LLL 20-MAR-73 9:48 15212

PARTY FOR FERGIE

Party for Fergie, tomorrow at 4:00 at the Infirmary, Mountain View, Moffett Blvd. See you all there (The peanuts are free) 1

LLL 20-MAR-73 9:48 15212

PARTY FOR FERGIE

(J15212) 20-MAR-73 9:48; Title: Author(s): Lane, Linda L. /LLL;
Distribution: /SRI-ARC; Sub-Collections: SRI-ARC; Clerk: LLL;

MDK 20-MAR-73 14:37 15213

tenex / nls stuff

Marilyn ...
I read your recent journal item (Ljournal, 14977, 1:w) on the need
for a new reference document on TENEX and NLS, and concur.
I think there should be at least three additional commands covered,
(in addition to those you've already covered in
(Userguides, Tenex,)):

PROTECTION (the subcommand of DIR;
see my file (Kudlick, Protection, 1:w)
JOBSTAT;
TERminal Type is (for prospective IMLAC users)

MDK 20-MAR-73 14:37 15213

tenex / nls stuff

(J15213) 20-MAR-73 14:37; Title: Author(s): Kudlick, Michael D. /MDK; Distribution: /mfa ; Sub-Collections: SRI-ARC; Clerk: MDK;

MDK 20-MAR-73 15:09 15214

Dave ... Here's that long-promised list of some SRI-ARC system people whom you may want to call upon on-line for help and advice.

Charles IRBY (CHI)
Jim NORTON (JCN)
Dirk VANNOUHUYS (DVN)
Harvey LEHTMAN (HGL)
Marilyn AUERBACH (MFA)
Smokey WALLACE (DCW)

1

15214 Distribution
Walden, David C. ,

(J15214) 20-MAR-73 15:09; Title: Author(s): Kudlick, Michael D. /MDK; Distribution: /dcw3 ; Sub-Collections: SRI-ARC; Clerk: MDK;

MDK 20-MAR-73 17:30 15215

Linking in TENEX

Ken ... Some time ago I got an interesting note from a very knowledgeable person, Alex McKenzie, whom you probably know. 1

The note follows, then a reply that I've written but not yet sent. Would you please give me your comments on his note and my reply? 2

Alex's Note: 3

AAM 2-MAR-73 8:24 14852
LINKing
Message: Dear Mike,
I wish to object, in the strongest possible terms, to either the use or the documentation of the link command (or both). On March 2 at about8am (your time) I had typed about 10 minutes worth of a journal message (I can only type with one finger) when I was "linked to" by marilyn auerbach who was "trying to get a hold ofDave Walden". I got out my copy of the TNLS Users Guide to see what to do and it assured me (section 1, page 9) that the link wouldn't hurt me.. Nevertheless, my journal document was terminated by the linking action (or something related). The folklore around here now tells me that I should have typed a Control C to escape harm, but my TTY had just printed an "@". Its very annoying to be trying to use your system, typing myself rather than using my secretary and the mail (or the phone) and getting screwed up like this.
Alex McKenzie

3a

MDK's Reply: 4

Alex ... On Linking: 4a

I agree with your objections to the Tenex link mechanism as it's now constituted. (This is in reference to a journal item you sent me last month, NIC# 14852, 2-Mar-73) 4b

The problem is, as you are well aware, that SRI-ARC can't change the Tenex link mechanism, but only uses it. This means that the only two commands one can use to control the linking process are "REFUSE" and "RECEIVE", to refuse all links or receive all links, respectively. This is clearly not enough. 4c

The model that I would like to see followed in the design of an entirely new link mechanism is that of a super-efficient personal secretary, as follows: 4d

The user should be able to tell the system i.e., his "secretary", that he will accept links (analogous to accepting "phone calls") from users x, y, and z, say, but from no one else. 4e

The system would in turn keep a record of all attempted links giving person, date, and message, if any. (This would be analogous to the present "MESSAGE.TXT" file, though done in real time.) 4f

Such a record should be in a file, say "LINKS.TXT", which could be interrogated, deleted, etc. at any time by the user. 4f1

The system would NEVER allow anyone to link in the present sense. Rather, it would intercede as a secretary would, and tell you that X is trying to link, and give you the option of accepting or rejecting the link. 4g

This would give you the privilege of replying in one of a few standard ways, to wit: 4g1

Will accept the link now. 4g2

Busy in output mode (or busy in input mode) (or busy with another link): will link back within N minutes. 4g3

Note that in this schema, even when the system tells you that X is trying to link, X must be one of the persons that you specifically said it was o.k. to accept links from. Otherwise, the attempted link from X would merely be noted in the file "LINKS.TXT". 4h

Note also of course that this still leaves a problem to be resolved: how should the system tell you that you have a message from one of the privileged users (X, Y, or Z in the above simple example)? 4i

In my opinion you should either be interrupted by the system as at present, or else not be told until the next time TENEX typed its herald "@". At this point the system could type something like LINK FROM X, TYPE "LINK CR" TO READ IT. 4i1

These two options might be selectable by the user, or they might not. I have no strong preference. 4i2

I believe the model of a super-efficient secretary can be

exploited even further. Moreover, I strongly believe that it is the correct model to use. We need privacy when we're using the computer; we need protection from intrusions on our input or output copy; and we need a way to reply courteously to those who would sincerely like to get in touch with us. 4j

Linking in TENEX

(J15215) 20-MAR-73 17:30; Title: Author(s): Kudlick, Michael D.
/MDK; Distribution: /KEV JBN (for your information or comments) ;
Sub-Collections: SRI-ARC; Clerk: MDK;
Origin: <KUDLICK>WALDEN.NLS;2, 20-MAR-73 17:28 MDK ;

TO 20-MAR-73 13:11 15216

cbm igmemlist changes

we have a number of corrections, additions, and deletions to make to the
cbigmemlist. shall we submit them to you by message or attempt to enter them directly into the file? if the latter,how do you get advised of additions so that new members will receive their initial package? 1

TO 20-MAR-73 13:11 15216

cbm igmemlist changes

(J15216) 20-MAR-73 13:11; Title: Author(s): O'Sullivan, Thomas /TO;
Distribution: /JBN; Sub-Collections: NIC; Clerk: TO;

TO 20-MAR-73 13:24 15217

rt

this is a real test 1

TO 20-MAR-73 13:24 15217

rt

(J15217) 20-MAR-73 13:24; Title: Author(s): O'Sullivan, Thomas /TO;
Distribution: /JCN; Sub-Collections: NIC; Clerk: TO;

cbigmemlist

i?

1

TO 20-MAR-73 6:33 15218

cbigmemlist

(J15218) 20-MAR-73 6:33; Title: Author(s): O'Sullivan, Thomas /TO;
Distribution: /JBN; Sub-Collections: NIC; Clerk: TO;

ci bigmemlist format

TO 20-MAR-73 8:03 15219

ci bigmemlist format

(J15219) 20-MAR-73 8:03; Title: Author(s): O'Sullivan, Thomas /TO;
Distribution: /JBN; Sub-Collections: NIC; Clerk: TO;

TO 20-MAR-73 8:07 15220

cbigmemlist

can a space be inserted between entries in the subject list? 1

TO 20-MAR-73 8:07 15220

cbigmemlist

(J15220) 20-MAR-73 8:07; Title: Author(s): O'Sullivan, Thomas /TO;
Distribution: /JBN; Sub-Collections: NIC; Clerk: TO;

TO 20-MAR-73 8:43 15221

a

can you send me a tnls users guide, 1

a

(J15221) 20-MAR-73 8:43; Title: Author(s): O'Sullivan, Thomas /TO;
Distribution: /JBN; Sub-Collections: NIC; Clerk: TO;

AKB 21-MAR-73 12:59 15222

RE. MAIL PROTOCOL

I THINK IT IS AGOOD IDEA TO PROPOSE A SEPARATE MAIL PROTOCOL AT THIS STAGE. THE MAIL PROTOCOL CAN "LIVE" WITHIN FTP IN THE SENSE THAT THE SERVER LISTENS ON SOCKET 3 (AVOIDING A PROLIFERATION OF SERVERS, DAEMONS, AND SOCKETS). THE MAIL PROTOCOL COULD BE INVOKED BY THE MLTO COMMAND (RFC 475). THE ALTERNATIVE YOU SUGGEST OF JUST SENDING THE PATHNAME CAN HAVE DIFFICULTIES IN TERMS OF THE FILE NOT BEING THERE. ALSO WHAT ABOUT SITES WHICH DO NOT HAVE A SERVER FTP? IDO AGREE THAT FILE NAMES SHOULD BE ALLOWED INSTEAD OF THE COMPLETE TEXT AS IN CITATIONS. PERHAPS WE SHOULD DISCUSS THIS A LITTLE. WHY DONT I GIVE YOU A CALL SOON. BYE

1

AKB 21-MAR-73 12:59 15222

RE. MAIL PROTOCOL

(J15222) 21-MAR-73 12:59; Title: Author(s): Bhushan, Abhay K. /AKB; Distribution: /JEW; Sub-Collections: NIC; Clerk: AKB;

BAH 21-MAR-73 10:38 15223

MAR 11-17, A Week In Review

MAR 11-17, A Week In Review

WEEKLY ANALYSIS REPORT: 1

2
(ARC) 2a

2a1
WEEK: MAR 11-17, 1973 (24 HOURS/DAY) 2a2

2a3

IDENT	CPU HRS	CON HRS	CPU/CON	% SYS	CON/CPU	2a4
						2a5
(DIA)	.396	14.550	.027	1.0	37:1	2a6
(MFA)	.447	12.116	.037	1.1	27:1	2a7
(WLB)	.392	21.438	.018	1.0	56:1	2a8
(KFB)	.155	18.076	.009	.4	111:1	2a9
(CFD)	.318	10.292	.031	.8	32:1	2a10
(DCE)	.804	24.721	.033	2.0	30:1	2a11
(JAKE)	.855	18.694	.046	2.1	22:1	2a12
(WRF)	.703	20.932	.034	1.7	29:1	2a13
(BAH)	.774	11.511	.067	1.9	15:1	2a14
(MEH)	.902	25.409	.035	2.2	29:1	2a15
(JDH)	.373	13.108	.028	.9	36:1	2a16
(CHI)	1.190	18.051	.066	2.9	15:1	2a17
(MEJ)	.423	35.200	.012	1.0	83:1	2a18
(DSK)	1.640	29.731	.055	4.0	18:1	2a19
(KIRK)	1.099	34.186	.032	2.7	31:1	2a20
(MDK)	.279	9.251	.031	.7	32:1	2a21

(LLL)	.542	22.014	.025	1.3	40:1	2a22
(SRL)	.089	6.361	.014	.2	71:1	2a23
(HGL)	.586	16.222	.036	1.4	28:1	2a24
(NDM)	.434	16.790	.026	1.1	38:1	2a25
(EKM)	.344	13.180	.026	1.1	38:1	2a26
(JBN)	.398	17.251	.023	1.0	43:1	2a27
(JCN)	.815	47.105	.017	2.0	59:1	2a28
(JCP)	1.831	42.851	.043	4.4	23:1	2a29
(JR)	.006	.596	.010	0.0	100:1	2a30
(PR)	.530	16.398	.032	1.3	31:1	2a31
(JFV)	.519	13.223	.039	1.3	26:1	2a32
(EKV)	.039	16.617	.002	.1	500:1	2a33
(DVN)	.490	15.072	.033	1.2	30:1	2a34
(KEV)	2.671	24.583	.109	6.5	9:1	2a35
(DCW)	3.203	44.952	.071	7.8	14:1	2a36
(RWW)	.054	1.309	.041	.1	24:1	2a37
(JEW)	.176	4.940	.036	.4	28:1	2a38
			-----	-----		2a39
(TOTAL)				57.6%		2a40
(AVERAGE)			.141			2a41

2a42

HIGHEST CPU: DCW 3.203 hrs LOWEST CPU: JR
.008 hrs 2a43

HIGHEST CON: JCN 47.105 hrs LOWEST CON: JR
.596 hrs 2a44

HIGHEST CPU/CON: KEV .109 HIGHEST CON/CPU: EKV
500:1 2a45

2a46

(RADC) 2b

2b1

WEEK: MAR 11-17, 1973 (24 HOURS/DAY) 2b2

2b3

NAME DIR	CPU HRS	CON HRS	CPU/CON	% SYS	CON/CPU	
(JHB)BAIR	.179	28.053	.006	.4	167:1	2b5
249						2b6
(WPB)BETHKE	.009	.756	.012	0.0	56:1	
19						2b7
(JPC)CAVANO	-	-	-	-	-	
42						2b8
(RFI)IUORNO	.016	.868	.018	0.0	56:1	
28						2b9
(FSL)LAMONICA	.070	16.581	.004	.2	250:1	
49						2b10
(TFL)LAWRENCE	.619	36.240	.017	1.5	59:1	
75						2b11
(JLM)MCNAMARA	.128	11.983	.011	.3	91:1	
127						2b12
(RBP)PANARA	-	-	-	-	-	
73						2b13
(MDP)PETELL	-	-	-	-	-	
-						2b14
(RADC)RADC	.035	2.188	.016	.1	62:1	
78						2b15

(WER)RZEPKA	.197	34.192	.006	.5	167:1	2b16
62						
(FPS)SLIWA	.048	6.362	.008	.1	125:1	2b17
34						
(JRS)STELLATO	-	-	-	-	-	2b18
-						
(DLS)STONE	.646	37.241	.017	1.6	59:1	2b19
151						
	-----	-----		-----		2b20

(TOTAL)	1.947	174.464		4.7		2b21
987						

(PER CENT TOTAL DISK CAPACITY) 2b22
2.0%

2b23
(XEROX) 2c

2c1
WEEK: MAR 11-17, 1973 (24 HOURS/DAY) 2c2

NAME	CPU HRS	CON HRS	CPU/CON	% SYS	CON/CPU	
						2c3 2c4
(DDC)COWAN	-	-	-	-	-	2c5 2c6
(LPD)DEUTSCH	.033	.506	.065	.1	15:1	2c7
(CMG)GESCHKE	.006	.205	.029	0.0	34:1	2c8
(EMM)MC-CRGHT	-	-	-	-	-	2c9
(RMM)METCALFE	-	-	-	-	-	2c10
(JGM)MITCHELL	.048	5.311	.009	.1	111:1	2c11
(WHP)	.029	.334	.087	.1	11:1	2c12

(EHS)SAT-WTE	.240	8.594	.028	.6	36:1	2c13
(RES)SWEET	.517	17.697	.029	1.3	34:1	2c14
	-----	-----		-----		2c15
(TOTAL)	.873	32.647		2.2		2c16

2c17

(NETUSERS) TOP FIVE 2d

2d1

WEEK: MAR 11-17, 1973 (24 HOURS/DAY) 2d2

2d3

NAME	CPU HRS	CON HRS	CPU/CON	% SYS	CON/CPU	2d4
						2d5
UCSB	1.084	42.123	.026	2.6	38:1	2d6
MITRE-TIP	1.033	95.082	.011	2.5	91:1	2d7
BBN-TENEX	.613	8.791	.070	1.5	14:1	2d8
NBS-TIP	.391	13.150	.030	.9	33:1	2d9
BBN-NET	.386	14.085	.027	.9	37:1	2d10
	-----	-----		-----		2d11
(TOTAL)	3.507	173.231		8.4		2d12

BAH 21-MAR-73 10:38 15223

MAR 11-17, A Week In Review

(J15223) 21-MAR-73 10:38; Title: Author(s): Hardeman, Beauregard A. /BAH ; Distribution: /SRI-ARC DLS TFL JHB LPD JGM ; Sub-Collections: SRI-ARC RADC ; Clerk: BAH ;

DHC 21-MAR-73 12:35 15224

MIDAS

Mike -- We are trying to build up a complete Netwrok library and would like to get some (three) copies of the MIDAS assembler documentation (TENEX claims to have MIDAS as a subsystem) which BBN references as "MAC AI memo No. 90, MIDAS, by Peter Samson". Can you get some copies to me (Dave Crocker, 3732 Boelter Hall, UCLA, L.A., Calif., 90024) or let me know who to contact? (This is all official, so purchase orders can be made out if needed.

many thanks.
Dave/

1

15224 Distribution
Padlipsky, Michael A. ,

MIDAS

(J15224) 21-MAR-73 12:35; Title: Author(s): Crocker, David H. /DHC;
Distribution: /MAP; Sub-Collections: NIC; Clerk: DHC;

I talked to Mike Kudlick about this already, but thought you might like to have this formally:

The Output Processor generates some fairly 'unclean' text, with a variety of (apparently) unnecessary control character (especially cntl-S and cntl-B) running around. Under some circumstances (e.g., using the text file produced by output device printer and then run thru SENDPRINT and FTP to another site) these control characters can do unfortunate things.

Separrate but equal problems can occur due to not having form feeds (cntl-l) at the beginning of a line. The Output Processor tacks control L's at the end of the line. This messes up line-oriented processing completely. (I realize that no protocol requires ff's at the beginning of a line. This seems to be a-rather peculiar problem.)

Thanks. Dave/

(J15225) 21-MAR-73 12:42; Author(s): Crocker, David H. /DHC;
Distribution: /BUGS; Sub-Collections: NIC BUGS; Clerk: DHC;

JBN 21-MAR-73 8:01 15226

Trouble With Lack of Margin in ARC SNDMSG

Jim: SNDMSG from ARC to ARC still doesn't know about 8 1/2 x 11 right margins and prints off across the page. As customary, I print and delete, and tesr off. So I'll never know what your message about the ARPA address was unless you tell me. -- Jeanne 1

JBN 21-MAR-73 8:01 15226

Trouble With Lack of Margin in ARC SNDMSG

(J15226) 21-MAR-73 8:01; Title: Author(s): North, Jeanne B. /JBN;
Distribution: /jcn ; Sub-Collections: SRI-ARC; Clerk: JBN;

Viewspec Y, Message to TO

Tom: Yes we will send you a TNLS Users Guide. Yes, you can insert a space between entries in any file by the command v[iewspec] y. Sometimes the command is embedded, as in some LOCATOR-approached files, and sometimes it is not. You should always be able to get it by the command.--Jeanne 1

15227 Distribution
O'Sullivan, Thomas , North, Jeanne B. ,

JBN 21-MAR-73 8:13 15227

Viewspec Y, Message to TO

(J15227) 21-MAR-73 8:13; Title: Author(s): North, Jeanne B. /JBN; Distribution: /to nicsta ; Sub-Collections: SRI-ARC NICSTA; Clerk: JBN;

JBN 21-MAR-73 8:28 15228

Sending Group Changes to NIC Station Agent

Tom: NIC prefers you send changes to membership lists to it in the Journal to be entered at NIC, partly because of the problem you see, that under present possible procedures the changes might escape the offline mail process. Change messages can be addressed to Marcia Keeney, our new Station Agent, and she will enter them in the Identfile and the membership list. -- Jeanne 1

15228 Distribution
O'Sullivan, Thomas , North, Jeanne B. , Keeney, Marcia Lynn ,

JBN 21-MAR-73 8:28 15228

Sending Group Changes to NIC Station Agent

(J15228) 21-MAR-73 8:28; Title: Author(s): North, Jeanne B. /JBN;
Distribution: /to nicsta mlk ; Sub-Collections: SRI-ARC NICSTA;
Clerk: JBN;

JHB 21-MAR-73 14:53 15229

Using DCEs work by quoting directly from cited files:
Collaboration.

Response to DCE message

JHB 21-MAR-73 14:53 15229

Using DCEs work by quoting directly from cited files:
Collaboration.

Doug: 1

Of course I wouldn't copy anything without citing the source; but I'm a firm believer in supporting ones ideas, perceptions, etc. by citing others in a "scholarly manner". It lends to the establishment of "ethos", a concept we students of human communication like to use without citing Aristotle...(ha, ha). The particular paper I found useful was: 1a

D. C. Engelbart. COORDINATED INFORMATION SERVICES FOR A DISCIPLINE OR MISSION-ORIENTED COMMUNITY. Paper presented at the Second Annual Computer Communications Conference, January, 1973, San Jose, California. 1a1

I copied (as in editing command) some of the statemnts describing what AKW is and what it does. Your descriptions were particularly lucid and concise, just right for my introduction. What I did, if it's OK, was edit these to fit the context of my paper, thus resembling paraphrasing, and then cited you using an in content footnote. Does this seem to be a valid mode of collaboration? 1b

Thank you for your response and offer to help. I would really appreciate your comments and reaction to my proposal (bair,ahi2,). It represents the major thrust of my work here: the analysis of the effects of AHI on the communication among AKWs. It is oriented toward those in the social sciences rather than computer people. 1c

Best regards, Jim 1d

JHB 21-MAR-73 14:53 15229

Using DCEs work by quoting directly from cited files:
Collaboration.

(J15229) 21-MAR-73 14:53; Title: Author(s): Bair, James H. /JHB;
Distribution: /dce ; Sub-Collections: RADC; Clerk: JHB;

(ucla-ccn) 1

The best way for network users to contact UCLA-CCN personnel (other than by phone) is to use the FTP Mail command. This may be effected either through SNDMSG from a TENEX Host, or through an ICP to socket 3 then entering "MAIL CR LF". For the latter alternative, the command sequence is:

```
@H 65 LF
@R F S 3 LF
@I C P LF
MAIL CR LF
```

For more information, contact the following:

BRADEN - Technical Liaison
NOBLE - User Services/Consulting help
BELL - Getting started, forms, charges, and other administrative information

.....Braden 1a

JI 21-MAR-73 10:39 15230

(J15230) 21-MAR-73 10:39; Author(s): Iseli, Jean /JI; Distribution: /JBN(from braden at ccn today - received at USC-ISI); Sub-Collections: NIC; Clerk: JI;

KEV 20-MAR-73 20:39 15231

reply to 15215, linking in tenex

While i like your reply, my personal feelings are that we can not hope to get such a "super secretary" from the system. i would suggest that you refer mckenzie to ray tomlinson or bob clements of the tenex group at bbn. 1

KEV 20-MAR-73 20:39 15231

reply to 15215, linking in tenex

(J15231) 20-MAR-73 20:39; Title: Author(s): Victor, Kenneth E. (Ken) /KEV; Distribution: /mdk ; Sub-Collections: SRI-ARC; Clerk: KEV;

KIRK 20-MAR-73 21:38 15232

BUG with substitute with viewspec D.

The substitute command does not work when viewspec D is on. 1

KIRK 20-MAR-73 21:38 15232

BUG with substitute with viewspec D.

(J15232) 20-MAR-73 21:38; Title: Author(s): Kelley, Kirk E. /KIRK;
Distribution: /bugs ; Sub-Collections: SRI-ARC BUGS; Clerk: KIRK;

Network Mail Addresses

Bert ... The responses to Larry Roberts' memorandum requesting the Network mail addresses of the Principal Investigators fall into three categories: 1

1) Those whose addresses were explicitly given. 1a

2) Those who requested that their accounts be set up at either USC-ISI or BBN-TENEX. 1b

3) Those who did not respond at all. 1c

The purpose of this note is to find out two things: 2

First, who is going to handle the question of setting up accounts at BBN-TENEX or USC-ISI; 2a

Second, of those PI's that did not respond, is it because they are no longer PI's (i.e., is the NIC's list out of date) or is it because they are simply late. 2b

Here is what we have found so far: 3

Address Known 3a

Name	NIC Ident	Network Mail Address	
Abbott, Robert		ABBOTT @	USC-ISI 3a2
Balzer, Robert M.	RMB	BALZER	USC-ISI 3a3
Engelbart, Doug C.	DCE	ENGELBART	SRI-ARC 3a4
Heart, Frank E.	FEH	HEART	BBN-TENEX 3a5
Kehl, William B.	WBK	KEHL	CCN 3a6
Kleinrock, Leonard	LK	LK	UCLA-NMC 3a7
Marill, Thomas M.	TMM	TOM	CCA 3a8
McCarthy, John	JMC	MCCARTHY	SU-AI 3a9
Millstein, Robert E.	REM	MILLSTEIN	USC-ISI 3a10
Neumann, Peter		KUDLICK	SRI-ARC 3a11
Pratt, William K.	WKP	PRATT	USC-ISI 3a12

Network Mail Addresses

Raichelson, Eugene	GR	ISELI	USC-ISI	3a13
Raphael, Bertram	BR	RAPHAEL	SRI-AI	3a14
Roberts, Lawrence G.	LGR	ROBERTS		3a15
Stockham, Thomas G.	TGS	STOCKHAM	UTAH-10	3a16
Sutherland, Wm R.	WRS2	SUTHERLAND	BBN-TENEX	3a17
Address to be Arranged at Either		USC-ISI or	BBN-TENEX	3b
Baran, Paul		BARAN	?	3b1
Bernstein, Morton I.	MIB	BERNSTEIN	?	3b2
Bryan, Roland F.	RFB	BRYAN	USC-ISI	3b3
Buchanan, Bruce G.	BGB	BUCHANAN	?	3b4
Cooper, Frank S.	FSC	COOPER	BBN-TENEX	3b5
Culler, Glenn		CULLER	?	3b6
Fink, Robert L.	RLF	FINK		3b7
Frank, Howard	HF	FRANK	USC-ISI	3b8
Kuo, F.F.	FFK ?	KUO		3b9
Lampson, Butler W.	BWL	LAMPSON	?	3b10
Lederberg,		LEDERBERG	USC-ISI	3b11
Medress, Mark	MM2	MEDRESS	BBN-TENEX	3b12
Mitchell, James G.	JGM	MITCHELL	?	3b13
Did Not Respond				3c
Cheatham, Thomas E.	TEC	CHEATHAM	HARV-10	3c1
Dines, Thomas R.	TRD	DINES	AMES-TIP	3c2
Evans, David C.	DCE2	EVANS	UTAH-10	3c3
Feigenbaum, Edw A.	EAF	FEIGENBAUM	SU-HP	3c4

Network Mail Addresses

Forgie, James W.	JWF	FORGIE	LL-TX2	3c5
Glaser, Edward L.	ELG	GLASER	CASE-10	3c6
Newell, Allen	AN	NEWELL	CMU-10	3c7
Pyke, Thomas N.	TNP	PYKE	NBS-CCST	3c8
Stone, Duane L.	DLS	STONE	RADC	3c9
Uncapher, Keith W.	KWU	UNCAPHER	USC-ISI	3c10
Vorhaus, Alfred H.	AHV	VORHAUS	MITRE-TIP	3c11
Weissman, Clark	CW	WEISSMAN	SDC-ADEPT	3c12

Network Mail Addresses

(J15233) 21-MAR-73 17:10; Title: Author(s): Kudlick, Michael D.
/MDK; Distribution: /wrs2 ; Sub-Collections: SRI-ARC; Clerk: MDK;
Origin: <KUDLICK>BERT1.NLS;2, 21-MAR-73 17:08 MDK ;

SENDPRINT DOCUMENTATION

SENDPRINT, a subsystem for the TENEX timesharing system, provides the user with the capability of printing NLS formatted files at any terminal or transforming files into normal ASCII sequential files. It was designed to answer the need of Network and non-local users for a means of obtaining NLS formatted hardcopy output on terminals and printers at their own or other sites. Documentation for SENDPRINT resides in <USERGUIDES>SENDPRINT. 1

SENDPRINT DOCUMENTATION

(J15234) 21-MAR-73 10:18; Title: Author(s): Auerbach, Marilyn F. /MFA ; Distribution: /sri-arc ; Sub-Collections: SRI-ARC; Clerk: MFA ;

SENDPRINT DOCUMENTATION

SENDPRINT, a subsystem for the TENEX timesharing system, provides the user with the capabiity of printing NLS formatted files at any terminal or transforming files into normal ASCII sequential files. It was designed to answer the need of Network and non-local users for a means of obtaining NLS formatted hardcopy output on terminals and printers at their own or other sites. Documentation for SENDPRINT resides in <USERGUIDES>SENDPRINT. 1

15235 Distribution

Hargraves, Robert F. , Shephard, C. D. , Brown, Maurice P. , Ashenhurst, Robert L. ,
Connelly, Linda M. , Troxel, Janet W. , Rosewall, Connie D. , Webster, Linda M. , Coley, Anita L. , Mostrom, Carol J. , Sanford, Edwin A. , Tinker Air Force Base , Dunn, Robert M. , Reid, Joseph B. , Misencik, William T. , Sakai, Toshiyuki , Pouzin, Louis , Lundh, Yngvar , Hinckley, Robert H. , Zelkowitz, Marvin , Cowan, Donald , Pepper, Marianne , Dixon, Louis F. , Lee, Ted , O'Malley, Michael , Kirstein, Peter , Farber, David J. , Twyver, Dave , Bernstein, Art J. , Liddle, Dave E. , Showalter, A. Kenneth , Aufenkamp, D. D. , Barber, Derek Leslie Arthur , Schipper, Tjaart , Van Sylke, Richard M. , Aupperle, E. M. , Lipinski, Hubert , LeGates, John C.
Colman, Harold , Neigus, Nancy J. , Sack, Terry , McHale, Frances A. (Toni) , Young, Helen D. , Gilliard, Lucille C. (Lucy) , Falk, Gil , Collins, Ed J. , Blunck, Gary , Heafner, John F. , Beaman, Kathy , King, David J. , Moody, C. Jane , Lemaro, Maria E. , Pitkin, Sue , Fitzsimmons, Jerry , Hicks, Gregory P. , Maxey, Gloria Jean , Peeler, Roberta J. , Fields, Craig , McCauley, Ermalee R. , Iwamoto, Margaret , Larson, Dee , Doane, Robert E. , Odom, Dan , Monroe, Brenda , Reynolds, Dorothy A. , North, Jeanne B. , Cutler, Pam J. Klotz , Barnett, Barbara , Golding, Stan , Chipman, Steve G. , Barden, John P. , Ginsberg, Martha A. , Watkins, Shirley W.
Fink, Robert L. , Meir, Jaacov , North, Jeanne B. , Crocker, Steve D. , Lawrence, Thomas F. , McConnell, John W. , Ollikainen, Ari A. J. , White, James E. (Jim) , Hathaway, A. Wayne , Foulk, Patrick W. , Winter, Richard A. , Van Zoeren, Harold R. , McKenzie, Alex A. , Winett, Joel M. , Bhushan, Abhay K. , Pyke, Thomas N. , Wilber, B. Michael , Feigenbaum, Edward A. , Braden, Robert T. , Pepin, James M. , Wessler, Barry D. , Melvin, John T. , Greening, Travis L. , Silberski, Robert , Keeney, Marcia Lynn , MacNeil, Diane M. , Martin, W. A. , Air Force Global Weather Central (DN) , Bassett, Margaret A. (Maggie) , Smith, J. A. , Boone, Leina M. , Jones, Diana L.
Martin, Reg E. , Leichner, Gene , Falk, Gil , Iseli, Jean , Donnelley, Jed E. , Kantrowitz, William , Wolfberg, Michael S. , Feinroth, Yeshiah S. , Hurt, James , Hearn, Anthony C. , Stein, James H. , Shoshani, Arie , Harslem, Eric F. , Metcalfe, Robert M. (Bob) , Reussow, Bradley A. , Reins, E. R. (Dick) , Kadunce, Daniel L. , McCutchen, Samuel P. , Petregal, George N. , Madden, James M. , Young, Michael B. , Padlipsky, Michael A. , Stevenson, Schuyler , Deutsch, L. Peter , Davidson, John , O'Sullivan, Thomas , Seroussi, Sol F. , Bradner, Scott , Thomas, Robert H. , Thomas, John C. , Romanelli, Michael J. , Stoughton, Ronald M. , Owen, A. D. (Buz)

SENDPRINT DOCUMENTATION

(J15235) 21-MAR-73 10:22; Title: Author(s): Auerbach, Marilyn F. /MFA ; Distribution: /nlg nsag nag ; Sub-Collections: SRI-ARC NLG NSAG NAG; Clerk: MFA ;

SRL 21-MAR-73 13:05 15236

New Station Agent at ARC

To all network people:
It's been nice working with all of you. I have been given a new job at ARC with the analysis group and will no longer be the Station Agent. My replacement is Marcia L. Keeney, (MLK) and she will be able to help you with any problems. Thanks for being patient with us, Bye 1

15236 Distribution

Hargraves, Robert F. , Shephard, C. D. , Brown, Maurice P. , Ashenhurst, Robert L. ,
Connelly, Linda M. , Troxel, Janet W. , Rosewall, Connie D. , Webster, Linda M. , Coley, Anita L. , Mostrom, Carol J. , Sanford, Edwin A. , Tinker Air Force Base , Dunn, Robert M. , Reid, Joseph B. , Misencik, William T. , Sakai, Toshiyuki , Pouzin, Louis , Lundh, Yngvar , Hinckley, Robert H. , Zelkowitz, Marvin , Cowan, Donald , Pepper, Marianne , Dixon, Louis F. , Lee, Ted , O'Malley, Michael , Kirstein, Peter , Farber, David J. , Twyver, Dave , Bernstein, Art J. , Liddle, Dave E. , Showalter, A. Kenneth , Aufenkamp, D. D. , Barber, Derek Leslie Arthur , Schipper, Tjaart , Van Sylke, Richard M. , Aupperle, E. M. , Lipinski, Hubert , LeGates, John C.
Colman, Harold , Neigus, Nancy J. , Sack, Terry , McHale, Frances A. (Toni) , Young, Helen D. , Gilliard, Lucille C. (Lucy) , Falk, Gil , Collins, Ed J. , Blunck, Gary , Heafner, John F. , Beaman, Kathy , King, David J. , Moody, C. Jane , Lemaro, Maria E. , Pitkin, Sue , Fitzsimmons, Jerry , Hicks, Gregory P. , Maxey, Gloria Jean , Peeler, Roberta J. , Fields, Craig , McCauley, Ermalee R. , Iwamoto, Margaret , Larson, Dee , Doane, Robert E. , Odom, Dan , Monroe, Brenda , Reynolds, Dorothy A. , North, Jeanne B. , Cutler, Pam J. Klotz , Barnett, Barbara , Golding, Stan , Chipman, Steve G. , Barden, John P. , Ginsberg, Martha A. , Watkins, Shirley W.
Fink, Robert L. , Meir, Jaacov , North, Jeanne B. , Crocker, Steve D. , Lawrence, Thomas F. , McConnell, John W. , Ollikainen, Ari A. J. , White, James E. (Jim) , Hathaway, A. Wayne , Foulk, Patrick W. , Winter, Richard A. , Van Zoeren, Harold R. , McKenzie, Alex A. , Winett, Joel M. , Bhushan, Abhay K. , Pyke, Thomas N. , Wilber, B. Michael , Feigenbaum, Edward A. , Braden, Robert T. , Pepin, James M. , Wessler, Barry D. , Melvin, John T. , Greening, Travis L. , Silberski, Robert , Keeney, Marcia Lynn , MacNeil, Diane M. , Martin, W. A. , Air Force Global Weather Central (DN) , Bassett, Margaret A. (Maggie) , Smith, J. A. , Boone, Leina M. , Jones, Diana L.
Martin, Reg E. , Leichner, Gene , Falk, Gil , Iseli, Jean , Donnelley, Jed E. , Kantrowitz, William , Wolfberg, Michael S. , Feinroth, Yeshiah S. , Hurt, James , Hearn, Anthony C. , Stein, James H. , Shoshani, Arie , Harslem, Eric F. , Metcalfe, Robert M. (Bob) , Reussow, Bradley A. , Reins, E. R. (Dick) , Kadunce, Daniel L. , McCutchen, Samuel P. , Petregal, George N. , Madden, James M. , Young, Michael B. , Padlipsky, Michael A. , Stevenson, Schuyler , Deutsch, L. Peter , Davidson, John , O'Sullivan, Thomas , Seroussi, Sol F. , Bradner, Scott , Thomas, Robert H. , Thomas, John C. , Romanelli, Michael J. , Stoughton, Ronald M. , Owen, A. D. (Buz)

SRL 21-MAR-73 13:05 15236

New Station Agent at ARC

(J15236) 21-MAR-73 13:05; Title: Author(s): Lee, Susan R. /SRL;
Distribution: /NLG NSAG NAG; Sub-Collections: SRI-ARC NLG NSAG NAG;
Clerk: SRL;

We are getting ready to print more copies of the Protocol Notebook. Are there any pending updates to the Protocol Notebook at your end of the line? If so, let us know so that we can include them in this printing. Thanks. 1

15237 Distribution
Postel, Jonathan B. ,

(J15237) 21-MAR-73 13:24; Author(s): Keeney, Marcia Lynn /MLK;
Distribution: /JBP; Sub-Collections: SRI-ARC; Clerk: MLK;

following are modifications to be made to the cbigmemlist

corrections:v 1

15238 Distribution
O'Sullivan, Thomas ,

(J15238) 21-MAR-73 13:33; Title: Author(s): O'Sullivan, Thomas /TO;
Distribution: /TO; Sub-Collections: NIC; Clerk: TO;

prompting

Yesterday I got the folloeing message after entering an unacceptable
response to the prompt &&Go? under submit message
"Type CD to abort; 'y, 'Y, CR, SPACE, or CA for yes; 'n or'N for NO:"
Does this mean C followed by the letters D, R, or A respectivley, or control D, carriage return, and command accept? And what does ' mean? 1

TO 21-MAR-73 6:09 15239

prompting

(J15239) 21-MAR-73 6:09; Title: Author(s): O'Sullivan, Thomas /TO;
Distribution: /JCN; Sub-Collections: NIC; Clerk: TO;

JCN 23 MAR 73 4:17AM 15240

Notes From the SRI/Tymshare meeting in Cupertino 3/21

Jim Norton (JCN), Don Wallace (DCW), and George Kasolas met with Max Beere, Warren Prince, Mike Marrah, and Bert Novak of Tymshare (TS) to discuss: 1

Personnel and Training 1a

Tymnet 1b

Contractual items 1c

PERSONNEL AND TRAINING 2

We discussed the need for the key TS systems man (Marrah?) to work with ARC systems people at ARC to 2a

1) gain experience with TENEX on several lavels 2a1

2) get some insight into the workshop user environment, both seeing how ARC users work and taking the TNLS course to see what our "product" is like. 2a2

The TS people asked many relevant questions about TENEX, the file system, protection, backup, etc that DCW answered directly. 2b

One topic concerned the various priviledged status levels. We agreed that wheel status would be given only to TS key people, with the exception that ARC might at the beginning have temporary wheel status only for as long as needed by TS. 2b1

Mike will come to ARC Thursday, 3/22 at 9:00 to meet with DCW and JCN to make a plan for this interaction - and start into it. Warren Prince seems to want (from Mike) an idea of what the plan for training is after this initial visit to ARC. 2c

Max said that it appeared that three job types would be needed at TS: 2d

Systems Manager (Mike?) 2d1

This needs defining. I'm not sure whether it means systems programmer and manager of others at TS Utility center, or implies just manager. 2d1a

Operator(s) 2d2

Customer service person 2d3

This position might be filled by a combination of the above two at first, but as the load increases would be a separate job. 2d3a

This person would field direct user questions, pleas for help, etc from the users, attempting to determine if troubles are TENEX file problems. NLS problems, or user training problems would be effectively referred to ARC people responsible for NLS and training. 2d3b

TYMNET 3

We discussed the possibility that our workshop user community may include some commercial organizations (like General Motors, Bell of Canada) from the start. 3a

The use of the ARPANET for such traffic needs to be investigated with Larry Roberts (via Al Blue). 3b

The use of Tymnet as an alternative connection for such commercial users raised the question of where to tie Tymnet into the Utility PDP-10: Directly through the line-scanner? or to the IMP? 3c

After some chalkboard diagrams and talk, we concluded that tying to the IMP seems best, eliminating traffic thru the PDP-10 for possible non-utility traffic gaining access to the ARPANET. 3c1

From ARC's point of view, the goal is to provide easy, least expensive access to the Utility computer. Whether Tymnet is connected directly to the PDP-10, or through the IMP does not seem important for our purposes. The main concern if connected directly to the PDP-10 would be the potential Tymnet traffic to other points on the ARPANET and its effect of the operation of the PDP-10. We consider these as two separate issues. 3c2

JCN agreed to call ARPA to explore these ideas further. 3d

Note: The cost of using Tymnet is about $ 5.00 per hour. 3e

This is based on: 3e1

$ 3.00 per hour connect charge (down to $ 1.00 with volume) 3e1a

$ .125 per 1000 char 3e1b

$ .50 per logon 3e1c

In addition, there is a monthly charge of $2,150 for the basic connection to the Net (I think I have it right, but better check) 3e2

CONTRACTUAL ITEMS 4

Draft SRI/TS subcontract 4a

George Kasolas and JCN agreed to start preparation of a draft subcontract so that both SRI and TS will be able to get the negotiation details out of the way as soon as possible to be ready to sign in early July when SRI funding comes in. 4a1

Ordering the Pager 4b

TS will now ask BBN for a quote on the Pager at government prices. If we do get commercial support, the price can be renegotiated. This true of TENEX rights as well. 4b1

Network interface 4c

TS seemed surprised when DCW mentioned the $12.5k cost of an IMP interface. It should have been on the list of items in SRI's RFP. This should be checked. 4c1

Extending TS proposal expiration date 4d

TS agreed to send Kasolas a letter extending the date to 1 August. they said that there would be no change in prices, although we agreed that the cost of the pager should now be added after their price quote is obtained from BBN. 4d1

JCN 23 MAR 73 4:17AM 15240

Notes From the SRI/Tymshare meeting in Cupertino 3/21

(J15240) 22-MAR-73 9:27; Title: Author(s): Norton, James C. /JCN ;
Distribution: /dce rww dcw mdk ; Sub-Collections: SRI-ARC ; Clerk:
JCN ;
Origin: <NORTON>TYM.NLS;1, 22-MAR-73 9:23 JCN ;

15240 Distribution

Engelbart, Douglas C. , Watson, Richard W. , Wallace, Donald C. (Smokey) , Kudlick, Michael D. ,

Proposed Workshop Utility Brief ARC Job Descriptions

Manager for the Utility 1

This person should have several years management experience in the computer field, preferably in the service center operation area. 1a

He/she should have a good imagination, be able to effectively interact with the user population, the Utility Company, the ARC personnel who will provide the programming, documentation, and training help needed by the Utility. 1b

This person, should have some computer experience, preferably a BS. 1c

The main quality needed is the ability to effectively manage an operation. The insight needed to quickly absorb our technology to date, to perceive what the ARC longer range goals are, so as to help the Utility work toward them.. are needed traits. 1d

The salary is open. We must have such a person... will pay what is needed to get the person 1e

Programmer - TENEX for the utility 2

This person should be an existing ARC staff person. The training need for this job is too detailed for a new person.... unless BBN had a man they were not needing. We should be careful not to pirate any BBN people... our relationship must not be hurt by that kind of thing (or any other). 2a

Programmer - NLS for the Utility 3

This person should be an already existing ARC staff member. The training needed is too much for a new person. We need someone who can set up the initial quality control procedures and make them work. That person might very easily be better transferred to another job after 6-9 months. The first tasks, though are very demanding and will require a bright, competent, imaginative person. 3a

Documentation - writer or research assistant 4

In this area, we need more help for MFA. We also need another fresh viewpoint about documentation. It is not good for MFA to be stuck alone in the design of the documentation and the writing. Another writer would help. On the other hand, the

workload in the area of assistance to MFA as a writer is high. How can we get both more writing and more help for our writer? 4a

It would be nice for this person to have had experience in the area of user documentation we produce.. and in the production of it. MFA had such experience when she arrived. Can we be so lucky again? 4b

Training/teaching person 5

This person should have teaching experience, preferably in the online systems area, but not necessarily so. The most valuable trait is the he/she should be a "natural" teacher.... have the qualities that good teachers have to really grab their students. In addition, this person must be able to learn our technology, understand the lower and higher level implications, the details, and become a proficient user.. all in a short space of time. 5a

One of ARC's biggest challenges here isthe training of the teacher. 5b

This person must be willing to travel LOTS.. perhaps 1/2 time for a year. This person must be single... with no strings to speak of. 5c

The teaching here is really a combination of analysis (watching students, analyzing office situations) and teacher (getting the details across while "communicating" with the students. 5d

Ths teaching will probably be done both at the user's sites and over the Network via DNLS, TNLS.. Some ARC training sessions will occur, but from the start of the Utility on, we expect more of the training to be done " on the road" or over the network. 5e

ARC Community Development Interface 6

This job needs description by RWW. 6a

ARC Workshop User Development Interface 7

This job needs description by JCN. 7a

15241 Distribution
Engelbart, Douglas C. , Watson, Richard W. , Van Nouhuys, Dirk H. ,

RMS 22-MAR-73 14:13 15242

Graphics Standards

Craig,
I am doubtful that we can be of any assistance in your effort to research graphics standardization. Most of UCSB's graphics terminals are 'home-grown' and during the development of these terminals, we knew of no standards which existed in the feild of graphics. However, it is probably safe to say that any standard which may exist or may be adopted is most likely to be (rigthfully) 180 degrees out of phase with the techniques employed in our hardware. Sorry we can't be of any help. I mainly wanted you to know that we hadn't ignored your request for information. Ron Stoughton/UCSB 1

15242 Distribution
Maxwell, Craig S. ,

AAM 22-MAR-73 6:44 15243

Dear Jeanne,

I just received my update to the "Directory of Network Participants". I'm pleased to see that some of the sections are no longer photo-reduced, they are now much more readable.

Regards, Alex 1

15243 Distribution
North, Jeanne B. ,

AAM 22-MAR-73 6:55 15244

NIC distribution of BBN Report 1822

Sent to JBN & MLK

AAM 22-MAR-73 6:55 15244

NIC distribution of BBN Report 1822

I am in the process of preparing an update (possibly a whole new edition) of BBN Report 1822, Specifications for the interconnection of a Host and an IMP. ccording to my records, the NIC is supposed to get 120 updates (I think these are mostly to go in the "Protocol Notebook"). However, the last time I distributed an update I think I remember that 120 copies wasn't enough. Susan Lee was supposed to let us know, after some study, how many copies were really desired. Is someone working on this? 1

15244 Distribution
North, Jeanne B. , Keeney, Marcia Lynn ,

AAM 22-MAR-73 7:28 15245

Question about implementation of SENDPRINT

Smokey,
While using "sendprint" from the BBN TIP, if the printer is already in use I frequently get either the message
NO
or the message
T CANT
I'm trying to understand how tese messages are generated. Do you send them? If not, do you use the "commands from the Network" TIP feature (TIP Users Guide page 5-11) to send a "Set Device Wild" or a "Receive From Socket" command for the line printer as though it were from my TTY? If your answer to both of these questions is no, we will put some patches in the TIP software to try to discover what is happening, so please check your listing before answering.
Regards, Alex McKenzie 1

15245 Distribution
Wallace, Donald C. (Smokey) ,

AAM 22-MAR-73 8:01 15246

Answer to question on implementation of SENDPRINT?

Smokey,
OOPS. I just got the documentation on sendprint. It seems to say that you use "Commands from the Network" to send a "Set Device Wild" to the printer from my TTY. If so, all is explained and you can ignore my question of earlier this morning.
Alex 1

15246 Distribution
Wallace, Donald C. (Smokey) ,

AJR 22-MAR-73 5:48 15247

test message to myself

tst the message stuff

AJR 22-MAR-73 5:48 15247

test message to myself

15247 Distribution
Rosenfeld, Al J. ,

AJR 22-MAR-73 6:11 15248

testmessage

this is a test of messages 1

15248 Distribution
Rosenfeld, Al J. ,

NMDT 22-MAR-73 8:30 15249

A Look at the MPS Conversion

This is a substantially revised edition of the paper appearing as 14928.

A Look at the MPS Conversion

INTRODUCTION 1

In the next couple of years, the system developers at ARC would like to make the following kinds of changes and extensions to NLS: 1a

Reimplement a mixed text and graphics capability. 1a1

Combine all of our data base management facilities into one coherent and considerably more powerful (in fact, perhaps external to NLS) common data base management system. 1a2

Redesign and reimplement the Journal and Ident systems to take advantage of the new data base management capabilities and to greatly enhance the retrieval capabilities these systems must provide in order for there to really be a Dialog Support System. This includes making the journal processes considerably faster and supporting multi-site journal and Ident systems. 1a3

Allow resonably easy, fairly efficient access to other subsystems (perhaps on other machines in the NET) through NLS. This must be a rather powerful linkage, since we wish to be able to move data to the remote subsystem from NLS files or from the user and get data back to the user or into his files. 1a4

We want people to be able to construct specialty functions in other programming languages which can couple with NLS in this manner. This includes the ability for these programs to access NLS capabilities and to manipulate information portrayals (on display screens, etc.) for the user. 1a4a

We should also provide facilities which can be used by other programs in the NET to provide users with NLS capabilities without those users having to be aware that they are using NLS. 1a4b

Support extended character sets (Greek alphabet, mathematical symbols, etc) in addition to a wide variety of fonts and sub- and super-scripting. 1a5

Support multi-site NLS's: that is, a single NLS that is running on more than one computer. For example, the interactive command specification could be done "near" the user and the file manipulation could be done "farther" from him. One can imagine the use of specialty machines or

systems for rapid text scanning or substitution, data base management, specialized display processing, or large-scale computation. 1a6

Support a wide variety of terminals, adapting appropriate user interfaces for each type of terminal, without major changes to NLS. That is, to whatever extent possible, provide terminal independent command language specification. This allows us to make new subsystems and new commands without regard to the particular user feedback required for each type of terminal. 1a7

Increase the execution efficiency of NLS. 1a8

Provide command language programming facilities. 1a9

Provide a file system that can accommodate a wide variety of data, not just text and/or graphics. We envision a LISP-like property list associated with each node in an NLS file, where the "property" indicates the form of its data and specifies a set of access functions for manipulating it. 1a10

Provide "virtual" files which the user perceives (and manipulates) as a simple collection of information, but may, in fact, be parts of several physical files. We feel that a user should be able to take alternative paths through his information and have it presented to him in different ways (with access and manipulation rights dependent upon the path taken). 1a11

Provide increased user assistance features. This can most readily be done by having the command language described in a data structure which assistance facilities can examine. 1a12

Provide a broad range of formatting capabilities for display users. This means that one should be able to see the result of powerful formatting (such as the Output Processor now provides) and still edit the file(s). More work should be done on formatters. New ways should be sought to describe the format (or at least certain aspects of it) independent of the file. 1a13

In addition, we must provide a solid NLS to network users through the NLS Utility Service. 1b

The remainder of this paper discusses the problem areas which must be dealt with in order to proceed with the above

objectives. We include a discussion of possible alternative development strategies and a recommendation for the approach we should follow. 1c

THE SOFTWARE ENGINEERING CRISIS 2

Although the goal of providing good software engineering tools sometimes conflicts with the shorter term problems of programmers and managers, the penalties in cost and reliability associated with non-modular software are so high that decisions about modular programming systems and methodologies should reflect the best available engineering techniques. 2a

The current economics of large computer systems suggest that software development costs exceed hardware costs, and the day is coming when software system vendors will throw in computer hardware as a free bonus for the purchase of a software system (even today, one can buy in quanity a small computer on three chips for about ten dollars). Faced with rising software development costs and plummeting hardware costs, we must face up to the realities of large software systems: 2b

Machine dependence 2b1

The expected lifetime for most software systems exceeds that of any piece of computer hardware, and should be independent of the supporting hardware processor. 2b1a

Modularity 2b2

The hundreds of pieces in a large software system are developed over a long time period. Each component must be produced and verified independently of other software components in the system. Symbols must be localizable, to avoid the plight of most systems in which only one level of external communication is supported. 2b2a

The external interfaces for any module must be explicitly defined and documented. The implementation language should require the explicit specification of module interfaces to allow mechanical verification of module interconnections. 2b2b

There must be reasonable facilities for keeping track of existing modules, their functions and interfaces, and the structure of systems built from them. 2b2c

Reliability and Maintainability 2b3

Systems which are intended to be used by people in their day-to-day work must, like the telephone and power utilities, be extremely reliable. The economic and psychological consequences of their being unreliable would be disastrous. Learning to make software more reliable and robust is, therefore a major concern of research into human augmentation. 2b3a

In most large software systems the costs of enhancements made subsequent to initial implementation (usually referred to as program maintenance) exceed the development costs over the lifetime of the system. This is clearly true of our environment. 2b3b

Moreover, each change makes the following one more difficult and the system more difficult to alter: this is almost certainly not completely preventable, but the aging of a system can probably be slowed down significantly by paying attention to its health (cleanliness of interfaces) as part of its maintenance and development. 2b3c

THE INDICATED SOLUTIONS 3

The challange of producing software that satisfies the requirements of a constantly evolving system requires a set of sophisticated engineering tools. Among these are 3a

1) An implementation system which supports software engineering practices, including 3a1

A) a high level (machine independent) implementation language. 3a1a

See Appendix C. 3a1a1

B) source language debugging facilities. 3a1b

C) program integration tools: dynamic loading, virtual process binding, address space management, and control of system structure and module interrelationships. 3a1c

2) Design and documentation methodologies that encourage modularity. 3a2

Extensibility and modifiability are attributes that must

be built into the system from its inception; they cannot be retrofitted. 3a2a

3) Software production tools that allow collaborative development work. These include system documentation aids which understand programs and their interconnections, and not just text-editing or (syntactic) information retrieval techniques. 3a3

4) Software measurement tools that provide performance analysis data based on measurement of the running system. 3a4

3a5

The MPS system was conceived and is being developed to meet some of these needs. 3b

The MPS approach toward the development of large software systems 3c

The Modular Programming System (MPS) is a set of tools for the development and continued evolution of large software systems in an interactive environment. All such large software systems share certain characteristics: 3c1

(a1) they are the work of a group of people whose membership will change over time; 3c1a

(a2) they are necessarily constructed from a number of separately developed programs; 3c1b

(a3) they evolve and grow throughout their lifetimes (and there is evidence that they also "age" [Lehman & Belady]). 3c1c

MPS aims to decrease the effort required to build and evolve such systems and to increase the reliability of the resultant products. 3c2

Points a1, a2, a3 are axiomatic statements about the dynamics of all large software systems. The following discussion uses these and a few other axioms to establish desirable characteristics for MPS. Hopefully there is a minimum of hidden meaning in the following: Each axiom and consequence is intended to be taken strictly at face value. 3c3

We first add two more axioms to the above set: 3c4

(a4) Large software systems must be able to take advantage of available hardware for efficiency. 3c4a

(a5) Program bugs are not known before they occur. 3c4b

(a4a) a1-a4 imply that software components, hereafter called modules, should be separately compilable and debuggable. Therefore there must be a way of linking or binding separate components together to provide an environment (data and programs) within which a module can be debugged. 3c5

(a6) In an interactive programming environment, users must be able to develop and use debugging tools applicable to programs in the same programming system. 3c6

a4a, a5, and a6 together imply that 3c7

(a6a) the environment of a program must be dynamically alterable; 3c7a

(a6b) a program should not have to be altered when its environment changes in ways which do not affect the semantic intent of the program -- this is called programming generality. 3c7b

(a3a) a3 suggests that a desirable characteristic for tools for building large systems should be that the energy to change part of the system should be more a function of the complexity of the change than of the size of the system. This is very hard to achieve in practice, and perhaps the best we can do is to make it a function of the interconnectedness of the system local to the change. 3c8

(a3b) A new system always has parts which are functionally similar to previously developed systems. The new system may therefore be regarded as a change (though perhaps substantial) to an older system. a3a then points out the necessity for being able to reuse components which have been made reliable through usage. This increases the initial reliability of the new system, decreases its cost, and speeds up the trying of new ideas. 3c9

(a3c) One way of constructing useful components is to build them from combinations of already existing modules (a3b). Hence there must be a way of bundling useful configurations together as seemingly atomic modules so they can be readily reused. 3c10

THE PROBLEMS OF THE CURRENT NLS SYSTEM 4

NLS is a large, costly, and intricate software system. It provides the user with powerful and sophisticated infomation handling tools, yet as a software system it has several problems. We have attempted to identify the general problems of the NLS software system with the premise that it is essential to address the problems of NLS in order to extend its capabilities. 4a

The problems of NLS may be tracked to two general sources: insufficiently powerful implementation facilities and design deficiencies in portions of the system. Most of the troubles of NLS stem from the first source, and it should be noted that the NLS system is quite nicely designed and integrated (compared to many large software systems). 4b

The general problems of the NLS system are: 4c

1) NLS is difficult and expensive to maintain and modify. 4c1

As already stated above, most of the cost of a software system is encountered in the maintenance and enhancement phases of the system which follow its initial development. 4c1a

These high costs are principally a result of shortcomings in the software development methodologies and tools. More specifically we feel NLS is difficult to change because: 4c1b

It has diffuse functional interfaces. 4c1b1

The information bandwidth along functional interfaces is large. Most parts of NLS make significant assumptions about facilities provided by another part of NLS. The bandwidth of assumptions spanning the functional interfaces provides some measure of the degree of interconnectedness of the system, and it is the degree of the interconnectedness that impacts the difficulty of changing any part of the system. Using global, shared variables to pass information between procedures obscures the true complexity of their mutual interface. 4c1b1a

Its communication paths are unverified. 4c1b2

Program modules establish communication paths to program data and function facilities. The user and provider of the data/function facilities must agree on the reference protocol and definition of the facility. L10 provides no capability for verifying the correspondence between formal and actual arguments for a function or between the definition and useage of data structures. 4c1b2a

It is difficult to modify data representation. 4c1b3

L10 does not provide sufficient data definition and structuring facilities. The RECORD and FIELD facilities are useful, but are not general or powerful enough to describe many data structures. 4c1b3a

The fact that the syntax for accessing some data or functional facility in the L10 system is dependent upon the type of the object (a different notation is used for functions and arrays for example) implies that a change in the implementation strategy for a particular program facility may require that all of the references be altered as well. Finding and editing all of the references in a large software system is difficult, unreliable, and expensive. 4c1b3b

It is difficult to control the scope of names. 4c1b4

The scope rules are not flexible enough to support modular programming development. It is not possible to assure name uniqueness across independently developed parts of the system. 4c1b4a

The command parsing for NLS is not centralized. 4c1b5

Making significant changes to the NLS command language necessitates modifying many of the components of the system because command parsing is distributed too widely. 4c1b5a

NLS has inadequate system documentation, and it is difficult to learn about the design and actual implementation of the system. 4c1b6

2) NLS is running out of address space. 4c2

Currently there are about 65 pages of address space

remaining for NLS on the PDP10. We can not continue present cumulative development techniques much longer as the address space problem will solidly halt development work until solved. NLS was not designed to support an overlay system, and the retrofit of a segmentation or overlay system into the present NLS would be a substantial effort. 4c2a

3) NLS is tied to processing exclusively on PDP10's. 4c3

L10 is quite machine dependent and the machine and operating system dependencies are widely dispersed throughtout the system making it difficult to move any of the present NLS system to a non-PDP10 processor or one which does not run TENEX. 4c3a

4) NLS is expensive. 4c4

The execution cost of NLS is high and on a feature by feature basis is not competitive with other corresponding software systems. NLS encompasses more capabilities than any comparable software system, yet that seems an insufficient reason to tolerate high computer costs for NLS. One way to lower the cost of NLS would be to build the system so that part of the processing may be distributed over more efficient special application computers. Global code optimization and better structuring can improve the efficiency of NLS. 4c4a

EVALUATION OF ALTERNATIVE DEVELOPMENT STRATEGIES 5

Given that the NLS system has a known set of deficiencies common to most large software systems, the question is "What development strategy is most appropriate for accomplishing the goals of (1) significantly extending the capabilities of NLS, (2) solving existing NLS problems, and (3) providing a solid software foundation for NLS which will facilitate future NLS development?" 5a

A set of five alternative development strategies are suggested below. Each has its own merits and drawbacks. We have highlighted the implications of each strategy and have tried to assess the long range as well as shorter term implications of each method. 5b

PLAN 1 -- Status Quo approach 5b1

The status quo approach is the continuation of present development strategies utilizing present development tools. 5b1a

Advantages: 5b1a1

1) System remains stable and intact. 5b1a1a

2) No resources are "diverted" from NLS enhancements to the development of better software engineering tools. 5b1a1b

3) Retraining of development personnel is not required. 5b1a1c

Disadvantages: 5b1a2

1) Solves none of the problems of the present NLS system. 5b1a2a

2) Likelihood of significantly extending the capabilities of NLS is very low. 5b1a2b

Discussion: 5b1a3

It appears that this course of action is a dead-end route. The address space problem is very real and will soon halt NLS enhancements until it is solved. The cost of maintaining and incrementally modifying the present NLS system is proportional to its size, and this cost will continue to rise. Our development resources will eventually be consumed in maintenance activities, and it is doubtful if much of the planned growth for NLS can be accomplished using this approach. 5b1a3a

PLAN 2 -- Reimplementation of NLS using existing L10 system. 5b2

This strategy proposes that major portions of NLS be redesigned and reimplemented to improve and enhance NLS and provide a beter foundation for future development work. 5b2a

Advantages: 5b2a1

1) Some of the present NLS problems can be solved. 5b2a1a

overlay mechanism can be built to solve the address problem. 5b2a1a1

the command parsing can be centralized. 5b2a1a2

the system may be redesigned so it can be distributed over several PDP10s. 5b2a1a3

the system can be made more efficient. 5b2a1a4

the functional interfaces may be cleaned up. 5b2a1a5

Disadvantages: 5b2a2

1) Doesn't solve some of the most critical problems of NLS (which are due to current development tools, not simply shortcomings in the present implementation of NLS) 5b2a2a

2) High cost (relative to payoff) 5b2a2b

Discussion: 5b2a3

The redesign and reimplementation of NLS using present development tools can obviously solve only those problems which are related to design or implementation inadequacies of the current implementation. Unfortunately, some of the most costly problems of NLS are related to our current development tools and methodology, and a change in this area is indicated if we hope to be able to address these problems. 5b2a3a

PLAN 3 -- Improve L10 development system, then reimplement NLS 5b3

This development plan calls for the improvement of the L10 implementation tools followed by the redesign and reimplementation of NLS using the improved system. 5b3a

Many of the deficiencies of the NLS system as enumerated previously may be directly related to deficiencies in the L10 implementation system. Specifically, we have identified eight shortcomings of the L10 system that have direct impact on the current software problems of NLS. 5b3b

Some problems of the current L10 system: 5b3c

1) Inadequate data definition facilities 5b3c1

2) Uncontrolled and unverified procedure interfaces 5b3c2

3) Minimal type checking performed by the compiler 5b3c3

4) Lack of a consistent reference notation 5b3c4

5) Inadequate control over the scope of names and definitions 5b3c5

6) Insufficiently optimized code 5b3c6

7) Machine dependence 5b3c7

8) Complete data/procedure definitions not available at compile time 5b3c8

In asserting that the L10 system can be changed, we should identify exactly what changes are contemplated and how they may possibly be accomplished. 5b3d

Plan 3A -- First extension to current L10 system 5b3e

Items 1-5 listed above are principal contributors to the difficulty of change problems of NLS. If we expect to meaningfully impact the modifiability characteristics of NLS, then it is essential that this set of L10 problems be addressed. 5b3e1

Let's consider then that this constitutes the minimum set of L10 enhancements which are essential for providing better development tools. 5b3e2

Advantages: 5b3e2a

1) Provides a software implementation system for the production of more modifiable software. 5b3e2a1

2) Cleans up most of the major problems of NLS. 5b3e2a2

Disadvantages: 5b3e2b

1) The level of effort required to implement these changes to L10 is large and may easily exceed that effort required to complete the MPS system. 5b3e2b1

2) Requires a transliteration of NLS, that is the changed L10 could not directly compile existing L10 code. 5b3e2b2

Plan 3B -- Second extension of L10 system 5b3f

Plan 3B is to extend L10's scope of names rules to a general name space system incorporating the INCLUDE definition facilities of MPS. 5b3f1

Advantages: 5b3f1a

1) Solves the restricted name space problem. 5b3f1a1

2) Fairly inexpensive to implement. 5b3f1a2

Disadvantages: 5b3f1b

1) Doesn't impact most of the problems. 5b3f1b1

2) Requires a restructuring of NLS. 5b3f1b2

3) Requires a new loader and probably new debugging tools. 5b3f1b3

Plan 3C -- Third extension of L10 system. 5b3g

Plan 3C calls for turning L10 into a globally optimizing compiler in order to increase the execution efficiency of NLS. 5b3g1

Advantages: 5b3g1a

1) Gain in efficiency. 5b3g1a1

Disadvantages: 5b3g1b

1) Difficult to implement in tree-meta L10. 5b3g1b1

General discussion: 5b3h

The MPS system was designed and is being developed to solve the problems of the L10 implementation system. The decision was made some time ago do develop MPS independently of the L10 system. Plan 3 is a rejection of this idea and a proposal to enhance L10 until it approaches the capability of MPS. Theoretically, it is possible to accompilsh this, but

the amount of effort required to significantly extend L10 is greater than the effort required to develop MPS. 5b3h1

It appears that there are no significant advantages and several disadvantages to this development strategy. 5b3h2

PLAN 4 -- Incremental conversion of NLS to MPS 5b4

It is technically possible (albeit not efficient) to coerce the MPS system to communicate existing L10 programs. It is therefore technically possible to utilize portions of the present L10 system in a hybred MPS-L10 environment. 5b4a

Advantages: 5b4b

1) Permits some conversion to be distributed over time. 5b4b1

2) User programs may not require conversion. 5b4b2

3) Some feedback is obtained on the relative merits of the MPS system. 5b4b3

Disadvantages: 5b4c

1) The new NLS my be unstable because the interfaces between MPS and L10 sections can not be verified and controlled. 5b4c1

2) Restricts the redesign of NLS to compatability with the present implementation for those portions of the current system which would be candidates for incorporation in the hybred system. 5b4c2

3) Requires most of NLS to be converted before it can be run under MPS. 5b4c3

Discussion: 5b4d

The drawbacks of system instability and redesign constraints make this alternative quite unattractive. Elegance in software engineering is more than just a pretty word. Every ad hoc or "kludged" interface in a software system is a crack in its foundation; an

ediface as large and interface replete as NLS can tolerate very few cracks. 5b4d1

PLAN 5 -- Reimplementation of NLS using MPS system 5b5

This strategy calls for the redesign of NLS to take advantage of the features of the MPS system and simultaneously extend the capabilities of NLS. The redesigned NLS would then be implemented completely in MPS. 5b5a

Advantages: 5b5b

1) Potentially solves all of the existing NLS problems (assuming a domumentation methodology is developed and utilized for the design and implementation). 5b5b1

2) Provides an NLS system with significantly improved capabilities. 5b5b2

3) Provides a solid NLS system and software implementation facilities that will permit future research and development work at minimum cost. 5b5b3

Disadvantages: 5b5c

1) High initial cost. 5b5c1

2) May have to debug MPS facilities while developing new NLS system. 5b5c2

Discussion: 5b5d

This strategy has the highest potential payoffs of any of the proposed plans but it also has some risks. It appears that simple economics will eventually demand the adoption of this plan. 5b5d1

CONCLUSION 6

Within any of the suggested development plans, two approaches can be taken: 6a

1) as much of the development staff as is possible could be diverted to solve the existing problems and provide a basis for future growth (resulting in a period during which no new user features or improvements are observed), and 6a1

2) a small group could take a copy of the system and make the intended modifications, leaving the rest of the staff free to add features within the constraints of the aforementioned problems. 6a2

The NMDT currently favors this second approach. 6b

The above analysis indicates the following course of action. The NMDT should begin the redesign work for NLS in the MPS environment. They should draw on the support of the rest of the group as needed and should endeavor to keep the rest of the group abreast of their progress. This leaves the rest of the development staff free to continue enhancing the existing system. At some point in the future we will have two systems, one in MPS (NLS/MPS) and one in L10 (NLS/L10) with additional features. At this point an intensive training effort should begin so that the whole staff can bend itself toward moving the enhancements in NLS/L10 to NLS/MPS in a way that is consistent with its design philosophy and implementation conventions. This should result in maximal gain in user facilities at minimal long term cost. 6c

Appendix A -- a closer look at Plan 5 7

Description of the software engineering capabilities of MPS 7a

To satisfy software engineering objectives, MPS has concentrated on providing the following capabilities: 7a1

control mechanisms which enable modules to be linked together with a minimum of builtin assumptions about how each module interprets control transfer over the link between them. 7a1a

Simple function call and return mechanisms alone do not satisfy this requirement since they already impose assumptions about how each module is being used; i.e., each one is either a caller or a callee. 7a1a1

Data definition facilities that 7a1b

clarify the specification of the data structures which, together with control, completely specify the interfaces between modules; 7a1b1

are potentially economical in space and accessing speed without being dependent on a particular machine; 7a1b2

are an aid in developing and describing program components and the structure of algorithms. 7a1b3

Facilities for dynamically binding the virtual objects required by a module for execution to real objects: 7a1c

e.g., for binding a procedure call to a real procedure, a "typed" pointer to a data structure of the correct type, etc. The set of bindings for a module's virtual objects at a given moment comprises the environment for that module. 7a1c1

Complete accessibility to the MPS "virtual machine" (which is a set of primitive MPS programs) and to MPS programs as data structures. 7a1d

This enables debugging and measuring tools to be built as standard MPS programs and along with dynamic binding allows such tools to be brought to bear on MPS programs whenever necessary. 7a1d1

The ability to bundle a configuration of data and program modules together as a module which may be saved for later use just as a simple, atomic module: 7a1e

this allows systems to be initialized, partially executed and then bundled up for later use with the overhead of the initial computations factored out; 7a1e1

it also allows a configuration which has exhibited a bug to be saved away for later perusal with its state as it was when the bug was discovered; 7a1e2

lastly, it allows useful modules to be constructed by configuring them from other, existing modules. This is in the spirit of using already available components whenever possible and provides some logical completeness to the system. 7a1e3

Previous work in this area 7a2

The modularity/process/port/virtuality ideas have been successfully used by Rudy Krutar in several systems including an interactive extendible language system. 7a2a

A number of fairly complex, large programs have been implemented and are running in MPS; these include the

MPS compiler itself, loading and binding facilities, and the MPS debugging and measurement packages. 7a2b

Advantages of implementing NLS in MPS 7b

What we are looking for from MPS and the conversion 7b1

Include facility of MPS allows modules to share data definitions and allows programmers to control what is or is not shared. 7b1a

change single module rather than reloading entire system 7b1b

MPS will check consistency between declaration and usage of data and will check consistency of module interconnection, and will indicate to programmers that re-compilation of a module m, also requires recompilation of modules k,l, and n -- and in fact will not allow these module to execute until they have been recompiled. 7b1c

MPS can also supply static information about module interdependency. 7b1c1

These facilities can be used to supply information about the cost of an anticipated modification to a module in terms of required recompilations of modules which include it. 7b1c2

Further MPS development should provide the ability for one or more modules to be interpreted while the rest are compiled. This allows programmers great flexibility during software development and debugging, and should provide for easily written (albeit less than optimally efficient) programs to perform tasks which do not warrent large development cost (similar in nature to the current Content Analysis filters). 7b1c3

Ability to dynamically reconfigure the system allows for insertion of test or debugging modules and replacement of modules for testing updates or new configurations. 7b1d

More powerful control over the scope of symbols. 7b1e

Segmention (automatic overlay) system will help us out of our current upper bound problem and will make better use of available memory space. 7b1f

Virtual external references provide flexibility. Modules communicate via ports and may connect any other module to the port, provided the interface requirements are met, or may replace any module by another that satisfies the interface requirements 7b1g

Reliability 7b1h

simpler relationships and dependencies 7b1h1

with aids for the programmer to keep track of these 7b1h1a

better definitions of interfaces 7b1h2

ability to put a module into a test-environment for testing 7b1h3

Mechanical interconnection verification. 7b1h4

Efficiency 7b1i

The system should gain significantly in terms of efficiency because of better global optimization (more efficient overall organization) 7b1i1

Fully typed data structures and restricted control flow allow compiler to produce more efficient code. 7b1i2

Several basic mechanisms are faster in MPS than in L10 7b1i3

Co-routine linkage can save setup time for frequently used routines and may help in overall design. 7b1i4

better control facilities, especially SIGNAL's 7b1i5

Ability to redefine procedures should clean up many procedure interfaces and will reduce the number of procedures. 7b1i6

Since the compiler is heavily used by system programmers, it behooves us to have it be efficient as well as to have it produce efficient code for the programs which it compiles. Since the MPS compiler is written in itself, all optimization improvements made in the compiler can be brought to bear on the compiler itself. 7b1i7

Ability to interface special purpose "subsystems" to NLS 7b1j

may interface modules responsible for NLS file handling, display generation, etc. to new modules to make special subsystems of NLS 7b1j1

Transportability 7b1k

language for MPS and the system primitives should be relatively easy to move to other machines and operating systems. 7b1k1

very few primitives written for the base machine 7b1k2

All of MPS written as modules by bootstrapping 7b1k3

Compiler completely writtten in MPS 7b1k3a

Compiler implemented so that machine dependence is restricted to only a few modules. 7b1k4

Ability to access remote systems 7b1l

New design plus MPS dynamic reconfiguration of modules allows for more reasonable linkage of NLS to other subsystems and the distribution of NLS processing over more than one machine. 7b1l1

can build module which will run with NLS and drive another system over the ARPANET 7b1l1a

may interact with NLS user, format request, send over ARPANET, get response, format for insertion into NLS file or for NLS display 7b1l1b

well defined interfaces, dynamic loading, and modularity also make it possible for other groups to build modules to run with NLS 7b1l2

COSTS OF IMPLEMENTING NLS IN MPS 7c

The cost of the conversion to MPS has at least three different aspects. 7c1

The actual implementation cost (the manpower and computer resources). 7c1a

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