Response to L10 Questions

(20152,) Content Analyzer programs can only consider one statement at a time. If you wish to compare statements, you will have to write an executable program. I suggest you postpone learning that until you become proficient at Content Analyzer programs. 1

Please refer to page 89 of the L10 Users' Guide (18969,) for the format of <NLS>SYSGD. 1a

All NLS commands can be called from user programs by calling their core procedure. As we discovered, it is not always clear just what the arguments are, but you can usually figure it out by knowing the command and following it through, beginning with <NLS>NCTRL. 1b

(20206,) *str* refers to the contents of the string variable.
$str refers to the address of the first word of the string variable.
the first word has two fields: str.L refers to the actual length of the string currently stored in the variable, and str.M refers to the maximum size of the variable (both in characters).
str refers to the contents of the whole first word of the string variable "str". 2

An stid is a single word, and may be stored in a simple variable or as the first word of a text pointer. Procedures which require an stid expect the word itself. Procedures which require a text pointer expect you to pass the address of the text pointer. 2a

Since, in a procedure call, you may only pass single word parameters, you may need the REF construction for some applications. If a simple variable has as its contents the address of another variable (perhaps a local in the calling procedure) and if it is REFed, then you may refer to and operate on the other variable by using the REFed variable's name. E.g. the simple variable "near" hold the address of the string variable "far". To put the word "blah" in the string variable far, you may (after having REFed the variable near) say: *near* ← "blah"; That will actually put the word in the variable "far". When you REF a variable, it simply becomes a pointer to the variable whose address it holds. 2b

Since you can only return single variables, if you want to pass back a string, you probably want to declare the string in the calling procedure, pass the address of th string variable to the called procedure, REF the formal parameter receiving the address, then operate on the string via the REFed pointer. 2b1

(20210,) The order of declarations is unimportant, but you can only

REF variables which have already been declared, so the REF statement should follow the declarations. 3

(20251,) "tempref" is declared as a simple variable. You cannot refer to *tempref*. The construct *str* refers only to string variables. It is not safe to try to construct a string from a hash word. The hash word is just used for fast preliminary scans, then the actual strings are compared. To isolate the name of a statement, the following procedures might be of use: 4

getnmf(stid) returns true if st has name, else false 4a

getnmdls(stid,astr) puts name delimeters in string 4b

puts in string: left delimeter character or "NULL", a space, right delimeter character or "NULL", a space. 4b1

Sorry this answer was so long in coming. I hope it is of some use. Feel free to send more questions in. I am using them to upgrade the Users' Guide. Good luck and have fun. --Dean 5

NDM 15-NOV-73 13:22 20301

Response to L10 Questions

(J20301) 15-NOV-73 13:22; Title: Author(s): N. Dean Meyer/NDM;
Distribution: /DHC JCN(to give you an estimate of the kind of support i
have been giving dhc and cavano); Sub-Collections: SRI-ARC; Clerk: NDM;
Origin: <MEYER>TEMP.NLS;1, 15-NOV-73 13:19 NDM ;

MEJ 15-NOV-73 14:38 20302

John Day, ILL-ANTS, Gives Seminar at ARC 11/28/73

Wednesday afternoon, 28 November 1973, John Day, ILL-ANTS, has agreed to give ARC a short informal seminar and discussion of both the DECUS meeting in San Francisco (previous Monday) and of his paper that he gave at that meeting. For those newer ARC personnel who are not acquainted with John, he is a systems programmer at the ILL-ANTS Project, University of Illinois, who is responsible for the interfacing of the software into the hardware of the ANTS and is involved in the implementation and installation of the ANTS devices/systems, from the ANTS systems point of view. 1

The seminar will be held in the ARC Conference room at 2:30 PM and all ARC personnel are invited. Mike Kudlick will act as host and introduce John to our group. 2

John Day, ILL-ANTS, Gives Seminar at ARC 11/28/73

(J20302) 15-NOV-73 14:38; Title: Author(s): Mil E. Jernigan/MEJ;
Distribution: /SRI-ARC DAY JI JOC ARH I; Keywords: I-Colony Seminars;
Sub-Collections: SRI-ARC I; Clerk: MEJ;
Origin: <JERNIGAN>DAY.NLS;1, 15-NOV-73 13:58 MEJ ;

Dave, I was wrong about one thing. Global variable in Content Analyzer programs do retain their value from one statement to the next. So you may compare one stid to the next. -Dean

1

(J20303) 15-NOV-73 14:08; Title: Author(s): N. Dean Meyer/NDM;
Distribution: /DHC; Sub-Collections: SRI-ARC; Clerk: NDM;

DIA 15-NOV-73 17:03 20304

Comment on the Test of System Response with 3000+ free disk pages

It would also be cool to do it with 6-7000 free pages also, if possible.

DIA 15-NOV-73 17:03 20304

Comment on the Test of System Response with 3000+ free disk pages

I would like to strongly suggest that we do a PC sample of the disk page assign code in TENEX at the same time that we test for increased system response with 3000+ free pages. 1

DIA 15-NOV-73 17:03 20304

Comment on the Test of System Response with 3000+ free disk pages

(J20304) 15-NOV-73 17:03; Title: Author(s): Don I. Andrews/DIA;
Distribution: /SRI-ARC; Sub-Collections: SRI-ARC; Clerk: DIA;

Still Problems with MERGE

Thanks for your replies to my queries. I am still however having trouble with Merge. Every time I have tried to use it I get the
fst entry nonexistant
message. I have tried the follwing possibililities and am now stuck

1. created 2 files in NLS and sorted plex .1 then tried to merge them,
2. thinking it might not like to merge files with PCs I updated the two files and tried again, still no luck.
3. perhaps sort may be upsetting it I thought, so tried inputting two files in nls and then merging without a sort .. still that message

I am now at a loss to know wat to do on that score, and dare not put any of our work on at the moment in case we cannot update it(ie merge in new entries). 1

From what you say on tabs it looks like a question of trial and error (and perseverance). I shall have to persevere 2

SRW 16-NOV-73 01:41 20305

Still Problems with MERGE

(J20305) 16-NOV-73 01:41; Title: Author(s): Stephen R. Wilbur/SRW;
Distribution: /KIRK; Sub-Collections: NIC; Clerk: SRW;
Origin: <UK-ICS>MES.NLS;1, 16-NOV-73 01:27 SRW ;

eaf Practice at journal submission

The common cormorant, or shag, 1
Lays eggs inside a paper bag. 2
The reason, you will see, no doubt, 3
Is to keep the lightning out. 4
But what these unobservant birds 5
Have failed to notice is that herds 6
Of bears may come with buns, 7
And steal the bags to hold the crumbs. 8

20328 Distribution
Edward A. (Ted) Flinn,

RADCMIS

I have given some though to our proposal related to contracting for maintenance and applications programmers. We should bare in mind that we have valuable experience in writing programs within a time frame that proves exceptional by comparison to other programmers. Certainly we would be getting ourselves into the same old bag of relying on contractors to do work we may never be able to understand. In other words contracting 30 to 40K dollars to me seems a mistake. I have given suggestions in a file (radcmis) that I have prepared. Please read it and consider some of the thoughts there. As I have said before, use consultants to advise programmers but PLEASE not to actually do our programming....HOW can you debug contractor work that may be misunderstood? Also the concept of updating such a large data base may not be feasible. Case in point....we have written a program to update theree records (travel, trip, trip-info) on a field basis. It turns out that the code necessary amounts to as much as other programs updating as many as six records (depending on the number of fields per record). The idea deserves more though, as well as our accomplishments so far.
daughtry

1

20329 Distribution

Joe P. Cavano, Edmund J. Kennedy, Roger B. Panara, Duane L. Stone, Rocco F. Iuorno,

FJT 16-NOV-73 06:05 20330

Remaining part of October - Tickler

Joe, would you please have Donna put the month of December in the tickler file. And remind her about the changes...Thanks - Bobbie

Remaining part of October - Tickler

(of2) 12 October - Friday 1

Col Thayer on TDY 1a

Dry Run for Center - ODDR&E Briefing at 1:30 hrs. Bldg. 106 Room A-119 - This for the Commander 1b

Inputs to Annual Revision of Project 5550 PMP are required - R. Panara 1c

Due Date - R. Iuorno - From Col Thayer - A-Job 1d

Timecards due today. 1e

Bobbie: Travel figures due by noon. 1f

Due Date - ISIM/ISIS - Military Personnel Authorizations - Completed 1g

Due Date - ISIM/D. VanAlstine - Final Report for Contract F30602-73-C-0024 1h

Bob Mulhauser from Auerbach will be here to discuss topics in the following areas: Modeling Simulation WWMCCS DMS, Comparison of File Structure of WWMCCS, IDS, DM-1, etc. Please indicate interest and priority, if interested. Point of Contact - Ray Liuzzi. 1i

(om3) 15 October - Monday 2

Frank Tomaini and Dick Nelson will be on TDY all this week 2a

Col Thayer - TDY 2b

15 - 26 October presentations to the Commander (Dry-Runs) for the DL Technical Review begin 2c

0830 hrs. Branch Chief's Meeting 2d

Backup Material must be submitted to DORP today for the DL Technical Review.Completed 2e

Due Date - Review of Documents for Revision to Distribution Statements - Calicchia & IuornoCompleted 2f

Due Date for ISI - Military Personnel Authorizations - Completed 2g

Collect Write-Ups for Confessions by noon 2h

Dr. George Borden visit - Focal Point - Ed Kennedy 2i

Remaining part of October - Tickler

(ot3) 16 October - Tuesday 3

ISI Confessions - 0830 hrs.Cancelled 3a

Col Thayer - TDY 3b

(ow3) 17 October - Wednesday 4

0830 hrs. Branch Chief's Meeting 4a

laboratory activity reports are due tomorrow. 4b

Collect topic write-ups today by noon for confessions. 4c

R & T Selection of the Month is due in ISI.Negative 4d

Due Date - ISIM/ISIS - Excess Property List - Completed 4e

(oth3) 18 October - Thursday 5

Laboratory Activity Reports due today: Bucciero must have them by 1000, ISM must have them by 1100, and DOT must have them by 1600. 5a

0830 hrs. ISI Confessions today Cancelled 5b

(of3) 19 October - Friday 6

Bobbie: Travel figures due by noon. 6a

Due Date - ISIS/Capt Ives - Technical Evaluation - PR-B-4-3233 - Completed 6b

(om4) 22 October - Monday 7

0830 hrs. Branch Chief's Meeting 7a

(ot4) 23 October - Tuesday 8

Due Date - ISIS/ISIM - Junior Achievement Program 8a

(ow4) 24 October - Wednesday 9

0830 hrs. Branch Chief's Meeting 9a

laboratory activity reports are due tomorrow. 9b

(oth4) 25 October - Thursday 10

Remaining part of October - Tickler

Laboratory Activity Reports due today: Bucciero must have them by 1000, ISM must have them by 1100, and DOT must have them by 1600. 10a

Officer's Commander's Call - 0900 hrs. - Bldg. 105 - Auditorium 10b

Nelson/Robinson - DAIS (AFAL) due date - To Col Thayer 10c

(of4) 26 October - Friday 11

Commander's Review of DL Technical Review - Bldg. 106 - Room C-102 from 1030 - 1130 hrs. for ISI & ISC from 1330 - 1430 hrs. 11a

Timecards due today. 11b

Bobbie: Travel figures due by noon. 11c

Due Date - ISIM/Ray Liuzzi - Final Report Contract F30602-72-C-0491 - Completed 11d

1200 hrs. - LUNCH - ALL MILITARY 11e

(om5) 29 October - Monday 12

0830 hrs. Branch Chief's Meeting 12a

Briefing from Hughes Aircraft will be here to discuss what Hughes is doing in area of simulation and modeling, topics will include simulation langauage survey, ecss studies, simscript 2.5 studies and other areas of interest. Discussions will be informal. Point of contact - Roc Iuorno. 12b

1000 hrs. University of Michigan - R. Iuorno 12c

(ot5) 30 October - Tuesday 13

DL Technical Review 13a

(ow5) 31 October - Wednesday 14

DL Technical Review 14a

0830 hrs. Branch Chief's Meeting 14b

Form 2's (employee time expenditures) are due today. 14c

Form 6's (projected manpower) are due today. 14d

IR&D Evaluations Due - ISC/Semeraro - Completed 14e

20330 Distribution
Joe P. Cavano,

15nov73telecalls

Record of telecalls 15 NOV 73

R. Panara

1. FROM ESD/Major Bailey

2. TO USAF/Major Starbuck

3. TO ESD/Major Bailey

4. TO AFSC/Lt. Col. McGinnis

5. TO ESD/Major Bailey

6. FROM AFSC/Lt. Col. McGinnis

a. Project 5550 funding

1. Major Bailey called and said MCI had sent a priority message to is asking for rationale for $1.9 million cut which had been brought up in our DL review. He said this was being done because in a review General Shiely conducted at ESD, the cut affected the Security task and was "yellow-tagged". (I guess it means this is a hot item). He called because they needed info right away.

2. I called Major Starbuck (because I couldn't get AFSC/Lt Col McGinnis) to get the rationale. He said the rationale was that the cut was part of a USAF response to the House of Representatives reduction of $32.0 million and took place in late October 73. The cut was undistributed (i.e. taken from what USAF felt was available). The FYDP for Project 5550 was $1.0 million and the $1.9 million was deferred and appeared to be easily available.

3. I called Major Bailey and passed above info to him.

4. I called Lt Col McGinnis and told him of my conversations. He said AFSC had not been officially informed of cut but decided to check DLX. He found they had just received a "piece of paper" on the cut but could not say what position would be taken at this time since the information had just arrived.

5. I called Major Bailey and told him that i talked with Lt Col McGinnis and AFSC/DL had received word of the cut. I also told him any impact would be on a project basis. he said he understood. He said he had passed on to Mr. Vechery what I had

told him. Mr. Doane would probably write a memo to Gen. Shiely. He said he would keep me informed. 10e

6. Lt. Col. McGinnis called and said he examined the "piece of paper" more closely and had called Major Starbuck about it. It was an RD-5 which Major Starbuck thought was internal to USAF. Lt Col Mcginnis does not know whether this is official or unofficial notification. He and Major Starbuck will check out the matter. 10f

b. GLOBAL WEATHER CENTRAL D&F 11

2. Major Starbuck said he had a conversation with Mr. Sherer on the subject. Mr. Sherer asked him to call Dr. Gableman and determine if some of the mapping & charting equipment could be used. Major Starbuck will call Dr. Gableman and asked me to have Mr. Metzger check into it and call him on frday to discuss this posibility. I talked with Mr. Metzger who will discuss it with Mr. Loreto and Col. Thayer. 11a

4. I told Lt Col McGinnis of this request and he expects to be informed also. 11b

20331 Distribution
Rocco F. Iuorno, Robert H. Thomas, Frank J. Tomaini,

NJN 16-NOV-73 08:26 20332

New USER

Dave--
Dr. Stan M. Taylor from the Aberdeen Ballistics Research Lab (BRL) wnats to be in USERS. His ident = SMT. Will you enter his ident?
Thanks , Nancy

1

20332 Distribution
David H. Crocker,

NJN 16-NOV-73 08:49 20333

New Dates for the USING meeting

Group--
There were sufficient complaints about the dates Dec. 3-4 for the USING meeting that we are changing them to Jan. 3-4, 1974 (which happens to be a Thursday and Friday). Many of you preferred Jan and no one ruled out these particular dates as impossible, so this is the best compromise, short of next summer. The meeting place has also been changed to the NIC, where someone volunteered Mil Jernigan to make the arrangements. Get your complaints to me, but only if you seriously cannot come on those dates. Then we will finalize.
Happy Thanksgiving, Nancy

20333 Distribution

Abhay K. Bhushan, Robert P. Blanc, Barbara Noble, Leroy (Lee) C. Richardson, Frank G. Brignoli, Elizabeth J. (Jake) Feinler, Michael D. Kudlick, James E. (Jim) White, Michael A. Padlipsky, Kenneth L. Bowles, A. Wayne Hathaway, Jean Iseli, David H. Crocker, Nancy J. Neigus, Stephen M. Wolfe, Ronald M. Stoughton, Jim O. Calvin,

KIRK 16-NOV-73 09:25 20334

Bug with TNLS Merge (fst table nonexistant).

Steve, there is a bug with Merge in TNLS. It doesn't occur in DNLS which is probably why we didn't notice it. I am sending this message to ident BUGS (as you may do whenever you find one). When ever you send something to BUGS, be sure to include enough information Harvey (HGL) or Charles (CHI) or another programmer to recreate the situation. I think there is enough information in [20191,4) and (20305,).

1

20334 Distribution

Bgs Bugs, Diane S. Kaye, Harvey G. Lehtman, Charles H. Irby, Stephen R. Wilbur,

AAM's message and Danthine's visit to ARC Monday

Alex McKenzie sent me the following message today:

"Professor Andre Danthine of the University of Liege (Belgium) is expecting to visit you Monday. Please give him the following message: We would be pleased to have you visit BBN on Wednesday. I will be busy with other visitors, and I don't know what Frank Heart's schedule will be, so when you arrive you should ask for Randy Rettberg who will show you around." 1

20335 Distribution

Michael D. Kudlick, Jeanne B. North, James C. Norton, Richard W. Watson, Jeanne M. Leavitt, Elizabeth J. (Jake) Fainler,

How to Not Print text, Statments

The output processor directives, Igtext, and her sisters, Igs, Igb, Igls, and Igrest make it possible to put in comments that are not printed via O D P. The directive Defsyn allows you to define some (briefer) synonym for Igtxt, e.g. ".I;"(but not "%"). 1

20336 Distribution
Robert N. Lieberman,

DHC 16-NOV-73 15:10 20337

Dr. Taylor -- welcome to USERS. Dave Crocker. 1

20337 Distribution
Nancy J. Neigus, Stan M. Taylor,

AKB 16-NOV-73 15:39 20338

Response to ARPANET NEWSLETTER request

Thanks for your note on NEWSLETTER request.
We will be happy to be the featured site for January.
Please let me know what I have to do for the article.
Best regards -- Abhay.

1

20338 Distribution
Jean Iseli, Jeanne B. North,

RWW 16-NOV-73 17:02 20339

Reply to (20258,) on the Need for a Remarks Entity

Robert, your suggestion on remarks is appreciated. For a long time a ccomments capability has been on our want list along with footnotes and other related issues. There are a number of journal items over the past two years on these topics with suggestions. Implementation keeps getting pushed because of other items with seeming higher priority. We just don't have the resources to do all the good things that would be useful that people think of. A commet facility will eventually see the light of day and your suggestion will be considered. I can't promise when however, but please keep sending ideas. They are not lost and are appreciated.@

20339 Distribution

James C. Norton, Robert N. Lieberman, I. Larry Avrunin, Frank G. Brignoli, Herb M. Ernst, Charles H. Irby, Jean Iseli,

DCE 16-NOV-73 18:44 20340

Iseli: Some people might call you

Jean: Yesterday and today I alked with three parties that may contact you for help and info about ARPANET and perhaps NLS: In NIE, Sam Rosenfeld and Charles Haughey; at Social Security Administration, Bureau of Data Processing, Ira McMann; and at Defence Documentation Center, Joe Powers. Gave each of them your name and MITRE phone number. Each of the latter two places have togh, long-term, big-system evolution tasks, and I'm hoping that they'll get a workshop architect activity going, and buy minimally into the Utility to get going. Can't tell yet what sort of place our bootstrap community activity might play in the NIE plans, but seems that there should be a lot of potential eventually. 1

20340 Distribution

Richard W. Watson, James C. Norton, Bonnar Cox, David R. Brown, Jean Iseli, Michael D. Kudlick,

INTRCP bug

it (e.g., I N) get printed on the terminal. When I have imnls loaded, the bell character gets printed before the I N.

.SAV file must have dropped a bit. D/ 1

20341 Distribution
Kenneth E. (Ken) Victor,

JI 17-NOV-73 09:23 20342

I group coordinator

Charles, Marcia indicated you were the person to contact regarding the ident file. I had asked her to insert me, ji, as the coordinator for the group, I, I-colony. My name was inserted for membership but not as coordinator. Thus, I am having no luck in entering the membership identities. Could you please designate me as group coordinator so that the record can be maintained more simply. Thank you Charles, ...Jean 1

20342 Distribution
Michael D. Kudlick, Mil E. Jernigan,

JI 17-NOV-73 09:45 20343

ARPANET Newsletter Featured Site for January

Abhay:

Thank you very much for accepting to write a featured site article for us for the January issue. The article should stress your work, plans, accomplishments, goals, network identity [how you would like the network community to view your site], and whatever else you deem relevent. I will need the article [send to JI through the Journal or to ISELI@ISI through network mail, whatever you prefer] prior to Dec. 21.

In general Abhay, the purpose of the article is to better inform the greater network community about your site, its activities, its resources and their attributes, and the like. We would like to hope that such articles will provide greater understanding within the community about its constituents and their work and interests.

Thank you again for according us your acceptance. I look forward to your article prior to 21 December 1973.

Warmest regards, Jean

1

20343 Distribution

Abhay K. Bhushan, Jonathan B. Postel, Mil E. Jernigan, Jeanne B. North, David H. Crocker,

JI 17-NOV-73 09:53 20344

Future Featured Site Article : Multics

Dear Dr. Saltzer:

In mid-summer, your Mike Padlipsky indicated a featured site article on Multics for the ARPANET Newsletter might be possible after the installation of the new MULTICS machine.

I would like to invite your consideration for such an article early next year. The article should be directed towards characterizing your site as you would like to have the greater ARPANET community understand it.

Your consideration of this request is appreciated.

Most sincerely, ...Jean Iseli 1

20344 Distribution
Jerome H. Saltzer, Michael A. Padlipsky, Mil E. Jernigan, David H. Crocker, Jeanne B. North,

JI 17-NOV-73 10:12 20345

Possible ARPANET Newsletter foreign correspondant

Adrian:

I would like to invite your consideration in assuming the responsibility of keeping the ARPANET community apprised of the plans, goals, needs, and accomplishments of your site. Any news that you deem appropriate to better informing the community relative to UKICS-TIP and its community would be most welcome.

You may address articles to me, either through the NLS Journal system to JI or to ISELI@ISI through network mail.

Thank you for your consideration of this request. Regards, ..Jean 1

20345 Distribution
Adrian V. Stokes, Mil E. Jernigan, Jeanne B. North, David H. Crocker,

more l10 q's.

Dean -- Thanks for all the responses. The last one, regarding why my program is bombing, was insufficient, in that I changed that portion of the text in (ucla-nmc,dhcl10,procproc) that got the statment name, but am still bombing. apparently the stid (curproc) in the FIND expression, is no good, but I can't figure out why.

My code seems to be functionally equivalent to your toc code. I've added some bells and whistles to the prtion of code in question, but that was in the futile hope that it might help me pinpoint the problem. Any ideas?

Also, How does the FIND statment/expression know whether to use a text pointer as defining the beginning of a search-sstring, versus storing the ccpos into it? SE(xx) and SF(xx) are obvious, but not so with regular text pointers.

tnx. Dave.

1

20346 Distribution
N. Dean Meyer,

DHC 17-NOV-73 19:08 20347

Bug discovered and swatted

Dean -- Dornbush tild me about ↑ptr versus ptr in FIND.

Turns out, my manual was printed at CCN which doesn't have up-arrows.
So it doens't show the difference. Scratch last request for info.
Looks like debugging should be easier now (I hope.). dhc. 1

20347 Distribution
N. Dean Meyer,

DCB 17-NOV-73 22:10 20349

Need for 33in37out Terminal Type

Would like quick reply from Ken, Smokey, or Charles.

DCE 17-NOV-73 22:10 20349

Need for 33in37out Terminal Type

Ken, Smokey, Charles: I need a 'Terminal Type' declaration form in our TENEX that fits the typewriter that I borrowed here in Washington -- it's keyboard is like a TTY33, but it prints both upper and lower case. I can declare it to be a 33, and it will let me use TNLS and produce lower-case VSpecs etc. What I'd like is that when I do a Print command, or an Output Device Teletype, it prints both upper and lower case. Is this unreasonable to provide? I ran across a display terminal in London that was the same way. This Terminal is a Computer Devices Teleterm 1030 (I tried the Computer-Devices terminal declaration and it didn'g give me what I wanted.) If it happens to be a simple fix, it would be nice to have before I demonstrate the system to a DDC man at his home Sunday afternoon. I'd guess that the new name could even be something like '33in37out'. Thanks, Doug 1

DCE 17-NOV-73 22:10 20349

Need for 33in37out Terminal Type

(J20349) 17-NOV-73 22:10; Title: Author(s): Douglas C. Engelbart/DCE; Distribution: /KEV DCW CHI JCN RWW; Sub-Collections: SRI-ARC; Clerk: DCE;

JI 17-NOV-73 23:45 20351

URIO : ARPANET Newsletter Request

Dear Ysmar:

I would like to solicit your consideration in writing an article for the ARPANET Newsletter relative to the interest of Universidade Federal Do Rio de Janiero in international networking and/or the ARPANET.

With increasing awareness of and interest in international networking, such an article would be of timely and great interest to our readership.

If you can accord this request you affirmative endorsement, mail may be sent to me at:

Jean Iseli
The MITRE Corporation
Westgate Research Park
McLean, Virginia 22101
U.S.A.

or, through the ARPANET, either to ISELI@ISI or JI through the NIC Journal.

Sincerely, ...Jean

1

JI 17-NOV-73 23:45 20351

URIO : ARPANET Newsletter Request

(J20351) 17-NOV-73 23:45; Title: Author(s): Jean Iseli/JI;
Distribution: /YV JBN(fyi) MEJ(fyi) DHC(fyi); Keywords:
URIO-BRAZIL-Newsletter; Sub-Collections: MITRE-TIP NIC; Clerk: JI;

20351 Distribution

Ysmar Vianna E Silva Filho, Jeanne B. North, Mil E. Jernigan, David H. Crocker,

DHC 18-NOV-73 01:08 20352

A cute new viewspec

Lynn and Anita -- when doing rough drafts of NIC documents (print plex, instead of output processor) use viewspec E, in addition to whatever other ones you normally use.

E causes some simple minded pagination. It makes the output much more readable, without incurring the overhead of the output processor.

Note that the "E" must be upper-case. Use "F" to turn this kind of pagination off.

cheers. D.

1

DHC 18-NOV-73 01:08 20352

A cute new viewspec

(J20352) 18-NOV-73 01:08; Title: Author(s): David H. Crocker/DHC; Distribution: /LYNN ALC; Sub-Collections: NIC; Clerk: DHC;

SRW 18-NOV-73 04:20 20353

Some Journal Queries

Kirk: Thanks for your very quick reply to my Merge query, I thought journal mail was only delivered once a day and I hardly expected a reply for at least two days due to the time lag between you and us. My queries this time are largely concerned with journal mail so if this is not your forte by all means introduce me to one of your coleagues 1

My queries are as follows: 2

Recovery of archived journal files. It appears to me that to recover archived files one normally uses the 'interogate' command in exec. However, trying to interrogate files in other than your own directory does not seem to be accepted. How, therefore, does one unarchive something like <KJOURNAL>12345? 2a

Copies of authored mail to KIRSTEIN@USC-ISI. I have noticed that on occasions, possibly always (I have not checked), any mail I author, besides going in branch 'author' of my initial file also goes to KIRSTEIN@USC-ISI. Whilst I have no worries about secrecy( ) it did cause a little confusion, especially when it resulted in sending a second version of an item to Doug which I thought had not been properly delived. This second copy somehow upset the journal system. 2b

JWORK files. A curiosity question, this one. What do the JWORK files contain, and do they use up a lot of file space. Having looked at one after mail has been delivered it seems to be empty, can they be safely deleted in such a state? 2c

File submission of journal mail. When I send a file as a piece of mail how soon can the file be deleted? Is it copied into JWORK immediately? 2d

Finding usernames in SNDMSG. Is it possible to find out where a user has an account such that he can receive SNDMSG mail? The ident searching feature of journal is beautiful, but does a similar facility exist for general network users? 2e

That is all for now ... Regards Steve. 3

SRW 18-NOV-73 04:20 20353

Some Journal Queries

(J20353) 18-NOV-73 04:20; Title: Author(s): Stephen R. Wilbur/SRW;
Distribution: /KIRK; Sub-Collections: NIC; Clerk: SRW;
Origin: <UK-ICS>MES.NLS;1, 18-NOV-73 03:55 SRW ;

SRW 18-NOV-73 04:45 20354

TIP Buffers & Other Weekend Problems

Hugh: I thought I would send you my comments on the behaviour of the TIP hardware and software over the weekend, in case you wanted to cite them in any message to Alex McKenzie. The problems largely concern buffer sizes. 1

Input of paper tapes. As we discovered on Friday the buffer sizes for input on the direct connection (terminal) ports is completely inadequate for input of paper tapes even at 110 baud. After a bit of trouble, see later, I managed to dial into port 46(8) with in/out buffers of 60/30 words resp. On the whole everything went well until about 3/4 through my tape when the bell started ringing. Yes, I had lost some characters even with that size buffer. This would make a buffer size of 240 words on input on the 1200/75 baud port completely inadequate if that channel were being used flat ou, in fact port 46 would be useless at 300/300 as it was intended. 1a

Lost lines to ODEC. A problem which looked akin to the last one also occurred over the weekend. I sent a number of documents to the ODEC on port 2 (using SENDPRINT), and on some of them it was obvious that typically about six lines of text had been lost. On repeating the same text output, I would find that a different six or so lines were lost. In one doc several gaps were noted. It seemed a possibilty that it was again a buffer problem. 1b

Modem simulator. As you know I had problems using the Olivetti into a modem port even with the adaptor from the Mod-1 room. The sequel is that I could not even get response from the TIP with the adaptor on the shelf .. I checked that the battery was healthy, but does it need only one or both batteries? 1c

Cheers ... Steve 2

SRW 18-NOV-73 04:45 20354

TIP Buffers & Other Weekend Problems

(J20354) 18-NOV-73 04:45; Title: Author(s): Stephen R. Wilbur/SRW;
Distribution: /HRG PLH PK(for info); Sub-Collections: NIC; Clerk: SRW;
Origin: <UK-ICS>MES1.NLS;1, 18-NOV-73 04:24 SRW ;

20354 Distribution
Hugh R.G. Gamble, Peter L. Higginson, Peter Kirstein,

JI 18-NOV-73 09:42 20355

ELECTROLAB ARPANET Newsletter Request

Dear Hidetoshi:

We are attempting to better inform the ARPANET community relative to International Networking efforts since there is increased awareness of and interest in this subject. I would like to invite your consideration in writing an article for the ARPANET Newsletter directed towards the interests, plans, etc., of the Electrotechnical Laboratory.

An article addressing your networking interests in the ARPANET and possibly the ALOHA net would be most appropriate. If you can accord this request your affirmative consideration, please forward to:

Jean Iseli
The MITRE Corporation
Westgate Research Park
McLean Virginia 22101
U.S.A.

or, to ISELI@ISI or JI through the NIC Journal through the ARPANET.

Your interest and response to this request are appreciated.

Best regards, ...Jean

1

20355 Distribution
Hidetoshi Kawai, Jeanne B. North, Mil E. Jernigan, David H. Crocker,

I wish there was an Ignore Plex (IGP) directive (like IGB, IGS, etc.).

20356 Distribution
Nps Np, Richard W. Watson, Charles H. Irby,

JI 18-NOV-73 13:08 20357

JTT ARPANET Newsletter Request

Dear Takashi:

On behalf of the ARPANET Newsletter, I would like to invite your consideration to write an article to better inform the ARPANET community of the networking interests of the Japan Telephone and Telegraph company and in particular of any plans as they may regard either the ARPANET or the ALOHA Net.

With the increased interest and awareness of international networking efforts, I feel that such an article would be very timely and well received. If you can accord this request a positive response, your article may be sent to:

Jean Iseli
The MITRE Corporation
Westagte Research Park
McLean, Virginia 22101
U.S.A

or, through the ARPANET Mail to either iseli@isi or JI through the NIC Journal.

Thank you for your interest and response; Sincerely, ...Jean

1

20357 Distribution
Takashi Uetake, Jeanne B. North, Mil E. Jernigan, David H. Crocker,

JI 18-NOV-73 13:24 20358

WATERU ARPANET Newsletter Request

Dear Don:

I would like to invite your consideration in writting an article relative to the interests, plans, needs, etc., of the University of Waterloo in the area of International Networking and ARPANET. With the increasing interest and awareness of international networking activities, such an article would be most appropriate.

If you can accord this request your positive response, you may forward the article either to ISELI@isi or to JI through the NIC Journal.

Thank you for your interest and response...Sincerely, ...Jean

20358 Distribution
Don D. Cowan, Jeanne B. North, Mil E. Jernigan, David H. Crocker,

KIRK 18-NOV-73 13:56 20359

Request for a change in implementation of viewspec b.

For a list of observations about the new command language, see
<userguides,changes,1:eb>

KIRK 18-NOV-73 13:56 20359

Request for a change in implementation of viewspec b.

Viewspec b (add one level) when used while viewspec c is in effect (ALL levels), should work as viewspecs eb (current level plus one more) instead of resulting in 0 levels. I thought this was a bug in the old command language that would not be carried over in the new command language. Some bugs with viewspec e and 0 levels were fixed. How about changing this as well? If someone ever really wanted 0 levels, they could get there with viewspecs da. 1

20359 Distribution

Douglas C. Engelbart, James H. Bair, Elizabeth K. Michael, Richard W. Watson, Elizabeth J. (Jake) Feinler, Harvey G. Lentman, Kirk E. Kelley, Laura E. Gould, N. Dean Meyer, Jeanne M. Beck, Charles F. Dornbush, Dirk H. Van Nouhuys, Michael D. Kudlick, Diane S. Kaye, James C. Norton,

JI 18-NOV-73 19:31 20360

ITALCABLE ARPANET Newsletter Request

Dear Gino:

With the increasing interest and awareness of international networking efforts, I would like to invite your consideration in writing an article for the ARPANET Newsletter to better inform out readership of ITALCABLE's interests, plans, etc., relative to networking and possibly the ARPANET.

Your affirmative response would be most welcome. You may address to:

Jean Iseli
The MITRE Corporation
Westgate Research Park
McLean Virginia 22101
U.S.A.

Warmest regards, Jean

1

20360 Distribution
Gino Puccioni, Jeanne B. North, Mil E. Jernigan,

JI 18-NOV-73 21:49 20361

HUT ARPANET Newsletter Request

Dear Kauko:

With the increased awareness of and interest in International Networking, I would like to invite your consideration in writting an article for the ARPANET Newsletter directed to your interests, plans, etc., relative to International Networking in general and the ARPANET in particular. Such an article would be of timely interest to our readership so that your affirmative response would be most welcome. You may address mail to:

Jean Iseli
The MITRE Corporation
Westgate Research Park
McLean, Virginia 22101
U.S.A.

Thank you for your interest and response; Most sincerely, ...Jean 1

20361 Distribution
Kauko Rahko, Mil E. Jernigan, Jeanne B. North, David H. Crocker,

SRW 18-NOV-73 23:26 20362

Some Journal Queries

Possibly second copy

SRW 18-NOV-73 23:26 20362

Some Journal Queries

Kirk: Thanks for your very quick reply to my Merge query, I thought journal mail was only delivered once a day and I hardly expected a reply for at least two days due to the time lag between you and us. My queries this time are largely concerned with journal mail so if this is not your forte by all means introduce me to one of your coleagues 1

My queries are as follows: 2

Recovery of archived journal files. It appears to me that to recover archived files one normally uses the 'interogate' command in exec. However, trying to interrogate files in other than your own directory does not seem to be accepted. How, therefore, does one unarchive something like <KJOURNAL>12345? 2a

Copies of authored mail to KIRSTEIN@USC-ISI. I have noticed that on occasions, possibly always (I have not checked), any mail I author, besides going in branch 'author' of my initial file also goes to KIRSTEIN@USC-ISI. Whilst I have no worries about secrecy( ) it did cause a little confusion, especially when it resulted in sending a second version of an item to Doug which I thought had not been properly delived. This second copy somehow upset the journal system. 2b

JWORK files. A curiosity question, this one. What do the JWORK files contain, and do they use up a lot of file space. Having looked at one after mail has been delivered it seems to be empty, can they be safely deleted in such a state? 2c

File submission of journal mail. When I send a file as a piece of mail how soon can the file be deleted? Is it copied into JWORK immediately? 2d

Finding usernames in SNDMSG. Is it possible to find out where a user has an account such that he can receive SNDMSG mail? The ident searching feature of journal is beautiful, but does a similar facility exist for general network users? 2e

That is all for now ... Regards Steve. 3

20362 Distribution
Kirk E. Kelley,

EJK 18-NOV-73 23:42 20364

viewgraph

Stoney would you please ask Anne to make a viewgraph out of the stuff I put to gether. At this moment it is highly unlikely that I will be in for the pitch. The best substitute would be FJT if he can be talked nto it.

EJK 18-NOV-73 23:42 20364

viewgraph

BASIC RESOURCES	PRIMARY PRODUCTS	SECONDARY PRODUCTS	1
---	---	---	2
			3
MAN HOURS	CONSULTANT SERVICES	ADVICE AND REPORTS	4
			5
CONTRACT DOLLARS	CONTRACTS	REPORTS A/O MODELS	6
			7
FACILITIES	SUPPORT		8
			9
			10
			11
	MANAGEMENT		12
	---		13
			14
PLANS	RESOURCE EXPENDITURES	VARIANCES	15
			16
	PROGRAM STATUS		17
			18
			19
	OPERATIONS		20
	---		21
			22
REQUIREMENTS	STATE-OF-ART	DEFICIENCIES	23

20364 Distribution
Duane L. Stone, Frank J. Tomaini,

ARPA Net Maintenance - ISF letter

ISFE (Mr Comito/2242) 15 November 1973

ARPA Net Maintenance

RADC/ISIM (Dr Kennedy)

With reference to several meetings in the past week, the following represents agreements reached relative to the ARPA net maintenance support. These agreements are in addition to the present support in the area of NIC agent (clerical), preventive maintenance for the TIP, interim printer capability (Data Products Printer) and Imlac Displays (low priority).(LJOURNAL,19855,1:w)

a. ISFE will tag each unit identifying a focal point and telephone number for reporting any equipment malfunction and relocation.

b. ISFE will assume maintenance responsibility for the Execuports and Imlac's.

c. The Tycoms, TI Silent 700s and cassete recorders are presently waiiting for a maintenance scheme . ISI, along with support from ISF (J. Rossi will), will set up the maintenance contracts for these equipments and ISF will assume maintenance responsibility.

d. Custodial responsibility will be transferred to ISFE. Units required to leave BLDG 3 will be handled by hand receipts from the assigned custodian.

e. Modification to the present units and new equipments will remain the responsibility of ISI.

f. ISI will provide current and future funding for the acquisition of new equipments, maintenance and supplies. The procurement of maintenance and supplies will be done by ISF.

WILLIAM F. STINSON, Capt, USAF

Chief, R&D Computer Facility
F. Trolio (ISFE)

Copies for:

D. Stone ISIM)

EJK 19-NOV-73 00:27 20365

ARPA Net Maintenance - ISF letter

(J20365) 19-NOV-73 00:27; Title: Author(s): Edmund J. Keanedy/EJK; Distribution: /DLS(fyi) JLM(fyi) RFI(fyi); Sub-Collections: RADC; Clerk: EJK;

SK 19-NOV-73 03:00 20366

MONDAY MESSAGE

MESSAGE TO SK

SK 19-NOV-73 03:00 20366

MONDAY MESSAGE

(J20366) 19-NOV-73 03:00; Title: Author(s): Sylvia Kenney/SK;
Distribution: /SK; Sub-Collections: NIC; Clerk: SK;

RWW 20-NOV-73 15:45 20367

Basic Issues and Beliefs for the Design of Knowledge Workshop Systems and Status of NLS with Respect to Them

This paper was written as support for (20389,).

RWW 20-NOV-73 15:45 20367

Basic Issues and Beliefs for the Design of Knowledge Workshop Systems and Status of NLS with Respect to Them

INTRODUCTION 1

This document outlines what I consider to be major issues in the building of an augmented knowledge workshop and briefly outlines the status of ARC and NLS with respect to them. These issues were published in (14724,) and (18368,), but tended to get lost in the surrounding material and therefore I felt it useful to break them out into a separate document. 1a

WORKSHOP DESIGN ISSUES AND BELIEFS 2

1) NEED FOR COLLABORATION 2a

The workshop technology that we want to evolve has more levels and dimensions than any single R & D group can handle by itself, both for lack of funding and for lack of knowledge in all relevant areas. The effective evolution of such a workshop will require collaboration among people from many organizations and disciplines - computer science and engineering, operations research, management science, psychology, to name a few. Also there is much to be gained from the dialog even controversy that develops from alternate or overlapping ways of viewing a problem. The goal of any healthy collaborative framework is to provide mechanisms that lead to constructive dialog and synthesis or resolution of alternatives or overlapping approaches. 2a1

ARC NLS STATUS 2a1a

We are strongly committed to do what we can to get a healthy community collaborating on the development of workshop systems. 2a1a1

2) NEED FOR REAL USE 2b

An effective workshop cannot evolve in a vacuum. There must be real users in a variety of environments doing their everyday work on some version of the evolving systems to enable careful analysis of user needs and experiences. 2b1

In particular, the evolving workshop features should be used by the collaborating groups to aid them in their daily work and collaboration. We should try to develop modes of working that encourage wide spread use of each others' tools. 2b2

ARC NLS STATUS 2b2a

We have set up a Workshop Utility with the computer to be

operated by Tymshare to provide an access point to a prototype workshop system to enable a range of real users other than ourselves to gain and feedback advanced workshop usage experience. Associated with the Utility will be other services such as close liaison, training, analysis etc. 2b2a1

3) EMBEDDED IN A COMPUTER NETWORK 2c

The computer-based "tools" of a knowledge workshop will be provided in the environment of a computer network such as the ARPANET. For instance, the core functions will consist of a network of cooperating processors performing special functions such as editing, publishing, communication of documents and messages, data management, and so forth. Less commonly used but important functions might exist on a single machine. The total computer assisted workshop will be based on many geographically separate systems. 2c1

Once there is a "digital-packet transportation system," it becomes possible for the individual user to reach out through his interfacing processor(s) to access other people and other services scattered throughout a "community," and the "labor marketplace" where he transacts his knowledge work literally will not have to be affected by geographical location. 2c2

Specialty application systems will exist in the way that specialty shops and services now do - and for the same reasons. When it is easy to transport the material and negotiate the service transactions, one group of people will find that specialization can improve their cost/effectiveness, and that there is a large enough market within reach to support them. And in the network-coupled computer-resource marketplace, the specialty shops will grow; -- e.g., application systems specially tailored for particular types of analyses, or for checking through text for spelling errors, or for doing the text-graphic document typography in a special area of technical portrayal, and so on. There will be brokers, wholesalers, middle men, and retailers. 2c3

ARC NLS STATUS 2c3a

We are strongly committed to use and development of ARPANET protocols as a basis for resource sharing. We have coupled NLS to the Network Mail functions, to UCSB's file storage services, and we plan a strong effort in the coming year to couple to other services on the network such as the Datacomputer and other dialog support

services. We would also like to make an effective connection to numerical capabilities. 2c3a1

A proposal to initiate a meeting to design resource sharing protocols is contained in (20389,). 2c3a2

4) COORDINATED SET OF USER INTERFACE PRINCIPLES 2d

There will be a common set of principles, over the many application areas, shaping user interface features such as the language, control conventions, and methods for obtaining help and computer-aided training. 2d1

This characteristic has two main implications. One, it means that while each domain within the core workshop area or within a specialized application system may have a vocabulary unique to its area, this vocabulary will be used within language and control structures common throughout the workshop system. A user will learn to use additional functions by increasing vocabulary, not by having to learn separate "foreign" languages. Two, when in trouble, he will invoke help or tutorial functions in a standard way. 2d2

ARC NLS STATUS 2d2a

We have just completed a redesign of the NLS command language in an attempt to remove inconsistencies that have developed over the years. We have also implemented a central command language interpreter that controls all parsing, prompting and feedback to the user. The operation of this interpreter is based on tables derived from compilation of the command language syntax expressed in a Command Language Metalanguage. The principles on which this cleanup is based are: 2d2a1

1) Making the command language syntax for the typewriter (TNLS) version and the display (DNLS) version as close as possible, except where the difference between the one dimensional and two dimensional media clearly prohibits this or would limit one or the other version. This decision was made to allow people working in environments consisting of both typewriter and display terminals to be able to move back and forth with ease. 2d2a1a

2) As much as possible to make the operation specification of the form verb noun and to try to maximize the fullness of the verb-noun matrix. 2d2a1b

3) Operand specification is contained in a number of fields variable with the type of command. All commands of a similar type have had the order of the operands made consistent and as natural (relative to normal English usage) as possible. Infrequently used operand fields are optional and novice users need not be aware of their existence. 2d2a1c

4) Organization of the system into clearly defined subsystems with uniform rules for their entry and exit. Any subsystem can be entered from any others either to "execute" a single command with automatic return or to perform a chain of commands with explicit return, either to a specifically named subsystem in the path of subsystems traversed or to the previous one. 2d2a1d

5) Four forms of command operation recognition are provided to enable the user to choose the one most appropriate to his terminal type, system response, previous system experience, and present NLS experience level. We have worked to pick an operation vocabulary that guarantees operation verbs and nouns to be unique in a maximum of three characters. 2d2a1e

A) An expert mode allowing high speed single character recognition of the most commonly used commands; less commonly used commands require an escape character followed by enough characters for unique recognition. 2d2a1e1

B) A demand mode ala Tenex requiring a right delimeter to initiate recognition. 2d2a1e2

C) An anticipatory mode requiring the user to type enough characters until the command is uniquely specified; the system then automatically filling in the remainder. 2d2a1e3

D) A fixed mode that guarantees recognition on entry of three characters. 2d2a1e4

6) Provision of user controllable options on prompting, feedback and other parameters whenever it seemed a single option was not appropriate to some significant class of users. 2d2a1f

A mechanism is to be implemented that enables the

user to create a file stating what options he wants to run with. The system automatically sets his options when he enters. 2d2a1f1

7) All operations that have a natural inverse (editing commands still do not have an "undo" facility) have had that added if it was missing. 2d2a1g

Along with the command language redesign following as consistent a set of principles as we could define at this time, we have increased the number of levels of HELP available online: 2d2a2

1) Increased prompting in both DNLS and TNLS to let the user know what type of operand is expected next. Prompts are either terse or more extensive, or can be turned off entirely under user control. 2d2a2a

2) A user can type a question mark at any point during command specification to obtain more information about the options or syntax available at or from that point. 2d2a2b

3) The user can enter an online HELP data base by typing (control-q) at any point to obtain further information. He is entered into the data base at a point associated with what he has most recently typed. From within the HELP data base he can perform additional queries and movement with a very simple command language. The HELP data base contains information on command syntax, system concepts, obsolete commands, command assumptions and side effects if any. 2d2a2c

4) More explicit and understandable error messages. 2d2a2d

5) We are also considering a facility to allow linking to a person on HELP duty if such a resource should seem needed. 2d2a2e

The other aspect of user interface is the workstation and is discussed further later. 2d2a3

When we interface to foreign systems such as BASIC or the Datacomputer, we plan to allow a natural NLS user interface in terms such as: obtaining and returning data from and to NLS files at points and in a format natural to NLS; command specifications according to NLS syntax if

that would be most consistent, and HELP uniform with the rest of the system. 2d2a4

5) GRADES OF USER PROFICIENCY 2e

Even a once-in-a-while user with a minimum of learning will want to be able to get at least a few straightforward things done. In fact, even an expert user in one domain will be a novice in others that he uses infrequently. Attention to novice-oriented features is required. 2e1

But users also want and deserve the reward of increased proficiency and capability from improvements in their skills and knowledge, and in their conceptual orientation to the problem domain and to their workshop's system of tools, methods, conventions, etc. "Advanced vocabularies" in every special domain will be important and unavoidable. 2e2

A corollary feature is that workers in the rapidly evolving augmented workshops should continuously be involved with testing and training in order that their skills and knowledge may harness available tools and methodology most effectively. 2e3

ARC NLS STATUS 2e3a

Most of the features to achieve this capability were discussed above such as providing consistency; optional fields that a novice user doesn't have to be aware of; a variety of recognition modes to meet novice and expert needs; user settable options wherever appropriate; and several levels of HELP, including a HELP data base designed with the types of questions or problems likely to be faced by experts and novices. 2e3a1

We can easily subset the command language available to a class of users, if that should seem appropriate. 2e3a2

6) EASE OF COMMUNICATION BETWEEN, AND ADDITION OF, WORKSHOP DOMAINS 2f

One cannot predict ahead of time which domains or application systems within the workshop will want to communicate in various sequences with which others, or what operations will be needed in the future. Thus, results must be easily communicated from one set of operations to another, and it should be easy to add or interface new domains to the workshop. 2f1

ARC NLS STATUS 2f1a

There are a number of problems in this area to which NLS offers solutions, but we feel this is an area requiring considerably more work. A proposal for a general ARPANET wide approach to this problem is contained in a related paper, RFC 592 (20391,). 2f1a1

There are two main classes of intercommunication (1) between subsystems built within the NLS environment and (2) between subsystems built within the NLS environment and those built outside. 2f1a2

Let us review quickly mechanisms used within the NLS environment. Communication between NLS subsystems utilizes their common knowledge of NLS file structure and ability to access NLS file system primitives and their knowledge of the conventions and datastructures of the NLS running environment. The ability for the user to access any subsystem from any other subsystem falls out given operation in a common run time environment. 2f1a3

One specific mechanism worth pointing out is called the sequence generator. The sequence generator in conjunction with the content analyser is invoked to obtain strings from NLS files in accordance with current NLS view specifications, content analysis patterns, or user program transformations. It is through this mechanism that language processors and hardcopy output formatter subsystems interface to the main body of NLS. This mechanism is also used to output NLS structured files to sequential files. There is a system default sequence generator and users can program and institute their own for special applications. The concept of the sequence generator is quite general and powerful. 2f1a4

The general concept can probably be extended to provide similar services on input as well as output. A step in this direction has been taken with an extension to our FTP server to allow it to invoke user programs to transform input strings being entered into NLS. 2f1a5

As mentioned in (20391,) we plan to reimplement the NLS Journal into separate well defined services with communication between them to follow specified protocols so that these services can exist distributed on various hosts on the ARPANET. 2f1a6

We plan to reimplement NLS in a new Modular Programming System (MPS) that among other things, should enable

additional inter-subsystem communication mechanisms to be established 2f1a7

There is presently limited or no communication with subsystems existing entirely outside of the NLS or Tenex environment. What communication exists uses standard Tenex system calls and fork structure. Features of the Tenex Executive and File Transfer Protocol are directly accessible from NLS. Tenex treats terminal devices and network connections the same as other files and this clean design simplifies intercommunication with other systems in the Tenex environment and communication out through the network. Additional facilities such as subroutine file capability would be useful. A subroutine file allows a program to be interposed in the file stream to perform transformations. 2f1a8

We will be studying the design issues of connecting to non NLS subsystems and services closely during the coming year. As we redesign various NLS facilities we will look at doing so according to the network service philosophy described in RFC 592 (20391,). 2f1a9

Another issue is the desirability to allow the user to reach out quickly from within one subsystem to assess functions in another without requiring the user to return to an Executive Level. These mechanisms should allow easy and quick return to the branch point. I envision a workshop as growing and growing and it seems unnecessary to require all subsystems to duplicate editing or other functions. We are providing such a nested intersubsystem or tool domain communication within NLS and would like to see mechanisms agreed upon to allow this generality across the ARPANET. 2f1a10

7) USER PROGRAMMING CAPABILITY 2g

There will never be enough professional programmers and system developers to develop or interface all the tools that users may need for their work. Therefore, it must be possible, with various levels of ease, for users to add or interface new tools, and extend the language to meet their needs. They should be able to do this in a variety of programming languages with which they may have training, or in the basic user-level language of the workshop itself. 2g1

ARC NLS STATUS 2g1a

NLS currently has a powerful user programming facility in which the user can write programs in the L-10 language (the Algol like system programming language in which NLS is currently implemented) and has access to all the NLS file manipulation and other primitives. These user programs can be entered into a growing library of such programs to perform useful but infrequently used functions. These programs range from simple string transformations to effectively independent subsystems with subcommands, user prompts and feedback, etc. 2g1a1

This user programming capability does require programming knowledge, and familiarity with NLS system primitives, and is not readily accessible to ordinary non-programmer type users. Therefore, what is desired is an additional capability to enable users to create "programs" out of sequences of NLS commands stored as normal NLS text files. Such an "NLS" programming capability is to be provided. 2g1a2

8) AVAILABILITY OF ADDITIONAL SUPPORT SERVICES 2h

An augmented workshop will have more support services available than those provided by computer tools. There will be many people support services as well: besides clerical support, there will be extensive and highly specialized professional services, e.g. document design and typography, data base design and administration, training, cataloging, retrieval formulation, etc. In fact, the marketplace for human services will become much more diverse and active. 2h1

ARC NLS STATUS 2h1a

We presently provide a range of people support services to our local staff, such as transcription of handwritten drafts into the system, editing, document catalogging, training and advice on use of COM typography. Much needs to be learned, however, about how to most effectively organize and use such services, particularly on a geographically distributed basis. 2h1a1

9) COST DECREASING, CAPABILITIES INCREASING 2i

The power and range of available capabilities will increase and costs will decrease. Modular software designs, where only the software tools needed at any given moment are linked into a person's run-time computer space, will cut system overhead for parts of the system not in use. Modularity in hardware will

provide local configurations of terminals and miniprocessors tailored for economically fitting needs. It is obvious that cost of raw hardware components is plummeting; and the assumed large market for knowledge workshop support systems implies further help in bringing prices down. 2i1

The steady expansion of vital application systems to other domains explains why the capabilities of the workshop will increase. Further, increasing experience with the workshop will lead to improvements, as will the general trend in technology evolution. 2i2

ARC NLS STATUS 2i2a

The capabilities of the NLS based workshop are continuously increasing as experience with the system grows and areas of new needs are enhanced with system features. Likewise, the cost of using the system is decreasing. The switch from the XDS 940 to PDP-10 enabled 3-4 times more users to be interactively supported performing more functions for about the same cost. Measurement and optimization of parts of the code and system organization is a steady background process. 2i2a1

Recent decreases in the cost of mini computers and the introduction of follow on versions of the PDP-10, will lead to additional reorganizations and changes to keep the cost decreasing. 2i2a2

What we need most, besides steadily decreasing cost, is to learn how to assess the value of new capabilities and to measure the total usage cost involving both machine and user time and effort. To get started in this area we have set up a two person Analysis group headed by an experienced Operations Researcher that we plan to expand to a four person group in the coming year. 2i2a3

A basic design issue we are beginning to pursue is how to organize the workshop system, taking advantage of micro and mini computers, to perform the most frequently used functions at low cost while yet allowing access to a wide range of coordinated and less frequently needed tools at a proportionally higher cost. 2i2a4

I believe that such a system organization and use of rapidly decreasing hardware cost can allow a system design providing both low cost (both in terms of usage

and particularly when the users time to perform tasks are considered) and flexibility and generality. 2i2a4a

10) RANGE OF WORKSTATIONS AND SYMBOL REPRESENTATIONS 2j

The range of workstations available to the user will increase in scope and capability. These workstations will support text with large, open-ended character sets, pictures, voice, mathematical notation, tables, numbers and other forms of knowledge representation. Even small portable hand-held consoles will be available. 2j1

ARC NLS STATUS 2j1a

The present system operates with ASCII symbols and supports a range of terminals from offline magnetic tape cassettes for data entry, through typewriter devices as per ARPANET Telnet, to a variety of displays such as low cost alphanumeric (as DNLS terminals, mouse and keyset, with a special low cost microcomputer based device we call a Line Processor) to mini-computer based displays such as IMLAC to special systems like our local Tasker systems. 2j1a1

We plan to generalize our basic file system to support mixed text and graphics, voice, numerical and other types of data structures and representations. 2j1a2

We plan to support in the future the new multiple font displays now under development and interface to an increasing range of workstation capabilities. 2j1a3

Portrayal of information for online devices (CRTs and typewriters) and for offline devices (printers and COM) is presently performed with several portrayal processes. We plan to build a single portrayal generator capable of coordinated opertion with both online and offline devices. 2j1a4

One direction we are moving in is toward a mini-computer based workstation cluster that would perform command parsing, prompting, and feedback and in larger models some local standalone frequently used editing functions, and would use centralized facilities for less frequently used operations. This type of organization should provide higher speed of interaction to the user and lower cost operation. 2j1a5

11) CAREFUL DEVELOPMENT OF METHODOLOGY 2k

As much care and attention will be given to the development, analysis, and evaluation of procedures and methodology for use of computer and other support services as to the development of the technological support services. 2k1

ARC NLS STATUS 2k1a

The area of use methodology development at SRI-ARC has proceeded in a somewhat ad hoc manner and needs much more explicit attention. The richness of NLS to meet many application needs is not fully utilized because of inadequate attention to use methodology development. We just have not had resources enough to push as hard here as needed. 2k1a1

12) CHANGED ROLES AND ORGANIZATIONAL STRUCTURE 2l

The widespread availability of workshop services will create the need for new organizational structures and roles. 2l1

ARC NLS STATUS 2l1a

The different communication paths easily established through communication with NLS like technology and different work modes available, create the need for new thinking about organizing collaborating groups of people whether small teams or large corporations. We have done some experimenting here, but lack of expertise and resources for adequate follow through have limited the conclusions to be drawn. Much more effort is required in this domain. 2l1a1

13) UTILIZATION OF EXISTING SYSTEMS 2m

We should not start from scratch, but should utilize as an initial condition existing systems. 2m1

ARC NLS STATUS 2m1a

We are determined to utilize existing capabilities developed by others around the Network as much as possible in the ongoing evolution of our NLS based workshop. We have worked actively in the development of Telnet, File Transfer, Mail and Graphics protocols and will continue to work to establish those conventions and

protocols that facilitate resource sharing, RFC 592 (20391,). 2m1a1

Our near term thrust will be to integrate fully into the developing network mail and dialog support facilities and to learn how to most effectively couple NLS and available large scale data management and information storage and retrieval systems. 2m1a2

CONCLUSION: 3

The present version of NLS and its supporting methodology does not adequately deal with all the design issues above, but we have made starts in each area. We have developed some further than others. There are also higher levels of system design considerations having to do with specific application areas that have not been discussed here that have received extensive development or fruitful starts with much room for further growth and exploration. 3a

Plans for a coming redesign during the next year include dealing with major gaps associated with the issues above and the determination to try and help get stronger collaboration between groups involved in important aspects of workshop technology. 3b

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Basic Issues and Beliefs for the Design of Knowledge Workshop Systems and Status of NLS with Respect to Them

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Summary of Accomplishments for ISI (past 5 years)

This was prepared for Dr. LeBerge's visit from past accomplishment reports for GT2. It was rejected by Center staff..reason unknown.

FJT 19-NOV-73 06:31 20368

Summary of Accomplishments for ISI (past 5 years)

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13 Background Information for Dr. La Berge's Visit

BACKGROUND INFORMATION--Dr. La Berge

The Information Processing research and development mission of the Rome Air Development Center is to bridge an anticipated gap between future need and the limited capability that could be provided without research and development. 14

About five years ago, the computer was emerging from a period where it was used as a stored program adding machine in support of scientific calculation and business accounting, to a period of development as an indispensable tool for Air Force resource management, battlefield deployment and weapon utilization. When the computer was used, primarily in support of accounting and scientific functions, it was operated solely by specialists called analysts and programmers. For these essentially civilian computer applications ease of operation, speed, on-line interaction, reliability, and even cost were not critical. 15

For military applications, however, these are important and accordingly, five years ago the priority list of Air Force Information Processing research goals read: 16

Ease of Operation 16a

On-Line Interaction 16b

Speed 16c

Reliability 16d

Cost 16e

Security 16f

It was recognized that if the computer is to be used as a real-time

aid to the military decision maker, the decision maker himself must have direct access to the computer.

Today, five years later, the list of goals is still valid. However, the priority has changed because of accomplishments related to ease of operation, on-line interaction and hardware reliability, to:

Reliability (Software)

Security

Cost

Speed

On-Line Interaction

Ease of Operation

The future emphasis will be toward less labor-intensive operations of the Air Force* and, accordingly, there will be a trend toward more automation. This will result in a desire for more automation,and accordingly result in the acquisition of more and more computing power and an attedant dramatic increase in the cost of software.

Most software costs are deferred until after the hardware acquisition phase. For instance, we learn from the **CCIP-85 study that some 95% of the 465L software delivered to SAC had to be rewritten and 67% of the Seek Data II software delivered in Vietnam had to be rewritten. In addition, slippages of software reduces the expected life of a system and, because it is on the "critical path", the indirect

*Manifestations of all-volunteer, paid military.

**Command and Control Information Processing - Post 1985 Requirements Study Report.

costs of software slippages very often far exceed its direct costs. Software is unreliable because it cannot be validated. Today, approximately 47% of the cost of software is spent in testing and even then critical software packages go into the field "unvalidated." 23

In summary, estimates of current Air Force annual expenditures on software are between $1 billion and 1.5 billion, compared to $300 to $400 million per year for hardware. With all of this, the hardware is adequate and reliable; the software is not. Hardware costs will decrease, while, if nothing is done to decrease the strain on software technology, it is not unreasonable to estimate that the cost of software could expect to increase an order of magnitude over the next decade and be so inadequate as to cause critical failures or "mistakes" that might affect national survival. 24

Relatedly, the future emphasis will be toward more cost effective operation of the Air Force. "While defense is taking a decreasing share of both the federal budget and gross national product, costs of manpower and weapon systems are growing at an alarming rate...If these trends are not reversed even significant increases in defense budget may not insure the force levels required by our national security." (Extract from U.S. Senate Armed Services Report 92-962, June 14, 1972). This may manifest itself through pressures to modify existing systems rather than the initiation of new designs and a concept of "Design for Minimum Test." As a rule, test is considered after designs are selected. The principle of considering test an integral part of designs may force designs into

simpler solutions - force us to use what we have and avoid developing things we cannot test. 25

All of this points up the need for automation, the criticalness of software and the re-emphasis of the "fly-before-you-buy" concept. 26 27

Information Processing Technology at RADC has been and is emphasizing R&D on software validation and methods of design that minimize initial costs and simplify modification. In addition, in-house design facilities in support of the "fly-before-you-buy" concept are emphasized. In this connection, RADC has developed: (1) a JOVIAL COMPILER VALIDATION SYSTEM and the expertise to validate JOVIAL, COBOL and FORTRAN compilers; (2) an Associative Processor emulation/simulation facility where the cost-effective application of parallel/associative architecture can be thoroughly evaluated for airborne data processing applications using empirical data; (3) a Pattern Recognition facility supported by an analog to digital preprocessing function so that sensor effectiveness can be evaluated "prior to flying", and where discrimination logic hardware can be designed and tested prior to production-fabrication; (4) a knowledge workshop which exploits recent ARPA supported research in the area of machine aids to the individual and groups of individuals involved in "high level" planning and management; and, (5) Display Expertise, in support of Tactical and Airborne Command and Control Systems, which exploits the latest technology to provide real time, highly reliable, low power consumption, reduced weight and volume interactive devices and

procedures, and automatic target detection and identification subsystems. 28

RADC's tangible Information Processing Accomplishment in the past year has been in three major areas, namely; studies in support of WWMCCS, the use of its pattern recognition facility for target feature validation and preprocessor logical design, and improved display/computer graphics capabilities. These are covered in more detail in the following paragraphs. Because of in-house and contractual efforts, next year should see the establishment at RADC of a software error analysis facility and some initial results on the value of "structured programming" as an approach to error-free program development. 29

The following are accomplishments, from 1968 to date, that have made significant strides toward achieving the Information Processing Goals. 30

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RADC MANAGEMENT EXPERIMENT ACHIEVES ON-LINE MULTIPLE ACCESS CAPABILITY 32

In May 1968, a Multiple Console Operation of the system was achieved. It seems worthy to state here the capability of the system as of that date. 33

A Control Data Corporation 1604B computer, operating in conjunction with high-speed, random access storage devices, allows up to five users to share the computer at one time in an on-line mode. Communications with the system was provided by RCA 6050 cathode ray tube display terminals and telephone data sets, which allow access to the retrieval

program in a matter of seconds. Once a user identified himself to the system, the on-line retrieval program allowed him to structure a request for processing in such a way that only data pertinent to his unique requirements were retrieved. The user could introduce logical and arithmetic operators to be used with search parameters. These operators include: 34

add	less than	34a
subtract	equal to	34b
multiply	less than or equal to	34c
divide	greater than	34d
	greater than or equal to	34e

In addition, the user could exercise various options on the retrieved data subset for further processing. Among these options are those that allow qualification of the input request to reduce the data subset to one that is more closely defined, the ability to obtain a display and/or hard copy of results, a means for saving displayed results, and the ability to perform, sort, and formulate operations on data requested in hard copy form. As additional users were interfaced to the system, the retrieval program apportioned the available time and keeps each user informed of the amount of time necessary to process this query duriing any search on the data base. At any time during problem solving, the user may return to the original data subset by means of a "reinstate" command. Use of a "reference" function provided him with the ability to link a retrieved subset to another data file based on common elements between the two. A civilian personnel data and a

document data base of DD 1498s, each containing about 32 million characters of information, could have been operated on by the retrieval program. Search times of approximately two minutes for retrieving data from these files was not uncommon and provided the user with rapid access to selected management data. The remote terminal device was used to maintain the data base by means of an on-line update program, but this operation was restricted to a single user mode. The system automatically monitored itself during operation and data in hard copy form was presented to the system designers and operators for further modification and improvement to the experimental configuration.

RADC 635/645 EXPERIMENTAL ON-LINE COMPUTER SYSTEM PROVIDES PRACTICAL TEST BED FOR USAF USER EXPERIMENTATION

Progressing from the planning stage of 1966, the RADC 635/645 On-Line Computer System became an operational reality during the Fall of 1967. At that time, there were 80 remote terminals accessing the central processor of a GE-635 computer. The system was capable of supporting terminal devices with data transmission rates of 110 to 1200 bits/second, and is currently being used daily by hundreds of individuals from many diverse groups within the Department of Defense.

Serving as an empirical test bed for recently developed software and languages, these users gained immediate first-hand experience in the on-line problem solving capability of a third generation digital computer.

System users employed the "BASIC" computer language developed by GE

and Dartmouth College, and were able to write programs up to 50,000 characters in length. Disk storage for 46 million characters was provided by the central computer system.

The users of the system varied in individual capability from beginning problem solvers to professional programmers. Positive user response was obtained as exemplified by such groups as the Defense Weapons Management Center of the Air Force Institute of Technology. Their use of the RADC On-Line System resulted in an estimated 50% increase in systems analysis performed as compared to previous output, using a conventional batch computer.

Although "BASIC" was initially designed primarily for mathematical calculations, imaginative users applied this new system to such diverse applications as calculating work center time standards for management engineering programs and computer-assisted management simulations.

AVAILABILITY OF AN INTERACTIVE ON-LINE PATTERN RECOGNITION AND ANALYSIS SYSTEM (OLPARS)

A solution to the pattern recognition problem requires the design of logic which is capable of automatically classifying the state of a physical environment. The pattern analysis problem is that of detecting and identifying relationships (i.e., structure or trends) in multi-variate statistical data. A pattern recognition and analysis system should consist of a general purpose computer with a display console and the necessary software to enable a user to communicate on-line with the computer. The use of displays would keep the human in

the analysis as much as possible, thereby taking advantage of his innate pattern recognition capabilities. 45

In 1968, a preliminary system consisting of the Bunker-Ramo 85 display coonsole and the Control Data Corporation 1604B computer was designed and implemented at RADC. The system provided the capability of analyzing up to 18 dimensional data (measurements) by means of a series of projections onto "optimal" one and two dimensional subspaces, implementing decision boundaries based on the results of these projections, determining and locating "clusters" which may exist in a data set, and the ability to get three-dimensional perspective plots of a data set. Experimentation with this system and application of it to real Air Force problems showed that this concept for solving pattern analysis and recognition prolems has a great deal of potential. 46

Several mathematical algorithms developed in-house during 1968 were; the discriminant evaluation method for measurement evaluation, non-linear mapping algorithm for data structure analysis, a similarity matrix clustering algorithm and a distribution free decision algorithm. 47

The application of the OLPARS system to real Air Force problems is a vital part of our research activity and the ultimate reason for the development of the system. Problems that have been worked on to date include ELINT signal classification, analysis of personnel data to automatically screen candidates for admission to the Air Force Academy, the development of an automatic intrusion detection system using multi-sensor data, and automatic classification of images in photographs. 48

BACKGROUND INFORMATION--Dr. La Berge

As a result of these studies, a large scale system has been designed to operate on the GE-635/645 computer system connected to a CDC Digigraphics 274 Display System. A paper, which will be used as a planning document for this system, has been written and will soon be published. It describes in dettail the various software packages which will make up the improved capability.

MILESTONE ACHIEVED IN THE DEVELOPMENT OF A SPACE PROGRAMMING LANGUAGE (SPL/J6) AND COMPILER TOOL (SPLIT)

By 1969, hardware technology had outstripped software technology. This was nowhere more evident than for spaceborne computers. In comparison with the cost of the computing hardware, that of software for manned spacecraft has gone up from 20 - 40 percent in the early '60s to approximately 200 - 400 percent today. Well over 200 manyears of effort (over 4 - 5 years and costing several million dollars) may be required for the sophisticated programming of an aerospace computer.

The reasons for this snow-balling of costs and lead time for programming onboard space computers stems from the early employment of small computers (a few thousand words of core) and actually small programs (a few thousand instructions). Compiler inefficiencies could not be tolerated because of self-imposed memory sizes. However, it was not a difficult task to hand-code, debug, and check-out a 5000 instruction program. Insidiously, spaceborn computers were assigned more tasks and their complexity and sophistication grew. Poor initial estimates of computing power decoyed management away from recognizing

the situation as a threat to the success of future space missions. The real problem was not in an inability to build sophisticated spaceborne computers but, in the tremendous problem associated with hand coding and insuring quality control of software associated with such devices. 53

Clearly what was needed was a programming language uniquely designed to solve complex spaceborne computations in their real time environment with minimum programmer effort to prduce optimum object code. 1st Lt Roger B. Engelbach of the Guidance Branch, Directorate of Technology, Space and Missile Systems Organization, Los Angeles, California, recognized this need and, as far back as the spring of 1965, initiated under RADC sponsorship a development effort which achieved in 1968, the following significant milestone. The Systems Development Corporation has designed a space programming language as an extension to JOVIAL (because JOVIAL has been adopted by the Air Force as a standard programming language for Command and Control). The official name of the space programming language is SPACE PROGRAMMING LANGUAGE/JOVIAL 6 (SPL/J6). Almost as important as the language design is th milestone reached for its implementation. In order to develop an SPL compiler that can produce optimum machine code, can be built speedily, transfer readily to new computers, and costs relatively little, SDC developed an SPL compiler building tool, or compiler-compiler called SPLIT. The SPLIT development took advantage of the lessons learned during the development of an existing SDC compiler building tool called META. SPLIT has demonstrated its power by generating an SPL/J6 compiler for the IBM 360-65. 54

BACKGROUND INFORMATION--Dr. La Berge

During 1969, the computer program supporting SPLIT was written in SPL resulting in the ability to transfer the compiler to different machines. SPL/J6 and its compiler-building tool (SPLIT) was a large step toward a solution of the software problems faced by the spaceborne software industry namely, the prospect of multi-million dollar missions degraded because of lack of software, and mission safety threatened because of inadequate software quality - assurance techniques. For his technical management efforts in connection with SPL/J6 development, 1st Lt Roger B. Engelbach was awarded $1,000.00 for Scientific Achievement Beyond the Requirements of his official duties. 55

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RADC SUCCESSFULLY APPLIES ITS ON-LINE, INTERACTIVE, GRAPHICS COMPUTER SYSTEM FOR PATTERN RECOGNITION AND ANALYSIS 57

During 1969, the Computer Applications Section at RADC was engaged in a research project to design, implement and apply an in-house, on-line, graphics oriented computer system, entitled OLPARS (On-Line Pattern Analysis and Recognition System), in order to achieve solutions to Air Force pattern analysis and recognition problems. One of the goals of this system is to provide a human operator with a library of mathematical algorithms, so that by means of interactive graphic displays, he can analyze the structure of the data, and design classification logic for the solution of his particular problem. 58

OLPARS was ultimately implemented on the system consisting of the GE-645 computer, using the GECOS-III operating system, coupled to the CDC Digigraphics 274 Display System. During 1969, most of the work on

this system was spent on the development of system software, modification of GECOS-III to allow an object program to operate in a priority mode with respect to allocation, dispatching and I/O scheduling, and interfacing the display system to the computer. A paper, which was used as the design document for this system, was written in-house and published (RADC-TR-68-263). 59

A preliminary system, consisting of a subset of the OLPARS algorithms, has been implemented at RADC on the CDC 1604 computer coupled to a Bunker Ramo 85 display console. This was accomplished in 1968. The remaining algorithms are available for off-line processing. Problems that have been worked on in-house to date include radar emitter classification, planimetric feature clssification, hand-printed character recognition, medical data classification, analysis of a document retrieval data base, and multi-sensor data classification. Preliminary results, summarized in the following paragraph have demonstrated the feasibility of using OLPARS to solve the radar classification problem. 60

Briefly, the problem was to determine if radar emitters could be uniquely identified on the basis of an unintentional frequency modulation introduced by the radar hardware. Three bodies of data were analyzed to date. The first consisted of emitter data collected locally by hardware designed by RADC to extract Laguerre coefficient information from emitter waveforms (the first five Laguerrre coefficients are used). Six emitters were considered in this problem, and final results showed a classification accuracy of 98%. 60a

BACKGROUND INFORMATION--Dr. La Berge

Using the same hardware, a second data set was collected by NSA at a different location. This was four-class data consisting of ten emitters. Analysis and classification of this data set yielded a 91% class assignment accuracy. Also, OLPARS could uniquely identify nine of the ten emitters with better than 75% accuracy and all but three emitters with greater than 90% accuracy. To the best of our knowledge, this was the first time anyone had attempted to discriminatee among individual emitters of the same type, and hence, RADC was very excited about the results. 60b

The third data set consisted of digitized waveforms of four of the six emitters from the first data set. By examining peaks, zero-crossing, decay, etc., a set of eight heuristic measurements were extracted and used for classification purposes. A classification accuracy of 100% was achieved. 60c

RADC has concluded from the results to date that Laguerre coefficients are sufficient to give good classification accuracy on a day-to-day basis, but they suffer from minor deviations over a period of time which degraded performance in the above experiments. RADC has reason to believe that these deviations could be controlled by sampling the radar pulses at a different instant in time. The results obtained using the heuristic measurements described above dictated on-line implementation of such techniques. 61

Hence, as a result of the research on this and other applications, it has become evident that it is necessary to extend the work on the OLPARS project to the area of data preprocessing, i.e., the development

of algorithms to convert the raw data (which is in the form of waveforms, photographs, strip charts, etc.) into a form suitable for processing with the OLPARS system (a list of finite dimensional vectors with digital component values). To solvee this problem, RADC has begun to design an On-Line Preprocessing System (OLPREPS), which will be an interactive graphics data preprocessing facility to provide a human operator with the on-line capability to define, extract and evaluate features or measurements from various types of raw data. 62

63

RADC INSTALLS NEW COMPUTER WITH EXPERIMENTAL INTERACTIVE ON-LINE SOFTWARE 64

In August 1968, the GE-645 computer system was installed in the Computer Sciences Central to replace the GE-635 which had been in operation since July 1966. The GE-645 is a modified version of the 635 to make it more suitable for laarge-scale multiprogramming operation. The 645, when operated with an advanced operating system called MULTICS under development at MIT (Project MAC), iis intended to support a large number of programs simultaneously where these programs have no limitation as to program size, file size or language, and can be initiated simultaneously from any user mode, including local batch, remote batch, and interactive terminals of various types including Graphics. The two important design concepts on which this is based is the concept of paging (and segmentation) and the virtual memory concept. 65

Since MULTICS was not anticipated to be available until the Fall of 1969 or later, a time-sharing system for the GE-645, called TSS/645, was

developed whhich is capable of supporting approximately 60 interactive users on teletypes with two languages, BASIC and FORTRAN IV. This system was put into operation on 1 January 1969 and took over the users previously supported on the Dartmouth time-sharing system on the GE-635. 66

The system is operated five days a week from 1300 to 1900, and is utilized by approximately 1200 individuals from 40 different organizations. These organizations include RADC engineers, 15 Department of Defense schools, 12 DOD operational groups and 13 local New York State schools. This time-sharing operation is being used to expose DOD groups to on-line interactive computer operation, assist in the evaluation of computer software and encourage the exploitation of on-line interactive computer operation for a wider variety of applications. The GE-645 is used at other times as a scientific support computer to RADC and in direct support of the RADC Information Processing R&D Program. 67

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LARGE SCALE ASSOCIATIVE PROCESSOR NOW PRACTICAL 69

In 1969, a new technology was developed at RCA under contract to RADC which rendered excellent, stable, fast, and compact associative processor cells of complementary insulated-gate transistors. The devices consisted of a thin film of single crystal silicon grown on an insulating single-crystal sapphire substrate, where the single-crystal silicon layer was etched to form isolated islands and doped and subjected to masked diffusion in a manner similar to conventional silicon processing steps. Using this technology, arrays of 16

associative processing cells have been fabricated, and, at the typical 10 volt operation, exhibited remarkable stability and nanosecond speed. The SOS Associative Cells are capable of performing write, non-destructive read and the full complement of non-destructive interrogate searches. Also of considerable interest is the ability of the associative cells to perform the proximity match which provides a measure of mismatch of each memory word when compared with the interrogate word. Due to the relative simplicity of the fabrication process, the ability to batch fabricate, the high density capability, the low switching and standby power requirements, and the ability to fabricate complementary devices in a single five step process, this technology will prove extremely versatile and cost effective. It will allow extremely sophisticated devices of the associative processor type to be fabricated at costs not greater than 30% that of random access storage and of, some importance, be resistant to radiation. 70

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UNCONSTRAINED HAND-PRINT CHARACTER RECOGNITION 72

A handprinted character recognition program has been in existence at RADC for a number of years. Past efforts include; a survey of the state-of-the-art in Hand-Printed Character Recognition; a study of printing constraints and logic arrays; and an effort to experimentally investigate the effects of logics, constraints and feedback on the entry of handprinted data. 73

Since July 1969, RADC has had Computer Symbolic, Incorporated, under contract to design decision logic to discriminate unconstrained

handprinted characters ("unconstrained", in this case, refers to a printing scheme requiring only that the originator print legibly and within specified areas on the page). 74

The technique examined is best described as a linguistic decomposition of one dimensional waveforms. The techniques is called Linguistic Pattern Recognition (LPR). The LPR approach simplifies the complex problem of the recognition of two dimensional (special data) patterns by constructing a series of simpler one dimensional pattern waveforms. The method involves a linguistic approach to pattern recognition. Briefly, the method works as follows: From the character pattern (Fig 1) histograms of the pattern are generated (Fig 2 - left histogram). The histograms are then decomposed into a series of adjoining primitive elements (Fig 3). The primitives are thought of as the building blocks from which complex patterns can be constructed. In this case, the primitives are straight lines constrained to a few pre-selected directions. Next, a string of primitives are grouped to form convex elements (convexities). In this way, a one-dimensional pattern is decomposed into a series of convexities (alternating convex elements). 75

The waveform is then coded as a string of symbols indicating the string of convexities. Such a string exists for each histogram. In the case of numerics basically two histograms are used, right and left views. These strings of codes represent, in vector form, features extracted from the original character pattern. The vector data is inputted to the On-Line Pattern Analysis and Recognition System (CLPARS)

where extensive analysis is performed and discrimination logic designed using the OLPARS' Distribution Free Logic Design Module. 76

The recognition logic employs a pairwise discrimination process which forces a decision for each pairwise comparison. These decisions are accumulated as votes and the final character selection is determined to be the class (or character) receiving the majority vote. 77

During 1970, a breakthrough was realized in the solution of the handprinted numeric problem. The data used was obtained from Stanford Research Institute (SRI). This data consisted of 1,640 handprinted numerics generated by 50 individual authors. Each character was scanned using a Vidicon camera and eventually represented on magnetic tape in a binary 24 X 24 grid. Feature data was extracted using the Linguistic Pattern Description Algorithm and input to OLPARS where logic design was performed. The completed logic design demonstrated the capability of correctly classifying 98% of the original 1,640 SRI characters. The logic required every character be classified and allowed no rejects. 78

It is believed that these results represent a significant breakthrough for two reasons. First, the recognition rate is as good as human performance (Commercial keypunching companies guarantee error rates of 5% unverified keypunching and 2% verified). Secondly, the results were significantly better than those obtained using state-of-the-art techniques. Experiments were conducted on the same SRI data set using two state-of-the-art recognition schemes, an exact match (EM) scheme and a linear discriminate function scheme (LDF). These experiments produced results that range from a high of 91.7% to a low of

77.5% correct recognition. It should be noted, however, that these results were obtained using subsets of the 1,640 characters and are described in a report published in the April 1969 issue of IEEE Transactions on computers. 79

Work will continue in this area. The data set has been expanded to incluude the alphas. Based on past performance, excellent recognition rates are being anticipated for the entire alphanumeric character set. 80

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ANALYSIS OF GEOMETRICAL MOMENT FEATURES EXTRACTED FROM DIGITIZED TANK PHOTOGRAPHS USING AN ON-LINE PATTERN ANALYSIS AND RECOGNITION SYSTEM 82

Identification and detection of ground based targets in their environmentt has long beedn an Air Force objective. To accomplish this objective, a variety of sensors and techniques have been applied. Often these techniques prohibit real time response and involve large expenditures in terms of human resources. An automatic detection system is therefore a desirable Air Force capability. 83

Aerial photo-reconnaissance, in particular, is one area in which automatic identification and detection systems may be feasible. Such a system would basically consist of three components: (1) a sensing device (camera), (2) a device to extract features from the photographs (i.e., target and environmental signatures), and (3) a device to classify target and environment areas based on the features extracted. 84

Initially, basic research has been conducted to determine the techniques that should be applied in the feature extraction process, in

order to obtain the features that will optimally separate the target and environment areas. 85

Analysis of a feature extraction process developed at the Army Ballistic Research Laboratories at Aberdeen, Maryland, was conduced at RADC during 1970. For the study, eleven ground level black and white photographs were taken of a tank in a typical environment. The environment consisted of a dense tree background and an open grassy foreground. Gray scale transparencies of the images were digitized using a flying spot scanner system. Seventy target and sixty-four environment sample vectors were obtained by extracting twenty-seven geometrical moment features from portions of the digitized photographs. The 27 dimensional target signuature vectors were subclassified as turrets, wheels and fore and aft views. The environment tank vectors were subclassified as foreground and background. In an effort to obtain detail enhancement, transformations were applied to the original data set (Gray Scale), yielding two additional data sets, Gradient and Laplacian. 86

The three data sets were analyzed using the On-Line Pattern Analysis and Recognition System developed at RADC. OLPARS is an on-line graphics oriented computer system which is used as a tool in solving pattern analysis and pattern recognition problems. 87

For the study two problems were formulated. First, using the OLPARS systtem, can automatic classification logic be designed to discriminate between tank and environment signature vectors? The success of the classification process is then an indication of the

usefulness of the extraction process. Secondly, if classification logic can be designed, which data set contains the most discriminatory information? 88

Results of the classification logic design for the three data sets were as follows: 89

90

DATA SET	NUMBER OF ERRORS	% CORRECT CLASSIFICATION	91 92
Laplacian	11	91.7	93
Gradient	3	98.4*	94
Gray Scale	1	99.2*	95

*The Gradient and Gray Scale logic design was performed using sixty-nine of the seventy tank vectors. 96

Since there were relatively few sample vectors, it was not feasible to split the data into design and test sets. Consequently, the results reported are only for the original set of sample vectors used in the logic design process, and should, therefore, be considered preliminary. However, some significant conclusions may be drawn from the study. It appears that some discriminatory information has been lost by implementing the gradient transformation and a significant amount lost in the Laplacian transformation. In addition, the original geometric moment features (Gray Scale) appear to contain enough information to solve the limited pattern classification problem of detecting tanks in a typical environment. The high rate of successful classification of the Gray Scale design vectors indicates that the extraction method is

feasible and warrants further study. Extension of the technique to the overall photo-reconnaissance detection problem requires further analysis involving samples from a variety of targets and environments. 97

The study was conducted by the Computer Application Section of RADC as an in-house project. A detailed description of the extraction techniques and the analysis performed at RADC were presented at the 1970 Army Numerical Conference in a paper co-authored by Mr. Donald F. Roberts and Lt Jerry Milton of RADC and Mr. James R. Rapp of the Army Ballistic Research Laboratories. 98

99

AN IN-THE-HOUSE EVALUATION OF THE ARPA SPONSORED MULTIPLEXED INFORMATION AND COMPUTER SERVICE (MULTICS) 100

In FY-71, in-house personnel of RADC's Information Processing Branch successfully implemented and evaluated the MULTICS computing system on the RADC/Honeywell 645 Computer. MULTICS (Multiplexed Information and Computing Service) is a computer system which permits many users to access the computer simultaneously and provides system and application programming aids which allow users to perform complex programming tasks. MULTICS has been under development, under ARPA sponsorship, at the Massachusetts Institute of Technology for several years. The system is presently operational in the MIT environment. 101

In addition to evaluating the performance and reliability of MULTICS, several data processing applications characteristic of the needs of future military information processing systems were written and exercised on the system. The results, observations, and conclusions of

this in-house effort are documented in the report, "RADC/MULTICS EVALUATION", RADC-TR-71-121, May 1971. The work emphasizes the advantages MULTICS provides over conventional operating systems in the area of: data management, security and protection in a multi-programming environment, resource sharing (both data and programs), handling of unpredictably larrge computer programs, manipulation of large files of the order of 30 million words and the creation of complex software subsystems. 102

The MULTICS operating system transforms the GE-645 into a virtual machine available to users through teletypes. Storage, processing and I/O are all symbolically addressed by the user. Storage, i.e., the user's address space, appears as an unlimited number of named segments, each up to 64K words in length. Processing requests are symbolic calls to operating system modules which perform requested tasks for the user. I/O appears as a symbolic character stream which the user may direct to real peripherals as well as to symbolic segments. 103

The virtual machine is created by the operating system which is written in PL-1. Since the PL-1 compiler produces re-entrant code, each operating system module is shareable and appears in the address space of each user. User programs, including subsystems, are sharable. A protection mechanism based on ring numbers is used to protect the operating system and library programs from user errors or maliciousness. The sharing of data as well as procedures has been realized with MULTICS. Inter-process communication can be used to support concurrent efforts to problem solution or workload disposition. 104

BACKGROUND INFORMATION--Dr. La Berge

The file system gives users a hierarchical, symbolic, virtual memory through an automatic multi-level store and paging. Each segment consists of 1K pages which are located either in disk, drum, or core memory. The user is neither aware of the location(s) of a segment's pages nor that pages exist. Because MULTICS is usable at a conceptual and symbolic level and because system programming is done in a higher level language, the cost of programming is felt to be significantly reduced from that on more conventional systems such as GECOS. The ability to define and solve more difficult system problems also results from this unifying conceptual view. This view is also supported by Honeywell which is installing MULTICS in Waltham and Paris for "software factory" purposes. 105

106

EXTENDABLE PROGRAMMING LANGUAGE RESEARCH 107

Research initiated in 1968 on the development of flexible and efficient programming languages culminated in 1970 in the design and initial implementation of the programming language EL1 and its programming environment ECL. ECL provides for the on-line conversational construction, testing, and execution of programs written in EL1. Specifically, ECL contains an interpreter, a compiler, and an editor--all callable either by the programmer or at run-time by a computation. In addition, ECL provides facilities for executing processes in parallel and for handling software and hardware interrupts. 108

The language EL1 is an extensible language. It provides facilities for syntactic extension (the addition of new kinds of information

structures), and operator extension (the addition of new operations associated with new data types). 109

It is easy to construct inefficient programs using extensible programming languages. ECL and EL1 have been designed to greatly reduce the kinds of inefficiency peculiar to most extensible programming systems. For example, a special compiler, at the programmer's option, represents data types in a space-efficient or time-efficient manner. Moreover, to facilitate debugging, programs can be run in an interpretive mode; but as portions of the program are debugged, they can be compiled, since compiled and interpeted functions can call each other in either direction. But more important, the programmer can supply as much declarative information as he wishes at the time a function is compiled, and the compiler will produce progressiveely better code. For example, he can specify that the data type of a variable is either: 1) completely dynamic at run-time; 2) restricted to a specific set of possible data types; 3) fixed in type, but with unrestricted length; 4) fixed in type and length; or 5) fixed in type, length, and value. As more restrictions are placed on the variable, the compiler takes progressively more action at compile time, and the compiled code becomes more compact and efficient. 110

In short, the ECL system allows flexible program construction and testing coupled with facilities for subsequent optimizing of code so that an efficient program can ultimately be delivered. 111

The design of EL1 and portions of ECL is given in ESD-TR-70-297, dated May 1970. 112

BACKGROUND INFORMATION--Dr. La Berge

113

MILESTONE ACHIEVED IN THE UPDATE OF THE STANDARD AF COMMAND AND CONTROL COMPUTER LANGUAGE - JOVIAL 114

FY-72 marked considerable progress towards the goal of modernizing the JOVIAL J/3 computer language, the USAF language standard for Command and Control applications. The designation of JOVIAL as the programming language on a number of AF systems, particularly the B-1 Avionics program, has provided the impetus for accelerating the language update work, and a new committee structure has been evolved. Work is now progressing rapidly with JOVIAL experts under direct full time contract. The language revision effort, coupled with the initiation of other R&D development efforts for JOVIAL tools, will provide the USAF with a hitherto unheard of capability for standardization and control of a computer language. These ancillary efforts are: 115

Development of a meta-language for precise and unambiguous description of both syntax and semantics of the JOVIAL language. 115a

Development of a JOVIAL compiler implementation tool, JOCIT, for generating JOVIAL compilers, transferring the compilers from machine-to-machine, and/or generating object code for machines other than the host machine on which JOCIT resides. 115b

Development of a JOVIAL compiler statistics collector for gathering data on language usage, programmer patterns, and error statistics. 115c

Development of an evaluation facility for measuring the effectiveness of software tests. The initial implementation will enable automatic

structural analysis of the logic of JOVIAL code, and will assist in establishing a confidence factor for the reliability of software. 115d

Development of a machine-independent programmer's reference manual for JOVIAL. 115e

Development of software documentation standards. 115f

All of the above are necessary steps in the goal of attaining cost effective, reliable software for the USAF, while at the same time retaining a high degree of machine independence. 116

117

RADC PROVIDES SUPPORT TO THE JOINT SERVICE TECHNICAL SUPPORT AGENCY OF THE DEFENSE COMMUNICATIONS AGENCY 118

In November 1970, RADC (ISIS) received a copy of the JOVIAL Compiler Validation System (JCVS), developed under Contract F19628-68-C-0301 for ESD by Data Dynamics, Inc., and initiated an in-house effort to evaluate the system as a compiler validation tool. The system is designed to measure compliance of any JOVIAL J3 compiler against the language/compiler specifications in the JOVIAL standard (AFM 100-24). To determine the value of such a system, the following problems required resolution: (1) errors in the basic test modules had to be corrected; (2) ambiguity of test results had to be removed; (3) I/O specification for each compiler implementation had to be specified. 119

To resolve the above problems, compiler tests were conducted on virtually all major computer systems which employ JOVIAL compilers, including the HIS 6000/600, IBM 360, CDC 6400, and UNIVAC 1108 computers. An abundance of errors was found in both the so-called COBOL

Driver Routines, which are used to process the JCVS test modules and the JCVS test modules which make up the Population File. Several hundred runs were required to thoroughly debug the test modules. Effort on the COBOL Driver Routines was dropped because of their poor condition. Different sets of I/O test modules were written and incorporated as part of the JCVS at each site prior to compiler testing. 120

To ensure that test results were indeed representative of compiler performance, additional tests were developed in areas heretofore neglected. Such areas include: error processing and reporting, capacity, efficiency (code expansion ratio), and machine/implementation dependent features. This expanded set of JCVS tests was employed to acceptance test the Honeywell Information Systems (HIS) 6000/600 WWMCCS JOVIAL compiler. The tests were conducted at the request of the Joint Technical Support Activity (JTSA). 121

Future plans include developing a "transferable" JCVS which will (1) incorporate modifications required by recent changes to AFM 100-24; (2) implement a system to fully automate the JCVS; and (3) develop all supporting documentation, including a User's Manual, to ensure that the JCVS can be effectively employed as a compiler validation tool in future procurements. 122

123

RADC ACQUIRES OFF-SHELF MICRO-PROGRAMMABLE ASSOCIATIVE PROCESSOR TO ASSIST IN "SOFTWARE FIRST" DESIGN AND COST/EFFECTIVE EVALUATION OF ASSOCIATIVE PROCESSING 124

Advanced studies (Command and Control - Post 85) have indicated the

need for processing capability in access of 500 million instructions per second (MIPS). A "Software First" test bed for evaluating an associative processing approach was designed and implemented in the Fall of 1972. The off-shelf computer selected is the SIMDA (Single Instruction Multiple Data Array) fabricated by Texas Instruments. It has one million bits of data storage, 36 thousand words of instruction memory, and operates under dual control allowing the array to be partitioned into a simultaneous processing and I/O mode of operation. I/O to the array can be made in the word slice direction or the bit slice direction. The array has any word to any word communication capability. 125

The SIMDA machine interfaced to RADC's Honeywell 6100 running under the MULTICS operating system will provide the structure for the cost-effective design of an Associative Processor for Advanced Air Surveillance, Command and Control, and Real Time ELINT (TOA), as well as the capability for simultaneous software development. 126

127

RADC WILL APPLY ITS IN-HOUSE DESIGNED GENERALIZED DATA MANAGEMENT SYSTEM (DM-1) TO THE RADC RELIABILITY ANALYSIS CENTER 128

The in-house test and evaluation of the initial version of the DM-1 data management system has been successfully completed. The main emphasis of this Phase I testing was to determine whether the DM-1 system functioned as designed. The results from this testing demonstrated that the DM-1 system does operate effectively within the complex environment of GCOS on the Honeywell 635 computer system. 129

BACKGROUND INFORMATION--Dr. La Berge

The DM-1 system represents an advanced state-of-the-art data management system that is modularly programmed to facilitate the generation, maintenance, query and analysis of data bases. The areas specifically tested were: data structure and definition, data manipulation functions, DMS system controls and host environment interrelationships. The following is the evaluation of these areas: 130

A total of seven unique Air Force data bases were defined to DM-1 in a variety of data structures that included both external and internal data base definitions. The internal files were loaded as random, random-serial, and serial structures with unique and multiple indexed fields on both primary and secondary levels of a data structure. The DM-1 data definition language, which allowed the user to formulate these structures, is both extensive and flexible. 130a

The data manipulation functions of DM-1 allow the user to manipulate his data through a sequence of data access verbs at the programmer level or data command verbs at the user level. These functions allow a given file to be searched, displayed and maintained based on a series of permissions at given levels. Data interrogation allowed for: retrieval of data base on specifications, deletion of selected data, sort or order by index lists automatically, and formatting the results for output. 130b

The DM-1 system maintained adequate housekeeping capabilities throughout the series of tests performed on it. All system tables were kept secure from user interference and were updated only when the integrity of the data being modified was secure. A monitoring

capability was available to system users to trace their movements throughout system usage. Data is recorded and kept for use in determining error analysis. 130c

The host environment interrelationships permitted DM-1 to interact completely with the GCOS envircnment. A series of programs were written in FORTRAN, COBOL and JOVIAL, all of which acted upon DM-1 data structures. The DM-1 data was configured for removable disc packs to make it more convenient for the user. The system was booted in an environment which could be easily tuned to specific user requirements. The executive interface module DMEXEC worked closely with the executive services of GCOS to maintain an efficient data storage and to optimally retrieve a given number of storage blocks from secondary storage upon commands. 130d

During the evaluation of DM-1, a series of developments led to the Reliability Analysis Center's (RAC) interest in the advanced capabilities of the DM-1 system. RAC's needs, plus the evaluation findings on DM-1, indicated that DM-1 could effectively be used to solve their data handling functions. This eveentually led to the selection of DM-1 as the data management system for the RAC. Since this selection, DM-1 is currently being further enhanced with proposed development of a query language and a complete report production system. These additional capabilities would enable the DM-1 system to completely evolve to a user specified information management system. 131

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EIS AND H6000 HARDWARE CAPABILITY STUDY 133

BACKGROUND INFORMATION--Dr. La Berge

In November 1972, RADC (IS) received a request from AF/ACDC indicating an urgent requirement for testing in support of the Worlwide Military Command and Control System (WWMCCS) procurement. Specifically, information was needed on the capabilities of Honeywell's Extended Instruction Set (EIS) and on the compatibility of the Honeywell H600 and H6000 series of computers. 134

To accomplish this task, the following steps were taken: 135

RADC formed an in-house task force of personnel intimately familiar with Honeywell hardware and software. 135a

RADC solicited technical assistance from SAC, NORAD, Data Services Center, and the Navy to formulate and conduct tests. 135b

RADC wrote a test plan that outlined procedures and resources necessary to: 135c

determine the effect the Extended Instruction Set has with the COBOL Compiler on the H6000 computer. 135c1

determine both hardware and software differences between H635 and H6000 computers. 135c2

determine relationship between the H61000 and the H6000 computers. 135c3

RADC conducted a series of tests utilizing data obtained from SAC, NORAD, Data Services Center and the Navy's COBOL Validator System.

RADC insured the validity of these tests by sending representatives to the Navy's Computer Center in Boston and SAC Headquarters in Omaha to conduct on-site testing of government H6000 installations. 135d

RADC then analyzed all results and prepared a report entitled, "EIS AND HARDWARE COMPATIBILITY STUDY" for AF/ACD, MCS/ESD. 135e

As a result of this study, RADC determined that: 135f

EIS has potential benefit to COBOL, FORTRAN, and JOVIAL Languages, and the WWDMS data management system. 135f1

The study indicates a minimum average 19% decrease in execution time and a minimum average decrease of 18% in number of machine instructions for mixed COBOL programs utilizing EIS. 135f2

The WWMCCS version of GCOS that executes on the H6000 should execute on the H635 and can thereby serve as direct backup to the H6000. 135f3

The H6100 offers complete compatibility with even or odd numbered series H6000 line computers. 135f4

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VALIDATION OF THE WWMCCS JOVIAL COMPILER 137

In March 1972, RADC (ISIS) received a request from CSAF to conduct the WWMCCS JOVIAL Acceptance Tests for the Joint Technical Support Activity (JTSA) at Honeywell Information Systems (HIS), Phoenix, Arizona. To accomplish this task, the following steps were taken: 138

RADC organized a Joint Acceptance Test Team consisting of RADC, NORAD, and ADC representatives. 138a

RADC wrote and distributed the Acceptance Test Plan and Procedures to JTSA and to all test team representatives. 138b

RADC conducted the Acceptance Tests, with the assistance of test team representatives, and prepared a preliminary report of test results. 138c

RADC then prepared and distributed a Final JOVIAL Acceptance Test Report which summarized all test results and included a specific recommendation that the JOVIAL compiler not be accepted by the procuring agency. 138d

To insure that the WWMCCS JOVIAL J3 compiler met the requirements of AFM 100-24, as amended by the WWMCCS contract, several classes of tests were developed by RADC which include: (1) language features (JCVS); (2) error detection and reporting; (3) capacity; (4) efficiency; (5) machine/implementation dependent features; and (6) generalized/other tests. 139

Validation of items in Class 1 was avcomplished through use of the JOVIAL Compiler Validation System (JCVS) as debugged, modified and maintained by RADC. The objectives of the JCVS are to establish that: (1) each language feature is accepted by the compiler; and (2) execution of the resulting source code produces the correct results. Proof that these objectives are indeed accomplished was obtained by running the JCVS against JOVIAL compilers on virtually all major computer systems, including earlier versions of the HIS 6000 series compiler. Tests in Classes 2,3 were procured primarily from NORAD with test variations/alternative from RADC. Tests in Class 4 were representative SAC programs used for determining efficiency or code expansion ratio. Class 5 tests were written by RADC and Class 6 by ADC. The complete package of tests was assembledd compied in a variety of formats to insure ease of use and interpretation of results. 140

The growth of capability at RADC in JOVIAL compiler validation is

particularly significant since JOVIAL is playing an ever increasing role in computer languages. The WWMCCS tests are a milestone in that these tests represent the most thorough analysis of this type ever conducted on a compiler procured by a Government agency. Such documentation and test materials should serve as a valuable compiler validation tool in future procurements.

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TARGET CLASSIFIER FOR SEISMIC SENSORS

143

Target classification logic and identify intruding targets, men, armoured personnel carriers, trucks, helicopters, and propeller aircraft using tactical surveillance sensors. This logic was developed by an in-the-house engineering team using the On-Line Pattern Analysis and Recognition System (OLPARS). The data was provided by RADC's West Lee Test Annex and was collected during runs, at varying distances, past the seismic sensor.

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The data was analyzed and 48 features were extracted. The OLPARS was then used and logic designs usuing 12, 15, 16, 22, 33 and 44 of these features were developed. The 16 feature design offered the best compromise between recognition accuracy and design complexity (which affects cost) and was chosen as the output product. This design has a design set probability of correctly classifying independent test set probability was .853 which indicates the performance to be expected in the field. These results compare favorably with the best previously available seismic classifier design which uses 18 features to identify

targets as either vehicle or people with a probability of .861 on the design set.

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147

WAVEFORM ANALYSIS AND DISPLAY SYSTEM

A Waveform Analysis and Display System (WADS) has been implemented at RADC by an in-house development team. The system has been implemented on a time-shared general purpose computer. An interactive storage tube device is used to display digitized waveforms and alphanumeric data required for analysis. The analyst communicates with the system via an alphanumeric keyboard. A hardcopy unit included in the system provides immediate copy of any data displayed on the storage tube.

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The system provides for input of digitized waveforms from tape in both on-line and off-line modes. A filing system was developed to facilitate storage and retrieval of the data on a 4.6 million word removable disc pack. The waveform data is plotted in the time or frequency domain in a variety of display formats. Additional information pertinent to the waveform data is computed and displayed as requested by the analyst. The system can be expanded to include new display formats or additional analysis programs as required by individual applications.

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The system has been used to display and analyze seismic and photometric waveform signatures for the purpose of defining features that discriminate classes of targets. However, the system is useful for

any waveform analysis problem that requires random access to data, graphics display, and hard copy output.

PLASMA DISPLAY INTERACTIVE TECHNIQUES

Recent research and development work involving plasma display/storage panels has yielded significant results. The research, performed by the University of Illinois and sponsored by RADC, has been aimed at broadening the interactive capabilities of plasma displays. Two significant advancements have been made during the past year. They are the development of techniques for implementing a light pen capability and techniques for electrically reading out the state of any element within the display matrix.

Successful techniques for producing pointing and tracking ls have been developed. Because image patterns are stored within the plasma display screen and are not periodically refreshed, the operating requirement for light pen capabilities are completely different from those of cathode ray tube systems. Using a fiber-optic "pen" and a specially designed light pen processor, an operator may position a visible cursor anywhere on the display screen for purposes of editing or creation of graphical or textual material. Depending upon the mode of operation, a visible track may or may not be left along the pen's path. The tracking process is non-destructive. As the cursor moves past an area, the original information is restored. Through the addition of a small amount of hardware and pointing algorithm, pointing light pen features were added. This feature is particularly useful for menu

selection and similar functions. The light pen features described have been physically demonstrated and tested. It has been concluded that such features are practical and highly suitable for plasma display graphic terminals. 154

Using commercially available panels the University of Illinois has designed, implemented, and tested a unique electrical readout system. The new circuitry takes advantage of the inherent storage properties of plasma panels, enabling displayed image patterns to be readout directly to central processors, hardcopy output devices, or other display terminals. Using cell voltage-sensing techniques, the readout scheme was applied to a 128 - 30 Digivue panel (128 X 128 matrix with a cell density of 30 cells per inch). Using cell parallel readout, speeds of 320 Kilobits per second have been demonstrated. The error rate was less than 1 in 1000000000 bits. As a result of this work, electrical readout for large scale plasma display arrays is considered to be technically and economically feasible. It is anticipated that this capability will be applied to 512 - 60 Digivue panels in the near future. 155

20368 Distribution
Duane L. Stone,

FJT 19-NOV-73 06:31 20369

tickler

Joe, I'm afraid I keep running out of room so I am getting rid of this also. I need December...If Donna can't do it within a day or so please let me know and I will do it...Bobbie

tickler

(nth1) 1 November - Thursday 1

DL Technical Review 1a

News Brief items due into Becky Today. Completed 1b

Bobbie: Personnel Strength Rpt. due. Completed 1c

Laboratory Activity Reports due today: Bucciero must have them by 1000, ISM must have them by 1100, and DOT must have them by 1600. 1d

Due Date - ISIM/D. Stone - Tech Eval of Cont Services with Imlac Corp - Completed 1e

(nf1) 2 November - Friday 2

Col Cosis - AFSC/DL will be here in the afternoon to visit & discuss a Management Information System for AFSC. Topics include Management Information Systems, Relational Data Bases and Data Management. 2a

Bobbie: Travel figures due by noon. 2b

(nm2) 5 November - Monday 3

0830 hrs. Branch Chief's Meeting 3a

MASIS Meeting for Tom B. in Bldg. 106 at 0900 hrs. in Room A-119. 3b

Backup Material must be submitted to DORP for DL Overview Briefing. 3c

Dry Run to Commander runs through 5 - 16 Nov for DL Overview Briefing. 3d

Due Date - Determination of Final Invention Report on Contract F30602-73-C-0024 with Auerbach Associates Inc. - ISIM/D. VanAlstine - Completed 3e

Due Date - ISI - Step Increase - R. Levine - Completed 3f

(nt2) 6 November - Tuesday 4

0830 hrs. ISC Confessions 4a

(nw2) 7 November - Wednesday 5

0830 hrs. Branch Chief's Meeting - Cancelled 5a

tickler

Center MIS - Presentation to IS - E. Kennedy responsible - Cancelled 5b

Due Date - ISIM/Calicchia - Reimbursement Agreement - Completed 5c

(nth2) 8 November - Thursday 6

0830 hrs. - Branch Chief's Meeting 6a

Laboratory Activity Reports due today: Bucciero must have them by 1000, ISM must have them by 1100, and DOT must have them by 1600. 6b

(nf2) 9 November - Friday 7

Due Date - ISIM/Capt Daughtry - Sponsorship of AFIT Student Theses - Completed 7a

Timecards due today. 7b

Bobbie: Travel figures due by noon. 7c

Due Date - ISIS/ISIM - Project Engineers Bimonthly Review of Tech Completions - Completed 7d

Due Date - ISIM/Stone - Tech Eval of Contract Services - F30635-74-M-0877, Maint Service for Execuports, Serial Numbers 2475 and 3125 and Tech Eval of Contract Services - F30635-73-M-1152, Maint Service for Execuport, Serial Number 2479 - Completed. 7e

20369 Distribution
Joe P. Cavano,