the computer
perpetuating these arbitrary breakouts by being applied to help only
within a particular isolated function or only on one aspect of a
problem.

In a modern organization the fragmentation due to delegation of
authority and separation of duties is something that may have to be
put up with in order to get anything done in an operational sense.
Hopefully, as advanced tecnology is applied more and more, the basic
structure of the organization itself will change and adapt itself to
take advantage of the new tools that are emerging. Nevertheless, top
management still needs to see a unified picture of the total
organization and feels they need to see it right now.

In the early 60's the idea of a general purpose Management
Information System (MIS) was born. It was based on the computer,
which had made great strides forward in the previous decade in the
processing of non-nummerical data.

ENTER MIS

The ultimate goal of an MIS would be to present a unified view of the
organization and its problems. The information system would cut
across all the individual functional areas that existed in any
particular company. It would seek to emulate an individual
entrepreneur by being a central depository for all the data of the
organization. It would accomplish this by providing integrated
non-redundant information, by incorporating techniques of management
science and by responding in a timely manner to ad hoc requests for
information.

An MIS would provide management with the data they need to coordinate
their activities, allocate resources (people and money) and control
operational plans and schedules. To do this, the information system
would provide management with unbiased information on the status of
personnel and the current financial condition of the organization in
a near real-time manner. Managers could then establish sound

policies and be made aware of shortcomings within the organization as they occurred and not after the fact.

At the same time the system should not be used to generate information indiscriminately. In our "information-rich" society the necessary information needed to solve a particular problem is usually buried with so much other extraneous data that it cannot be used effectively. Therefore, another prime goal of a MIS would be to deliver only the data that is needed; that is, the minimum information necessary for the problem at hand.

PROBLEMS WITH MIS

It appears that the information scientists over estimated both their capabilities and their understanding of the manager's job. As a result there have been a number of attempts at building MIS's for higher level management which have been less than successful, particularily in supporting the manager in his policy making and planning roles. In retrospect, some of the more out standing reasons for "under achievement" were:

the disjointed development of isolated subsystems, which were often incompatible with each other and merely fortified the organizational barriers extant between personnel, training, R&D, purchasing, etc.

the assumption that with enough diligence, anything is programmable. The complexity of some of the resulting systems was so great that they seldom worked for more than short periods of time. The programming teams that built them were subject to the same communication problems that any working group would have; with one vital exception. When they failed to communicate adequately, the system did not just slow down; it stopped altogether.

the use of the systems approach, on a "system" which could not be bounded. The manager's needs changed while the system was being constructed. It was not so much that the systems approach was inappropriate, but that the designers failed to include adaptability as one of their system design criteria. The result was often an inflexible system, delivered several years after the original analysis was made, which no longer meet the manager's needs.

the collary of the above was management's failure or unwillingness to involve themselves in all phases of system design and analysis. Too often the manager was more than willing to step aside and let the "whiz kids" construct the system for him.

4

the failure to recognize a dichotomy that exists in most
organizations. The people in the lowest levels of an organization
generate most of the data that enters the MIS yet they have the
least need for information generated by it. Each successive level
in the hierarchy produces less and less data but they have
correspondingly greater information needs. Finally, at the very
top of the organization almost no new data is generated. A
situation arises where the individuals who must input the data to
the MIS are the least motivated to keep it accurate and
up-to-date. As a result, we find the reliability of the data
decreasing with time and a corresponding decline in the validity
of decisions made on the basis of this data.

the failure to recognize the central fact of uncertainty in a
manager's job. A manager's job has been described as making
decisions under conditions of uncertainty. If there was no
uncertainty in a specific decision-making activity, a routine
could be established that would lay out what actions to perform
depending on the given conditions and anyone could accomplish
this. In some cases, it would not be necessary to invest money in
a manager at all. By this definition a manager should apply his
energy toward those efforts or tasks that are new. Since there is
by definition no prior experience to rely on in a novel situation,
no one could predict exactly what kind of information would be
relevant to this new problem. Therefore, the information system
cannot provide all the information needed because the manager,
himself, cannot identify in advance what kind of information he
might want. If a easy way to communicate his information needs to
his subordinates is provided the manager, however, some of the
limitations of the MIS can be overcome.

PROBABLY MOST IMPORTANT was the lack of an overall philosophy of
management and technology to guide system design and development. It
was necessary to first recognize that a manager was just a special
subclass of the more general class of people in this country called
"knowledge workers". It was also necessary to realize that an
evolutionary, incremental approach to system development must be
taken in a situation like the managers', where information needs and
technology are both changing rapidly.

It now appears that both the philosophy and technology are coming
into focus, which will allow successful integration of previously
isolated information systems into a cohesive whole. The philosophy
is best expressed in the writings of Peter Drucker and the technology
is emerging at Stanford Research Institute (SRI) [10].

PHILOSOPHY

The importance and implications of the idea of knowledge work have

been described by Drucker [4,5]. Considering knowledge to be the
systematic organization of information and concepts, he defines the
knowledge worker as the person who creates and applies knowledge to
productive ends, in contrast to an "intellectual" for whom
information and concepts may only have importance because they
interest him, or to the manual worker who applies manual skills or
brawn. In those two books Drucker brings out many significant facts
and considerations highly relevant to the theme here, one among them
(paraphrased below) being the accelerating rate at which knowledge
and knowledge work are coming to dominate the working activity of our
society:

   In 1900 the majority and largest single group of Americans
   obtained their livelihood from the farm. By 1940 the largest
   single group was industrial workers, especially semiskilled
   machine operators. By 1960, the largest single group was
   professional, managerial, and technical -- that is, knowledge
   workers. By 1980 this group will embrace the majority of
   Americans. The productivity of knowledge has already become the
   key to national productivity, competitive strength, and economic
   achievement, according to Drucker. It is knowledge, not land, raw
   materials, or capital, that has become the central factor in
   production.

In his provocative discussions, Drucker makes extensive use of such
terms as "knowledge organizations," "knowledge technologies," and
"knowledge societies." It seems a highly appropriate extension to
coin the phrase "knowledge workshop", just another name for the place
in which knowledge workers do their work. Knowledge workshops have
existed for centuries, but only recently has special emphasis been
placed on their systematic improvement, toward increased
effectiveness of this new breed of craftsmen.

TECHNOLOGY

The visible components of the technology are the time-shared computer
(allowing a number of persons to simultaneously share a computer's
vast resources in a real time manner) and the effective networking of
dissimilar computers [7,11]. The less visible side is the
recognition of the common "core" of activity carried on daily by
knowledge workers, regardless of their speciality.

To illustrate this later point, if you asked a particular knowledge
worker (e.g., scientist, engineer, manager, or marketing specialist)
what were the foundations of his livelihood, he would probably point
to particular skills such as those involved in designing an electric
circuit, forecasting a market based on various data, or managing work
flow in a project. If you asked him what tools he needed to improve
his effectiveness he would point to requirements for aids in

designing circuits, analyzing his data, or scheduling the flow of work.

But, a record of how this person used his time, even if his work was highly specialized, would show that specialized work such as mentioned above, while vital to his effectiveness, probably occupied a small fraction of his time and effort.

The bulk of his time, for example, would probably be occupied by more general knowledge work: writing a planning or design document; carrying on dialogue with others in writing, in person, or on the telephone; studying documents; filing ideas or other material; formulating problem-solving approaches; coordinating work with others; and reporting results.

The Augmentation Research Center (ARC) at SRI has been working for some years to develop a general purpose information system that would augment the common core activities of knowledge workers[3]. It has been more successful than other similar attempts because of its underlying philosophy and because of its development strategy called "bootstrapping".

Bootstraping implies a pragmatic, evoloutionary development process; where the developers of the system also used the system to further develop it. If newly developed capability was insufficient, just window dressing or otherwise fell into disuse, its deficiencies were soon noted by the developing group at the ARC and the new feature was eliminated, modified or upgraded.

The development of the system has progressed to the point where it is now being used by small groups around the country as their primary medium for conducting their daily business. It contains a host of tools, procedures and methodology embedded in a consistent command language; which allow one to accomplish most of his daily communication and documentation activities. Some of the more important communication features include:

linking..the ability to connect one's terminal to another (or several) and hence to carry on a "converation" between the linked parties.

message distribution..allows the immediate distribution of messages to one or more individuals.

shared files..allows two or more people to read and write on the same file, thus facilitating recorded dialog.

shared screens..allows two people to work on and view the same file at the same time. This mode of communication is often

further augmented by a telephone voice link between the two
parties.

journal..allows one to send any document (from one word to several
hundred pages) to any recognized user of the system. A reference
to the document is delivered on-line or the entire document is
delivered off-line via a remote printer or the US mails. The
document is automatically indexed by author, number and keyword in
the title. The indices are also available on-line and off-line
for subsequent searching.

Documentation capabilities include:

text editing..a full range of text editing features are availible
to the user.

viewing..the text is arranged in an hierarchial fashion and a
number of special views of the document one is preparing or
studying can be easily obtained based on the structure of the
document.

formatting..several hundred directives are available for the users
to format his document for publication. Printing can be done on
any conventional teleprinter terminal, on a highspeed line
printer, or on a phototypeset machine, where controls over font,
charactersize, columns, etc. are possible.

Concurrently, a second technology has been developed which allows the
interconnection of dissimilar computers. It has been supported by
the Advanced Research Projects Agency (ARPA) and is called the
ARPANET. There are currently over 40 computer sites in the US and 3
overseas, representing all the major computer manufacturers, linked
together.

This makes it possible to connect programs together which are
running on different computers located at different geographic
sites. This means that one no longer has to replicate software,
hardware and experteze on site before he can use some newly
developed information system. One need only provide a software
interface from the general purpose information system to the more
specialized (and more powerful in its domain) information system.

Examples of such special purpose systems available on the ARPANET
include:

a DELPHI system at the Universtiy of Southern California, which
allow the rapid collection of expert judgements in a formal
manner. [12,13]

a powerful 3 dimension graphics capability at the University of Utah, which can assist in the design and analysis of complex 3D objects.

a computer based instruction program at the Bolt, Berranck & Neuman company in Boston, which allows an instructor to insert course material and students to be taught in an on-line interactive tutoring mode.

a general purpose MIS capability at the Systems Development Corp., which allows one to experiment with setting up his own MIS files and query language.

CAN IT WORK

What does this all mean to a manager of the future? What impact might this technology have on the individual worker, the group, the manager, the organization, the society?

Will it (as its proponents proclaim) actually increased communication and at the same time reduce error, promote management by objective, improved the efficiency of individuals, groups and organizations, reduced administrative overhead? Or will it prove to be another expensive venture into the information science world that costs more than its worth?

Until this year, one could only speculate how well this technology might fair in competition with more conventional means of conducting business. The Rome Air Development Center (RADC) has started a two year project to evaluate the benifits and costs of this new technology. It has set out to answer 4 questions:

1. Can this technology be introduced at all into a "conventional" office environment. If so, what are the problems and pitfalls one should try to avoid?

To date the technology has only been used in a very special environment at the ARC. The people are primarily computer people and are highly screened and very motivated in their work. The principle users of the system are its developers, so why shouldn't they be able to make it work to their advantage?

2. What are the benefits and cost savings that might be associated with use of this technology in a government R&D office?

This question has to address the difficult problem of measuring knowledge workers' productivity.

3. What are the costs of the system and where are tradeoffs possible?

   There will be human costs as well as the more conventional dollars and cents costs[14].

4. Is it worth it to make comuter mediated human communication a way of life?

   This is a value judgement, which must be made after all the evidence is in.

The first phase of the evaluation has been completed and the tentative answer to question #1 is yes. This yes is based on the experiences of the Augmented Knowledge Workshop (AKW) team, which are covered in a detailed study by one member of the team[1]. Since the essence of question #1 is people and their reactions to this technology, the data collection instruments were adapted from the field of Psychology. The six used were:

   (1) a chronicle of comments and unstructured participant observation,

   (2) case study descriptions,

   (3) structured, but open-ended interviews,

   (4) a controlled attitude questionnaire,

   (5) a content questionnaire and

   (6) a tally of comunication transactions.

Because the study had to be conducted within a working environment, it was by necessity a descriptive field study. The study covered a 6 month time period and include 20 participents (a complete section and extention to the branch and division offices in the chain of command). Where appropriate, comparisons were made with an organizational unit of similar size and with a common manager. For an overview of the organizational landscape see appendix 2.

INITIAL FINDINGS

   GENERAL

   The most outstanding finding was the personal attitudes toward the introduction of the technology. They were shifted toward the negative side, despite the fact that the subjects worked in a computer sciences R&D group. The range was from extreme

apprehension at the thought of having to deal with a computer to
one of acceptance as a challenge. There was no significant
correlation with education, job position, age, sex, or prior
experience with a computer. In the opinion of the experimenters,
there was a correlation with a person's general personality.

It would pay any organization contemplating the introduction of
a technology which affects the everyday activity of everyone in
the organization, to preceed it with a through indoctrination
program. The philosophy behind the introduction of this
technology, what benifits should accrue to the individual and
the organization, and a empathetic attitude of management
toward the problems of learning should be made clear.

TRAINING

Training was conducted over a week period, in groups of 5-8
people. It was followed up by private tutoring at the request of
the student. A period of voluntary use of the system was
instituted for 1 month. At the end of that time all students in
the section were requested by their supervisor to use the system
exclusively for communication and documentation tasks.

The system was more of a burden to people than a help until they
attained a certain level of proficiency. The rate at whcih they
attained this minimal level was directly correlated with the
product of the length of time they had been exposed to the system
and the intensity of use during that exposure period. The
intensity of use in turn was influenced by the above mentioned
attitudes, by peer group pressure, and finally by management
pressure.

A second level of proficiency was noted, where the system was
essentially transparent to the user. At this level people are
doing on-line composition and prefer typing themselves, because of
the flexibility they have to change and rearrange text as they are
thinking about it.

Managers must expect to allocate a substantial portion of their
workers' time to training, before the system starts to pay-off.
They must also be willing to spend an equal, if not greater
amount of their own time in training.

The training program should be intensive in the beginning, ie
do not expect the worker to also carry on his regular job
during the initial training period. On-the-job training will
procede indefinately, primarily through personal contacts with
coworkers.

INCREASING THE PRODUCTIVITY OF THE KNOWLEDGE WORKER

WORKERS

The majority of workers, even those with initially negative
attitudes toward the technology, accepted the system as a way of
life by the end of the six month period. The time to acceptance
was a function of a person's rate of attainment of proficiency
with the system.

The majority of workers perceived improvement in the quality and
quantity of their work. The system improved the response time of
individuals to routine tasks greatly.

The immediate perceived benefit of the system to the worker is
that it gives him access to management that he never had
before. One would think that the worker might be more guarded
in his comments to management, since they are written and
perhaps stored in the computer forever for all to see. The
opposite seemed to be the case, perhaps because of the novelity
of the technology or perhaps because the general air of
informality the system seemed to generate.

GROUPS

Inter group communication was increased, intra group communication
was increased only slightly.

Informal geographically seperated groups are formed to attack a
common problem. This is possible only because of the ARPANET
technology.

Dont' look to technology alone to solve the intra group
communication problem. It will facilitate it simply because it
is easy to do, but will not guarentee it.

Expect informal groups to arise, which may never meet each
other. They will be brought together by complementary needs
and experteze. Its a way to get "free" consultant services,
but can add to a manager's problems in keeping his people
focused on the task at hand..

MANAGERS

There was no relation between the level of a manager in the
hierarchy and acceptance and use of the system.

If a manager did not use the system, for whatever reason, he was
bypassed by the worker and lower levels of management. The use of
a secretary to act as a surrogate system user, is of marginal use
in reversing this trend.

If a manager is contemplating introducing this type of technology into his environment, he had better be prepared to participate whole-heartedly, or he may find himself cut out of the mainstream of his organization's thought.

In the authoritative-to-participative continuum of management style, the use of this technology will force a manager toward the particpative end, whether he likes it or not. If he ignores feedback (which he will get even though he may not have solicited it), he will be by-passed or ignored.

COMMUNICATION

The frequency and breadth of communication of those using the system the most was substantially greater than those using it little or not at all. The number of different people and groups communicated with and the number of levels in the chain of command communicated with was greater for those using the system.

The system was used for social as well as work communication. There was a slight decrease in face-to-face communication for the users of the system.

Traditionally, there is a trade-off between two-way and one-way communication. One-way is faster, but more error prone. Two-way is slower but more accurate. The use of the system seems to eliminate this traditional trade-off; indeed, the notion of one-way and two-way is not too meaningful within the context of this technology. The system tends to be an equalizer and lower the barrier between management and worker. One manager in particular, took a lot of ribbing because of his disregard for the rules of punctuation and grammar.

MOTIVATION

Use of the system is self motivating when the second level of proficiency, mentioned in the training section above, has been reached.

There was a noticeable change in the work habits of the more proficient users of the system. They started comming in early in the morning, working through lunch hour, staying late at night and working on weekends. The system is more responsive at these times, which apparently motivates proficient users to use it at these times. The additional work hours obtained from the proficient and highly motivated workers was an unexpected benefit to the organization.

People tend to become dependent on the system as indicated by this quote from one of the more avid fans of the system.

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

He offers the following analysis using some learning theory concepts. He states that the use of DNLS is self--reinforcing because it is immediate, happens often, and happens at the level at which the behavior occurs. Less frequent, but perhaps more powerful reinforcment is obtained from coworkers -- "Oh I didn't know you could do that!" -- which gives one a feeling of being on top of things, one-up-man-ship, superiority, etc.; and it is obtained from bosses in a similar way. In addition, the ability to respond quickly, often before the question is asked, engenders admiration.

SUMMARY

If the findings of this study and the writings of the authors listed below are any indication, the manager of the future can expect to operate in an environment permeated with on-line, real-time networks of computers. One will find computers used more and more to augment human communication [8,9]. Indeed, in the foreseeable future, this will be the primary use of computers, with access to other more traditional systems being made from the communication computer.

The manager should be able to use this tool to practice participative management, without the traditional loss of organizational efficiency. When faced with difficult decisions, the manager will have a much broader and deeper base of talent upon which to draw, because of his easy access to internal and external expertise through the computer. His workers may not all be there during any given working day; some will be working from home, some will be comming in late or early. Less emphasis will be placed on number hours behind the desk and more on productivity and results.

Traditional office tools (desks, filing cabinets, typewriters, pencil and paper) will be replaced by consoles. Large screen displays will replace flip-charts, viewgraphs and blackboards as briefing aids in the conference room [6].

More importantly, managers will have to be even more aware of and

sensitive to the perceptions and attitudes of their employees as this technology ushers in the "brave new world".

INCREASING THE PRODUCTIVITY OF THE KNOWLEDGE WORKER

REFERENCES

(1) J H BAIR
Evaluation and Analysis of an Augmented Knowledge Workshop
To be published as a RADC Technical Report 1973

(2) J P CAVANO
Generation of an Information System
To be published as a RADC Technical Memorandum 1973

(3) D C ENGELBART, R W WATSON, J C NORTON
The Augmmmented Knowledge Workshop
Proceedings: National Computer Conference, June 1973

(4) P F DRUCKER
The Effective Executive
Harper and Row New York 1967

(5) P F DRUCKER
The Age of Discontinuity: Guidelines to Our Changing Society
Harper and Row New York 1968

(6) T W HALL
Implementation of an Interactive Conference System
AFIPS Proceedings-Spring Joint Computer Conference Vol 38 pp 217-229
1971

(7) R E KAHN
Resource-Sharing Computer Communication Networks
Proceedings of the IEEE Vol 147 pp 147- September 1972

(8) J C R LICKLIDER R W TAYLOR E HERBERT
The Computer as a Communication Device
International Science and Technology Number 76 pp 21-31 April 1968

(9) J C R LICKLIDER
Man-Computer Symbiosis
IEEE Transactions on Human Factors in Electronics Vol HFE-1 pp 4-11
March 1960

(10) N LINDGREN
Toward the Decentralized Intellectual Workshop
Innovation Number 24 pp 50-60 September 1971

(11) L G ROBERTS B D WESSLER
Computer Network Development to Achieve Resource Sharing
AFIPS Proceedings-Spring Joint Computer Conference Vol 36 pp 543-549
1970

(12) M TUROFF
"Party-Line" and "Discussion" Computerized Conference Systems
Computer Communication, Impact and Implications Proceedings of First
International Conference on Computer Communication Stanley Winkler
(Editor) 24-26 October 1972 Washington D C   pp 161-171 1972

(13) M TUROFF
Delphi and Its Potential Impact on Information Systems
AFIPS Proceedings-Fall Joint Computer Conference Vol 39 pp 317-326
1971

19772 Distribution
    Edmund J. Kennedy,

INCREASING THE PRODUCTIVITY OF THE KNOWLEDGE WORKER

L10 problem program 10/19

I'm trying to get this program to branch on the value of siml, so
that the same statements will be replaced by ****s or ######s
depending on how my IF statement is set up. I know there are other
ways to do this but right now I would appreciate it if you could tell
me why this program doesn't work when siml does not equal 1 (it works
alright if siml were 1 and branches to the THEN statement. But when I
think it should be going to the ELSE part, the file is returned
exactly as it is without #### being inserted. I hope this makes sense
to you and that you can straighten me out.

```
PROGRAM condense                                                    1

    DECLARE TEXT POINTER p1,p2,p3,p4,p5,p6,p7,p8,p9,p69;            1a

    DECLARE STRING txt="****************************************";  1b

    DECLARE STRING sub = "#########";                               1c

    DECLARE sim1 ;                                                  1d

    DECLARE sim2 = 2;                                               1e

    DECLARE sim3 = sim1;                                            1f

    DECLARE sim4 = "jonum";                                         1g

(condense) PROCEDURE;                                               2

    LOCAL array[100];                                              2a

    sim1 ← sim2 ;                                                  2b

    IF sim1 = 1 THEN                                               2c

        IF FIND NP ENDCHR ↑ p1 THEN                               2c1

            BEGIN                                                 2c1a

            ST p1 ← *txt*;                                        2c1b

            RETURN (TRUE)                                         2c1c

            END                                                  2c1d

        ELSE                                                      2c2

            IF FIND NP ENDCHR ↑ p1 THEN                          2c2a

                BEGIN                                             2c2a1

                ST p1 ← *sub*;                                    2c2a2

                RETURN (TRUE)                                     2c2a3

                END;                                              2c2a4

        RETURN (TRUE);                                            2c3

    END.                                                          2d
```

19773 Distribution
    N. Dean Meyer,

1

L10 problem program 10/19

(J19773) 19-OCT-73 08:51;   Title: Author(s): Joe P. Cavano/JPC;
Distribution: /NDM; Sub-Collections: RADC; Clerk: JPC;

Count us in for QBVM data collection

We at RADC would be most interested in DNLS user statistics collected
via QBVM. If you can conveniently include us in your analysis,
please feel free to do so. We would be interested to see how our use
of DNLS compares with other types of users at the ARC.   1

19774 Distribution
    Douglas C. Engelbart, Edmund J. Kennedy, Dirk H. Van Nouhuys, Susan
    R. Lee,

Count us in for QBVM data collection

(J19774) 19-OCT-73 09:05;   Title: Author(s): Duane L. Stone/DLS;
Distribution: /DCE EJK DVN SRL; Sub-Collections: RADC; Clerk: DLS;

Comments on analysis

I think an automatic analysis of how users use NLS and related
systems could provide some very interesting material from which to
draw conclusions and do not object at all to having my sessions
analyzed. However, I would like to suggest that this analysis be
given a proper perspective by having the user of NLS possibly input
personal comments about his type of usage, or by having a comparison
of different types of users and jobs, or possibly having a comparison
of outside and inhouse use, tnls vs dnls, etc. (I am sure Analysis
has several schemes of there own.) I do object to this information
being pesented on a personal basis in some instances, such as person
y is on the system constantly and person x is not, therefore y is a
better nls user than x. My feeling is that a person is a good user
of nls if he can quickly and easily get his work done with it, and
nls will be a good system if it allows the user to do his work
quickly and easily. We should get away from the game of 'look how
many routines I have memorized' and exchange it for a game of 'look
how few effective routines I need to get a job done well'. This
will give us real payoff, in my opinion, and I am sure that the work
of the analysis group will contribute significantly to this effort.
JAKE   1

19775 Distribution
    Douglas C. Engelbart, Richard W. Watson, Paul Rech, Susan R. Lee,
    Michael D. Kudlick,

(J19775)   19-OCT-73 09:31;   Title: Author(s): Elizabeth J. (Jake)
Feinler/JAKE; Distribution: /DCE RWW PR SRL MDK; Sub-Collections:
SRI-ARC; Clerk: JAKE;

Defense Advanced Research Projects Agency			1
1400 Wilson Boulevard			1a
Arlington, Virginia 22209			1b
As of 27 July 1973			1c
DIRECTOR'S OFFICE			2
			2a
Dr. S.J. Lukasik(dir)	802	43007	2b
Mr. A. J. Tachmindji(dep dir)		43035	2c
Dr. F.W. Niedenfuhr	41139		2d
Mrs. Doris Smith		43007	2e
Mrs. Margaret Goering		43035	2f
Ms. Claire Parisi	41139		2g
PROGRAM MANAGEMENT ADMINISTRATION			2h
			2h1
Dr. V. C. Fryklund (dir)	713	45917	2h2
Miss Jo Ann Settle	41541		2h3
Mr. B. Korenblit (dep dir)	41443		2h4
miss Kay Sanders	41443		2h5
PM DECISION			2h5a
Mr. B. Korenblit	813	41443	2h5b
Mr. W. A. Bangert	815	41633	2h5c
Mr. G.A. Davis	819	41588	2h5d
Miss Garnette Hooker		41588	2h5d1
Mr. L. P. Kallas	821	41674	2h5e
Mr. F.I. Edwards	825	41626	2h5f

ARPA Directory

Miss Pat Lindberg		41674	2h5f1
Mr. G. Morrow	823	41586	2h5g

MANPOWER & PERSONNEL OFFICE — 2h5h

Mrs. Helga Yeich	827	43236	2h5i
Mrs. Ardella Holloway		43236	2h5i1

MANAGEMENT INFORMATION SYSTEM DIVISION — 2h5j

Mrs. Constance McLendon	839	43506	2h5k
Mrs. Betty Favor		43510	2h5l
Mr. Cliff Mann		43506	2h5m
Mrs. Bonnie McLain		43510	2h5n

ADMINISTRATIVE SERVICES DIVISION — 2h5o

Mr. D.J. Sullivan	607	42087	2h5p
Miss Kay O'Bryan	610	42087	2h5p1

TECHNICAL INFORMATION OFFICE — 2h5q

Mr. F. A. Koether	634	45919	2h5r
Miss Ginger MOtyka		45920	2h5s

OVERSEAS OFFICE COORDINATOR — 2h5t

Mr. G. Fussell	605	432032	2h5u
Mr. R. Yee	603	43077	2h5v
Mrs. Etoile Hawkins	609	43032	2h5v1

OFFICE SERVICES BRANCH — 2h5w

CW2 W.L. Deweese, USAF	601	41608	2h5x
TSgt J.L. Benjamin, USAF	631	43998	2h5y
Tsgt J. I. Steele, USAF(Travel)		48011	2h5z
Mr. S. Green		43998	2h5a@

ARPA Mail Room			2h5a@1
Mrs. Kaye Pulzone	6333	43398	2h5a@2
Mr. L. Laughery		45004	2h5a@3
Mr. D. Mclendon	45004		2h5a@4
SSgt E.r. Gaines, USAF		45004	2h5a@5

MATERIAL SCIENCES   2i

                                                                     2i1

Dr. C.M. Stickley(dir)	707	43010	2i2
Dr. S. Ruby	709	45800	2i3
Dr.E.C. van Reuth	701	44750	2i4
Ms Joan Scrivener	703	43010	2i4a
Mrs. Cynthis Winter	703	45800	2i4b

INFORMATION PROCESSING TECHNIWUES   2j

                                                                     2j1

Dr. J. Licklider	731	45921	2j2
Mr. A.G. Blue	733	45922	2j3
Mr. S. D. Crocker	735	45037	2j4
Dr. R. E. Kahn	725	45922	2j5
Col J. N. Perry, Usaf	727	45051	2j6
Mrs. Paula Kazanjian	730	45921	2j6a
Mrs. Pamela Cutler	730	45051	2j6b
Mrs. Rowena Mirdjahangiri	730	45922	2j6c

TECHNOLOGY ASSESSMENTS OFFICE   2k

                                                                     2k1

Dr. V. C. Fryklund (dir)	713	45917	2k2

ARPA Directory

Mr. R.A. Black	715	45917		2k3
Col B. Pafe, USAF	711	45917		2k4
Cdr J.R. Beatty, USN	719	45917		2k5
Mrs. Pat Messler	716	45917		2k5a
TACTICAL TECHNOLOGY OFFICE				21
				211
Mr. K. Kresa (dir)	1005	42440		212
Dr. J. D. Douglas(Dep Dir)	1003	42885		213
Mr. R.M.Chapman	1011	41893		214
Dr. C.H. Church	1037	43580		215
LTC S.P. Dereska, USAF	1039	43532		216
Col H.M. Federhen, USA	1047	43512		217
LTC G.H. Greenleaf, USAF	1049	43015		218
Cdr B.K. Hannula, USN	1009	42612		219
Col W. F. Kirlin, USAF	1035	43611		2110
Mr. C.R. Lehner, Jr.	1001B	42974		2111
Mr. J. K. Milsted	1021	41821		2112
Mr. C. Ravitsky	1013	42394		2113
Cdr J. Seesholtz, USN	1017	42569		2114
Mr. G. Sullivan	1025	41771		2115
Ltc R. Franklin, USMC	1019	41843		2116
Maj P. Worch, USAF	1007	42723		2117
Mr. R. Zirkind	1045A	43522		2118
Mrs. Rosemary Bilder	1001A	42936		2119
Mrs. Alma Spring	1003A	42564		2119a

Mrs. Esther Cutler	1045	43015	2119b
Mrs. Sarah Haber	1027	41771	2119c
Miss Mary Jo Jackson	1016	41843	2119d
Mrs. Margaret Sprott	1003A	42885	2119e
Mrs. Marliece Williams	1045	43580	2119f
Miss Terri Coleman	1016	42394	2119g
As of 27 July 1973			2119h

DEFENSE ADVANCED RESEARCH PROJECTS AGENCY   3

  1400 Wilson Boulevard   3a

  Arlington, Virginia 22209   3b

19776 Distribution
    Richard H. Thayer, Duane L. Stone, John L. McNamara, Roger B. Panara,
    Frank J. Tomaini, Rocco F. Iuorno,