RLL 24-FEB-75 15:04 25451

'Final' citation template with complete discussion.

the template will be also journalized as a separate item.
This has been approved by all and thus is the desired and official format. At the moment no move is being made to change current citation to this new form.
This is also example of cooperative design; many people were involved and many cycles were made in the process of developing this format.

'Final' citation template with complete discussion.

The latest version is in branch called <template:wg>. ##### 1

Updated version: new branches (template); questions raised before are answered. 2

#This is an updated copy of the journal citation debate. New items are preceded by a '#'. Three new branches are Dialogue, New Comments, and 'Latest' Alternatives. The actual header in the journal file should contain the same information but it need not be in the same format. whether the format should be same, easily readable by the user, etc. is another issue to be resolved. 3

Various alternatives for a new journal citation. 4

One consideration is to allow each person to pick his own form. This would be stored in his ident record. The journal system (already having it loaded) would read the reference format name and use the appropriate "rel" file. If the "rel" file is not known or if none is specified, a default form will be used. 4a

There are two questions, what are the fields of information desired and what are the formats of these fields. These question are partially separate but not wholely. 4b

Some overall criteria to use for determining what fields are useful and where they should go. 4c

Citation should be as short as possible. 4c1

A form which is suitable for sorting. 4c2

Conform to other citations in the literature. 4c3

Take advantages of level and line capabilities. 4c4

Although a new journal system might not developed for some time, pressure for maintaining the same format will be very high and thus the future situation should be heavily considered. 4c5

e.g. multiple hosts 4c5a

(FIELDS) Below is a list of various fields, synoyms on the left. Arguments for or against this field to be included are found on the levels below it. 4d

AIDENT author ident 4d1

'Final' citation template with complete discussion.

PRO: Considered by most to be very important and should be on first line. 4d1a

ORG acronym of author's organization 4d2

CON: Easily obtained from ident record (which is available to journal system). 4d2a

PRO: For a large user community, the organization might be more meaningful than the person's ident or even his full name. 4d2b

PRO: This field is almost always included in most citations in the literature. 4d2c

#CON: could be very long for multiple authors; might not be suitable for following the AIDENT but on another line. 4d2d

NAME last name or full name 4d3

PRO: Most citation in the literature include full last name and initials 4d3a

CON: With the ident system one only needs to show record for ident. 4d3b

#CON: could be very lengthy for multiple idents. 4d3c

DATE day, month, and year when mail item was sent, (dd-mm-yy) 4d4

PRO: Used by many as a sort parameter. 4d4a

CON: should not be on first line since it does not add to the recognition of what this mail item is. For those you like to sort on it, programs can be coded even if it appears on a second or third line. 4d4b

#PRO: should be on first line to permit later, immediate retrieval; if the item is old then it might be irrelevant hence after author this might be the next important item. 4d4c

TIME time that the mail item was sent (xx:xx:xx); 24 hour clock or AM/PM 4d5

PRO: Gives another means for uniquely (almost) identifying mail item (especially SndMsg items). 4d5a

#PRO: important for tracing the history of a dialog 4d5b

'Final' citation template with complete discussion.

ZONE time zone 4d6

PRO: Users of the system are scattered among various time zones. 4d6a

PRO: It is possible that different computers might be in different time zones. 4d6b

CON: The journal system should maintain only one time zone for dating of mail items. 4d6c

DAY day of the week that mail item was sent (MON TUE ....) 4d7

#CON: seldom relevant 4d7a

RDATE: date and time when mail item was received. 4d8

CON: Not needed, one can use the signature of the statement. 4d8a

PRO: Signatures are not widely known and are costly for TNLS users. 4d8b

#PRO: Statement signatures may be meaningless, since user can edit his citation statement. 4d8c

#PRO: Could point out interesting and serious communications dynamics; delivery is not always immediate and items may be very timely. 4d8d

JNUM journal number 4d9

PRO: Useful for sorting and uniqueness of item; only of value in first line. 4d9a

CON: Duplicates information in LINK. 4d9b

CON: LINK might be better on first line. 4d9c

LINK complete journal reference in form of link 4d10

PRO: Should be in first statement of citation in order for jump to link to work when only first line is bugged or referenced. 4d10a

PRO: Even for messages that are delivered with the citation it should be present. This enables one to delete the message and still have the link. 4d10b

PRO: For messages that are delivered with citation

((ncluding SNDMSG mail) this should be a link with only viewspecs that opens up the view to show the whole message. This is predicated on the user having only a clipped view initial. 4d10c

#PRO: a second link might be desirable if the message follows immediately. The first link would just open up the view and the second would bo the complete reference link. 4d10d

TITLE the title or subject of mail item 4d11

PRO: Nearly everyone agrees this is the most useful field. 4d11a

COMMENT comments 4d12

PRO: to be put at a level below main citation. 4d12a

DIST distribution list of idents 4d13

#PRO: In participating in a dialog, I need to know who else is currently involved and might be interested in my response. 4d13a

#PRO: Should be exhaustive (including recipient himself) since citation could be copied by someone not on list. 4d13b

TO distribution list of idents receiving mail as action 4d14

PRO: Distinction should be made between list of people receiving item and those receiving an information only copy. 4d14a

CC distribution list of idents receiving mail item as information only 4d15

PRO: Distinction should be made between list of people receiving item and those receiving an information only copy. 4d15a

CON: Can use uppercase and lowercase to distinguish action and info copies. 4d15b

PRO: For uppercase only teminals, uppercase/lowercase will not distinguish 4d15c

#FROM the author(s) ident 4d16

#PRO: to be included if the full name or full last name is used instead of ident. 4d16a

#PRO: can serve as place where author's organization can be

specified since the ORG might be too much for the first line. 4d16b

#PRO: conforms to existing formats used by many organizations including the federal government. 4d16c

#FORWARD name of person forwarding this mail item. 4d17

PRO: It would be nice to know who sent you the item. Cannot assume author if it were secondary distribution. 4d17a

#FDATE date and time when person forwarded this mail item. 4d18

PRO: The time and date when sent, when received, and when forwarded are different and may be important for historical and political reasons. 4d18a

TYPE the word ACTION and INFO, for action or information 4d19

PRO: For a shorter citation just a short word might suffice 4d19a

PRO: Useful on the first line of citation to quickly determine whether to read mail or not. 4d19b

PRIV privacy type (priv or public or blank) 4d20

PRO: Might be nice to know if item is private or not. 4d20a

#PRO: tells recipient whether or not to share article with others. 4d20b

#UNREC unrecorded status. UNREC if unrecorded; blank if recorded. 4d21

PRO: If one depends on the indexes for later retrieval, then one is lost if the mail item is unrecorded. 4d21a

ORIGIN name of originating host computer 4d22

PRO: might be nice when there are many hosts (Office-1,2,3,4,5...) 4d22a

#PRO: helps locate author. 4d22b

#PRO: it is the place of "publication" which is often included in many citations. 4d22c

REF references 4d23

'Final' citation template with complete discussion.

PRO: Often used in many memos and useful for recipent. 4d23a

KEYW keywords 4d24

#PAGES number of pages (or suitable unit) of document 4d25

PRO: could be the number of disk pages or approximate number of hardcopy pages, or number of statements. An often used item in citations. 4d25a

Leading contenders for the new journal citation format and Comments (author ident at beginning). 4e

(JEW) provide several options and have the journal use your prefered format. (This is clearly the way to go.)(KIRK)(CHI)(RLL) 4e1

In addition, have a special directory containing userprogram formats ok'd by the journal programmer. 4e1a

(NDM) JFORM3.CA (matches MESSAGE,SUBSYS format) 4e2

DATE TIME AUTHORIDENT: The title begins here terminated by a CR and 3 spaces
Distribution: ACTION IDENTS ARE UPPER CASE info only idents are lower case
Received at: 12-OCT-74 04:31
(JJOURNAL,12345,1:w) 4e2a

Text of Message is a substructure statement. Note and Comments are also seperate statements in the order listed below. Note: in the statement above this, indentation does NOT represent a change in level. 4e2a1

Note: [ACTION] 4e2a2

Comments: Comments would appear last. 4e2a3

(KEV) modification of jform2 4e3

AUTHOR-IDENT: The title here would be terminated by a carriage return
DAY DATE TIME <Message -- 12345,>
TO: myident(comment to me) BUGS abc def 4e3a

Comment: date and time would contain the day of the week. 4e3a1

Message: The message occurs after the comment and is a

'Final' citation template with complete discussion.

statement in the substructure. For Journal links, <Message-- 12345,> would be replaced by <JJOURNAL, 12345,> 4e3a2

(JHB) places most parameters on first line including beginning of title. 4e4

DATE SENT (ONLY) AUTHOR(S) JNUMBER The title begins here terminated by a CR and 3 spaces
Received: TIME DATE; Sent: TIME
TO: Idents of recipients for action followed by a CR and 3 spaces
CC: Idents of recipients for info only followed by a CR and 3 spaces
Link or message is appended to citation here. Note indentation does not represent a change in level. 4e4a

New statement here is for comment. 4e4a1

New statement here is for notes. 4e4a2

(KIRK) closely resembles standard reference formats 4e5

AUTHOR-IDENT, Title begins here after a comma and has no CR following it. <JJOURNAL, 12345,> SITE DAY DATE TIME 4e5a

Distribution: UPPER CASE IDENTS FOR ACTION lower case idents for info-only 4e5a1

Note: this is where a note would appear. 4e5a2

Comment: this is where comments would appear. 4e5a3

For messages, "<JJOURNAL, 12345,>" is replaced by "Journal Number 12345" and the text of the message is located here. Distribution, Note, Comment, and Message are all separate statements in substructure. 4e5a4

(xxx) Just to see if all fields can fit. 4e6

AIDENT ORG TITLE, LINK, DATE TIME ZONE DAY ORIGIN <CR><SP><SP><SP> RDATE TYPE PRIV<CR><SP><SP><SP> TO: identlist<CR><SP><SP><SP> CC: identlist[next level down] COMMENT[next statement] REF[next statement] KEYW[next statement]Message (if delivered with citation) 4e6a

4e6b

Example. 4e6c

RLL 24-FEB-75 15:04 25451

'Final' citation template with complete discussion.

RLL (SRI-ARC) A Note on the future of journal headers,
(JJOURNAL,12345,1:w), 22-OCT-74 1332 PDT WED at OFFICE-1
Received at: 22-OCT-74 1356 PDT for ACTION (PRIVATE)
TO: ABC DEF GHI
CC: JKL MNO PQR SRT 4e6d

Comments: Just a test for fun. 4e6d1

REFERENCES: (MJOURNAL,34567,1:w) 4e6d2

KEYWORDS: test, journal, header 4e6d3

#Dialogue [new since last journalization as (MJOURNAL, 24284, 1:w)] 5

7-JAN-75 2247-PST LIEBERMAN: New Journal citation
Distribution: ENGELBART, norton, lieberman
Received at: 7-JAN-75 22:47:33 5a

Doug: I would like to talk to you about the new journal citation that will be delivered via the sendmail/journal system,
I have a file called <lieberman,headers,> that contains the comments, discussions, etc, on this subject. Sometime next week I hope applications will meet to decide the format. (JCN how does that go with you??) A meeting with you (DCE) before this I think would be appropriate. Robert 5a1

5-JAN-75 0951-PST BAIR: Journal citation meeting
Distribution: LIEBERMAN, bair
Received at: 5-JAN-75 09:51:30 5b

Rob, How about Weds morning if there are no conflicts?
How does it feel to be back? See ya, Jim 5b1

KIRK 30-DEC-74 16:29 24859 journal headers/citations
Some reasons for having <:wg> and using angle brackets in general in the proposed new sendmail 'envelope' format
Location: (GJOURNAL, 24859, 1:w)
*****Note: [INFO-ONLY] *****
5c

RLL 26-DEC-74 13:54 24828 Journal citation dialogue second go
Journal citation dialogue: second go around; two alternatives; call for a meeting.
Location: (GJOURNAL, 24828, 1:w)
*****Note: Author Copy*****
5d

Comments: I think it is time that a decision is made as to the

'Final' citation template with complete discussion.

form of the citation. Perhaps a meeting some time the week of january 6th. Send your responses to me (RLL) on either date and time or comments on alternatives. Thanks Rob 5d1

KIRK 17-NOV-74 01:52 24530journal citations
Good and Bad NLS practice reflected in your proposed sendail citation
Location: (GJOURNAL, 24530, 1:w)
*****Note: [ACTION] *****
5e

DVN 7-NOV-74 16:46 24437
One More thought about Journal Deliveryy
Message: As a step toward (documentation, final,,6b6c4) and the rest of that plex, what the journal should do is enter in everyone's initial file an author,keword, and arrival data catalog of journal items sent to her or that she sent.
*****Note: [ACTION] *****
5f

KEV 28-OCT-74 17:33 24337
journal citations again 5g

Message: The issue that pean raises (in-- 24336,) (and I think Jake raised it also) about having sort programs, etc. work is I beleive looking at the citation issue in the wrong way. The problem, as I see it, is having citations presented to an INDIVIDUAL user in the format preferred by that INDIVIDUAL user. Then if an individual wishes to sort her citations, it is her responsibility (perhaps with our help) to provide the sort keys, programs, etc. that will sort the citations in the desired manner. Obviously, these programs must be aware of the format of the citations they are to sort. 5g1

If an individual wishes to make use of pre-existing sorting programs, then she must see to it that her citations conform to the input format required by the program to be used (and of course both available programs and required citation formats should be published). All the catalog production programs that I am aware of, do not go through individual initial files to get their data, but work on other data bases. Thus, if an individual is only interested in seeing who wrote an article, when it was written, and where it lives, (admittedly a perverse example), there is NO need to have the title in the citation that gets delivered to this person.
*****Note: [ACTION] *****
5g2

RLL 24-FEB-75 15:04 25451

'Final' citation template with complete discussion.

Comments: I do have one or two other things to do, but occasionally I need a relief from them! 5g2a

NDM 28-OCT-74 15:34 24336
Opinion on Journal Citation Delivery Format
Location: (MJOURNAL, 24336, 1:w)
*****Note: [INFO-ONLY] *****
5h

Comments: Modifies slightly format listed as NDM's choice in (24284,). 5h1

27-OCT-74 2047-PDT BAIR: Journal headers
Distribution: LIEBERMAN, bair
Received at: 27-OCT-74 20:47:29 5i

Rob, All my input is in...a clear statement of what it shoould in view of your suggestions. That comprimise should satisfy all .
I do not think it should be sent to KWAC. It would be very inconsistent with previous design poloicypolicy. (witness the unilateral imposition of the info and attention branches.) 5i1

CHI 25-OCT-74 10:26 24324
Journal Citation Recomendations 5j

Message: Robbert, I have the following recommendations re journal citations delivered to users: 5j1

1) The recipient should be able to choose among several citation formats for mail delivered to him, or perhaps make up his own ala KEV's suggestion (This desired Citation format could be stored in master ident file) 5j2

2) The distribution lists should be made available to the recipient 5j3

3) the [ACTION] and [INFO-ONLY] fields should not be removed from the citation even though they are deposited into action and info branches (because if the user moves them he looses this info) and
4) I would like a citation format that had the author and title (as much as would fit) in the first line for t_viewspec.
*****Note: [ACTION] *****
5j4

JAKE 24-OCT-74 22:58 24319
Op. Cit.
Location: (MJOURNAL, 24319, 1:w)

RLL 24-FEB-75 15:04 25451

'Final' citation template with complete discussion.

*****Note: [INFO-ONLY] *****

5k

DVN 24-OCT-74 22:17 24318
More On Journal Citations
Location: (MJOURNAL, 24318, 1:w)
*****Note: [ACTION] *****

5l

KEV 24-OCT-74 14:38 24315
journal citations revisited
Location: (MJOURNAL, 24315, 1:w)
*****Note: [ACTION] *****

5m

JBP 24-OCT-74 09:58 24294
journal headers
Location: (MJOURNAL, 24294, 1:w)
*****Note: [ACTION] *****

5n

JHB 24-OCT-74 08:56 24291
re J24269: Journal notification & info/action branches
Message: I agree with Dirk's notion aout these 2 new features, particularly info and action. These are arbitrary categories at best, and serve to force additional compensatory decisions on the real users. IT's difficult not to be snide, but I don't recall any debate or even discussion about this.
I hope that the items that have been sent by myself and others on the Journal citation format are ok. If not let's have some discussion on them !
*****Note: [INFO-ONLY] *****

5o

RLL 23-OCT-74 22:38 24284
New Jornal header: alternatives; call for comments and additional input.
Location: (MJOURNAL, 24284, 1:w)
*****Note: Author Copy*****

5p

Comments: Comments received by FRiday 25Oct74 will be included for next pass which will include the KWAC. Thank you for contributing.

5p1

17-OCT-74 0755-PDT BAIR at OFFICE-1: Journal citation format
Distribution: KELLEY AT SRI-ARC, engelbart at sri-arc, norton at sri-arc, watson at sri-arc,, lieberman at sri-arc, bair at

'Final' citation template with complete discussion.

sri-arc
Received at: 17-OCT-74 07:56:01 5q

Dear Kirk, I understand (second hand) that you are in charge of the design of a new Journal citation format. In that case, I would like to cast my vote for the following (coordinated with RLL): 5q1

DATE SENT (ONLY) AUTHOR(S) JNUMBER TITLE <CR>
Received: Time and date; Sent: Time<CR>
TO: Idents of recipients for action<CR>
CC: Idents of recipients for info<CR>
Link or message
<new satements>comments. 5q2

This would permit a sort on meaningful fields, date and author ident, and would fit enough of the title on the first line for informative 1 line 1 level perusal. I think this is consistent with what most Utility clients want.
Thank you, Jim 5q3

#New comments [new since last journalization as (MJOURNAL, 24284, 1:W)] 6

A basic dilemma 6a

It was noted that the people at ARC are not typical of the overwhelming majority of users and, therefore, are a poor group to make the decision as to what citation should look like. 6a1

It was also noted that the users are basically unsophisticated (at least at the moment) and do not understand the potential and facilities of NLS, therefore they are a poor group for which to base the format of the citation. 6a2

It is hope that an evolving format will most likely be the best long term solution. In this case the more knowledgeable group (ARCers !!!) should have more say at the moment. 6a3

The link should always be in angle brackets: 6b

to stand out 6b1

to have a higher probability of not conflicting with some parenthetical remark. 6b2

to conform to the statement zero in a file. 6b3

The message (if delivered) should stand out. 6c

'Final' citation template with complete discussion.

It would be nice to have the message appear earlier so that one does not have to go through all the extra info. 6d

Levels should be used rather than lines for formating. 6e

If a 'line' actually is two or more line the format will look poor. 6e1

Some lines will be lost if more than two are present. 6e2

JHB believes his suggestion is most consistent with what utility clients want. He belives DATE, AUTHOR and TITLE are the important fields for the first line. 6f

Several people did not like the pending split between INFO and ACTION branches. 6g

CON: arbitrary categories 6g1

CON: most users integrate items based on date or subject not these categories 6g2

CON: force additional compensatory decision on users 6g3

CON: it would be better to have a code on first line indicating these two categories so that users can quickly judge whether to read the item or not. 6g4

Almost all agreed that some selecton of templates should be made available for users. Most also agreed that the method by which the user can specify his own would be desirable. 6h

An extensive preliminary specification of a template system to generate user defined formats was given (see -- MJOURNAL, 24315, 1:w) 6h1

It was mentioned that allowing arbitrary formats for the user would make it difficult to maintain a full selection of sort programs. 6h2

CON: For each template a sort program might have to be written. 6h2a

PRO: Sort programs are really only useful for the master indexes and if a user wishes to sort his items and makes up his own template he should also make up his own sort routine. 6h2b

'Final' citation template with complete discussion.

PRO: if a user wishes to sort his items and makes up his own template he should also make up his own sort routine. 6h2c

CON: It is a magnitude more difficult to make up a sort program than to specify a template for a header format. 6h2d

A suggestion was made (see -- MJOURNAL, 24318, 1;w) that it would be nice to have a daily (weekly ??) list generated of all journal items. This would serve to increase the usefulness and dialog interchange of the journal system. 6i

Most agreed that almost all the fields should be given. It is easy enough to delete fields or reformat but not easy to retrieve information from various sources and from various encryptions. 6j

One person stated that he used the date and time fields to trace the history of a dialog and as the primary access to items. He was in the minority as for primary access but most agreed that it was important and should be present (but not on first line). 6k

The following is a quote from one responder. 6l

The file itself ought to be a complete repository for information about that item. I think it is more important to have a format where the information is accessable in easily defined fields rather than deciding now what is pretty and/or limiting the content to what we currently think is standard/important. I think we ought to use the standard catalog citation format in the origin statement of journal file. 6l1

A distinction was made between citations delivered to users initial files and what is kept in the journal itself (as a header). (see -- MJOURNAL, 24319, 1;w) 6m

The concerned here was for the actual header in the journal. A strong desire was issued to have this look very much like the 'standard' citation used in the literature, E.G.: 6m1

Engelbart, D. C. and Jones, S. A. Who says people at Arc are KWACS? NLS Online Journal, Vol. 7, No. 23456, 28-32 (June 1974). 6m1a

Volume could be the file name or directory name. 6m1a1

Pages could be statement numbers (SIDS ?). 6m1a2

Number could be the NIC number. 6m1a3

'Final' citation template with complete discussion.

A strong opinion was given that the header should be exactly like the citation except for the necessary Ouput Processor commands. 6m2

The overwhelming opinion was to have only the author and title on the first line. 6n

New forms: 6o

(JBP) similar to (XXX) (see -- MJOURNAL, 24294, 1:W) 6o1

Postel (SRI-ARC) A Note on the future of journal headers, (JJOURNAL,12345,1:W), 22-OCT-74 1332 PDT WED at OFFICE-1
Received at: 22-OCT-74 1356 PDT for ACTION (PRIVATE)
TO: ABC DEF GHI
CC: JKL MNO PQR SRT
FROM: JBP 6o1a

Comments: Just a test for fun. 6o1a1

REFERENCES: (MJOURNAL,34567,1:W) 6o1a2

KEYWORDS: test, journal, header 6o1a3

(NDM) new form (see -- MJOURNAL, 24336, 1:W) 6o2

DATE TIME-ZONE AIDENT: TITLE terminated by a CR and 3 spaces
For your ACTION/INFORMATION, Private
Distribution: ACTION IDENTS ARE UPPER CASE info only idents are lower case (recipient included here somewhere)
Author orgs: Idents...
Received at: 12-OCT-74 04:31
(JJOURNAL,12345,1:W) 6o2a

Comments: Comments would appear as substatement of citation. 6o2a1

Text of Message is a substructure statement. 6o2a2

#Latest Alternatives 7

First alternative 7a

Examples. 7a1

RLL, A Note on the future of journal citation
22-OCT-74 1332 PDT <:wg> <JOURNAL,JRNL24,J12345:wg> for ACTION [PRIV,FORWARDED,UNREC] 7a2

RLL 24-FEB-75 15:04 25451

'Final' citation template with complete discussion.

TO: ABC DEF GHI
Cc: JKL MNO PQR SRT
From: OFFICE-2, Lieberman (SRI-ARC) 7a2a

Comments: Just a test for fun, %Statement not here if no comments% 7a2b

MESSAGE: If, indeed, it is delivered, the message text appears here, Notice the MESSAGE keyword is uppercase and text starts on same line. 7a2c

References: <MJOURNAL,34567,1:w> %Statement not implemented yet%
Keywords: journal, header %Statement not here if no keywords%
Received at: 22-OCT-74 1356 PDT 7a2d

Forwarded: JCN at 14:31-PDT 30-Oct-74 7a2e

RLL JHB, Another example of future journal citation
22-OCT-74 1343 PDT <JJOURNAL,67891,1:w> for INFORMATION 7a3

TO: ABC DEF GHI
Cc: JKL MNO PQR SRT
From: OFFICE-2, Lieberman (SRI-ARC) Bair (SRI-ARC) 7a3a

Received at: 22-OCT-74 1359 PDT 7a3b

Discussion 7a4

Should the link jump to the 0 or 1 statement in the journal file? Should the viewspec be 'w'? 7a4a

** statement 1 unless origin statement is changed to be nearly he same as the citation. 7a4a1

** Viewspec w 7a4a2

Should the TO, CC, and FROM lines be on separate statements? Should COMMENTS, KEYWORDS, REFERENCES be on separate statements or separate lines? The consensus is for the message (if it appears in citation) be a separate statement. 7a4b

** yes separate statements for each. 7a4b1

Should the fact that an item was 'unrecorded' be stated? If unrecorded it might be lost forever if the receiving parties

delete the message (hoping to retrieve it by the indexes in the future). 7a4c

** yes, included. 7a4c1

Should the FROM precede the TO? 7a4d

** yes FROM should come first. 7a4d1

Should the various statements be lined up after header field in each? 7a4e

** NO. 7a4e1

Should the secondary distribution list be singled out in the CC list? 7a4f

** Yes, in square brackets the newly added idents. 7a4f1

Should fields for the UPDATE and OBSOLETE commands in SENDMAIL be provided? Where should they be placed? 7a4g

** Yes all should be allowed if specified. 7a4g1

Should the originating host be specified for each author? Only if different for each author? Only the first author's host? 7a4h

** Only the orginating host needs to be specified. The host will not be assumed related to author (although in most cases this is so.). 7a4h1

Should the number of disc pages be included somewhere? 7a4i

** no, not meaningful. 7a4i1

Should the authors idents be included in the Cc list? 7a4j

** no, it is a duplication of information. 7a4j1

Note when the message immediately follows, a link with only viewspecs to open the view to full is inserted before the actual link. This makes it possible to just Jump to Link in every case without worrying about whether the message is in the delivered citation or not. 7a4k

What should the viewspecs be for this link? 7a4k1

'Final' citation template with complete discussion.

Should it be in angle brackets or parentheses to distinguish it from the full link? 7a4k2

Note that no message is given to indicate author copy; it should be obvious. 7a4l

Note that the PRIVATE and UNRECORDED fields are enclosed in square brackets to prevent any possible conflict with a link. 7a4m

With a long title, a portion of the title will be hanging on a second line by itself. This may or may not be nice for viewing, but does give an uncertainty to whether the link and other 'second line' parameters are indeed on the second line. 7a4n

This might encourage the title to be another line after 'From' and restrict the title to whatever fits on the first line of the citation. 7a4n1

** The link must be in first statement but need not be on second line. We will assume the clipped views will normal be one line, one level or all lines, one level. 7a4n2

Note that the full last name is used in the FROM line. 7a4o

The duplication of the author is for the following purposes: 7a4p

the organization can be specified 7a4p1

to simulate existing formats of memos 7a4p2

to allow the full last name to be seen (with a large community of users the ident might be very obscure and the IDENT system not used by the naive user.) 7a4p3

Note that except for the message header, only the first letter of the header is uppercase. 7a4q

This allows the actual message (if it appears) to stand out. 7a4q1

Note a one line, all level view has a "decent" view. Also if one turns on 'y' viewspec with all lines, all levels the format looks 'good'. 7a4r

The message text should begin on the same line as the word MESSAGE since a one line view of the citation would provide one line of the message itself thus adding information to

the decision process of whether to read this item and, later, helping to decide if it is relevant. 7a4s

CON: It would be easy to delete and manipulate the message text if it were a branch headed by 'MESSAGE' (messages are projected to be plexes which are less than 2000 characters.) 7a4s1

In the event that no one is receiving the item for action the 'TO' list will be empty; should the header 'TO' still appear or should the entire line be missing? Same for the 'CC' line. 7a4t

** The rule will be that if no information is present in any field that field will not be present at all. 7a4t1

The 'received' statement is the last one since: 7a4u

most felt it irrelevant 7a4u1

some professional journals put date received at the end of the article. 7a4u2

The split between lines and statements should be guided by viewspec controls and ease of manipulation. 7a4v

Perhaps the COMMENTS field could be temporarily used for specifying references (indeed it has been by many). 7a4w

** Yes, it should be broadcast that this is an intended use of comments. 7a4w1

It should be noted that the new field called REFERENCES has been strongly supported by several people. This would require a mod to the sendmail subsystem. The value is, of course, in having a clearer interlinking among the journal collection and conforming to many formats used by government and others. 7a4x

Few supported having the date and time on the first line. All supported having it appear in the first statement and having the capability to sort on it. 7a4y

Note that the time is a 24 hour clock. 7a4z

The CC list represents those who were specified as receiving item for information only for journal items and the CC list in the sndmsg items. 7a4a@

RLL 24-FEB-75 15:04 25451

'Final' citation template with complete discussion.

Note that the DATE TIME starts on a new line so that it will not be split as it might be if it just followed the AUTHOR and TITLE. 7a4aa

Note that the date, time and link are on the second line first statement. Sorting on date and time can easily be done. It is intended that such sort programs be made available at the same time this new header is instituted. 7a4ab

Note that even for messages the complete link is given. It is hoped that this will be enough to actual perform the link. 7a4ac

Should the directory appear in the link? It might be confusing to most people. It is unneeded but makes retrieval faster. 7a4ad

** Yes, the complete link should be given. 7a4ad1

Should the "Sent to" field be "Action for" and the "copy to" field be changed to "Info for" or "To" and "Cc"? 7a4ae

** The "To" and "Cc". 7a4ae1

Should the ACTION/INFO field be in the square brackets with other parameters? 7a4af

** Yes, they should. 7a4af1

How should the parameters in square brackets be spelled? 7a4ag

ACTION/Action/ACT/Act 7a4ag1

INFORMATION/Information/INFO/Info/INFOR/Info-only 7a4ag2

UNRECORDED/Unrecorded/Unrec/UNREC 7a4ag3

FORWARDED/Forwarded/Forw/FORW 7a4ag4

** See template below. <template> 7a4ag5

Another alternative for those wanting the date and time on first line. 7b

22-OCT-74:1332PDT RLL, A Note on the future of journal citation,
<:wg> <JOURNAL,JRNL24,J12345:wg> [Action,Priv,Forwarded,Unrec] 7b1

Sent To: ABC DEF GHI 7b1a

'Final' citation template with complete discussion.

Copy To: JKL MNO PQR SRT [XYZ] %secondary distribution list in square brackets% 7b1b

From: OFFICE-2, Lieberman (SRI-ARC) 7b1c

Comments: Just a test for fun, %Not here if no comments% 7b1d

MESSAGE: If, indeed, it is delivered, the message text appears here, 7b1e

Refer to: <MJOURNAL,34567,1:w> %Not implemented yet% 7b1f

Keywords: test, journal, header %Not here if no keywords% 7b1g

Received: 22-OCT-74 1356-PDT 7b1h

Forwarded: By JCN at 14:32-PDT 30-Oct-74 %this is the ident of person sending you secondary distribution% 7b1i

RLL 22-OCT-74 1332 PDT, A Note on the future of journal citation,
<:wg> <JOURNAL,JRNL24,J12345:wg> for ACTION [PRIV,UNREC] 7b2

To: ABC DEF GHI
Cc: JKL MNO PQR SRT
From: OFFICE-2, Lieberman (SRI-ARC) 7b2a

Comments: Just a test for fun, %Not here if no comments% 7b2b

MESSAGE: If, indeed, it is delivered, the message text appears here, 7b2c

References: <MJOURNAL,34567,1:w> %Not implemented yet% 7b2d

Keywords: test, journal, header %Not here if no keywords% 7b2e

Received at: 22-OCT-74 1356 PDT 7b2f

Forwarded by: JCN at 14:32-PDT 30-Oct-74 7b2g

RLL JHB 22-OCT-74 1332 PDT, A Note on the future of journal citation format
<HJOURNAL,12345,1:w> for ACTION [UNREC] 7b3

To: ABC DEF GHI
Cc: JKL MNO PQR SRT
From: OFFICE-2, Lieberman (SRI-ARC) Bair (SRI-ARC) 7b3a

Comments: Just a test for fun, %Not here if no comments% 7b3b

RLL 24-FEB-75 15:04 25451

'Final' citation template with complete discussion.

Received at: 22-OCT-74 1359 PDT 7b3c

RLL JHB 22-OCT-74 1332 PDT, A Note on the future of journal <HJOURNAL,12345,1:w> for ACTION [UNREC] 7b4

To: ABC DEF GHI
Cc: JKL MNO PQR SRT
From: OFFICE-2, Lieberman (SRI-ARC) Bair (SRI-ARC) 7b4a

Title: A Note on the future of journal citation format 7b4b

Comments: Just a test for fun, %Not here if no comments% 7b4c

Received at: 22-OCT-74 1359 PDT 7b4d

Discussion: 7b5

See the discussion with other alternative. 7b5a

A carriage return follows the title. 7b5b

The author is first field to allow for a meaningful statement name (statement names cannot begin with a number hence the date would be a poor choice). 7b5c

(template) latest template 7c

22-OCT-74 1332PDT RLL: A Note on the future of journal citation,
<:w> <12345,1:w> [ACTION,Private,Unrecorded] 7c1

To: ABC DEF GHI 7c1a

Cc: JKL MNO PQR SRT 7c1b

Comments: Just a test for fun. 7c1c

Rfc No: 123 7c1d

Updates: <12345,> 7c1e

Obsoletes: <23456,> 7c1f

Keywords: test, journal, header 7c1g

Subcollections: LANGUAGE BUGS SRI-DEV 7c1h

Received at: 22-OCT-74 1355PDT 7c1i

'Final' citation template with complete discussion.

Forwarded by: JCN at 30-OCT-74 0635PDT 7c1j

MESSAGE: If, indeed, it is delivered with the citation, the message text appears here. 7c1k

(syntax) 7c2

CITATION =: HEADER EOS LEVADJ BODY 7c2a

EOS =: end of statement 7c2b

LEVADJ =: down one level 7c2c

HEADER =: DATE SP TIME ZONE AUTHLIST ': SP TITLE CR LINKS SP '[PARAMETERS '] 7c2d

DATE =: DAY '- MONTH '- YEAR 7c2e

DAY =: '1/'2/'3/'4/'5/'6/'7/'8/'9/"10"/"11"/..."31" 7c2f

MONTH =: "JAN" / "FEB"/ "MAR"/ "APR"/ "MAY"/ "JUN"/ "JUL"/ "AUG"/ "SEP"/ "OCT"/ "NOV"/ "DEC" 7c2g

YEAR =: "74"/"75"/"76"/... 7c2h

TIME =: "0000"/"0001"/.../"0100"/.../"2359" 7c2i

ZONE =:
"PDT"/"PST"/"GMT"/"EST"/"EDT"/"MST"/"MDT"/"CST"/"CDT" 7c2j

AUTHLIST =: authorident / AUTHLIST 7c2k

TITLE =: full title 7c2l

LINKS =: LINK / OPENLINK SP LINK 7c2m

OPENLINK =: "<:w>" 7c2n

LINK =: "<number,1:w>" 7c2o

PARAMETERS =: PARAM / PARAM ', PARAMETERS 7c2p

PARAM =: TYPE / PRIVACY / RECORD 7c2q

TYPE =: "ACTION" / "INFO" 7c2r

PRIVACY =: "private" / NULL 7c2s

RECORD =: "Unrecorded" / NULL 7c2t

'Final' citation template with complete discussion.

BODY =: ITEM / ITEM EOS BODY 7c2u

ITEM =: ITEMNAME ': text string 7c2v

ITEMNAME =: "To" / "Cc" / "Comments" / "Rfc No" / "Updates" / "Obsoletes" / "Keywords" / "Subcollections" / "Received at" / "Forwarded by" / "MESSAGE" 7c2w

NULL =: null 7c2x

SP =: a space character 7c2y

CR =: a carriage return character 7c2z

(NOTES) 7c3

Note that the statement for subcollections will always be present. 7c3a

Note that each statement of information has a descriptor field name followed by a colon. This conforms with the network standard as proposed in RFC 561 <18516,> of Sept. 1973. 7c3b

The journal link will only have the number present and not the directory. 7c3c

There will be a carriage return following the title in all cases (even if title extends passed first line). 7c3d

The link <:w> [the OPENLINK] will be present only for mail in which the message is delivered with the citation (this will include, of course, SNDMSG generated items.). 7c3e

The only way one will distinguish SNDMSG and journal recieved mail is by the absence of the journal number link (and possibly by the directory name as opposed to the ident for the author.) 7c3f

The sndmsg format should be the same as journal items. 7c3g

Each field is a statement. 7c3h

If any of the fields are empty that statement will not appear at all. 7c3i

Of the four parameters in square brackets, only the first parameter (ACTION/INFO) will always appear. The others will

appear only if that condition is true; that is, Public and Recorded will never be shown. 7c3j

Only the ACTION/INFO parameter will be in uppercase; all others will be first letter uppercase only. 7c3k

The only information not in this version of the citation is the FROM field that contains the sending host, last name of author, and author's organization. 7c31

Note that the citation cannot be addressed as a statement name since the first character wll always be a number. 7c3m

(Other) templates 7d

RLL 1332-PDT-22OCT74, A Note on the future of journal citation, <:wg> <JOURNAL,JRNL24,J12345:wg> [Action,Priv,Unrec,Forwarded] 7d1

From: OFFICE-2, Lieberman (SRI-ARC) 7d1a

To: ABC DEF GHI 7d1b

Cc: JKL MNO PQR SRT [QWE SDF] 7d1c

Comments: Just a test for fun. 7d1d

Rfc No: 123 7d1e

MESSAGE: If, indeed, it is delivered, the message text appears here. 7d1f

References: <MJOURNAL,34567,1:w> 7d1g

Updates: <12345,> 7d1h

Obsoletes: <23456,> 7d1i

Keywords: test, journal, header 7d1j

Subcollections: LANGUAGE BUGS SRI-DEV 7d1k

Received at: 1356PDT:22OCT74: 7d1l

Forwarded by: JCN at 1432PDT:30Oct74 7d1m

RLL 74OCT22-1332-PDT, A Note on the future of journal citation, <:wg> <JOURNAL,JRNL24,J12345:wg> [Action] 7d2

From: OFFICE-2, Lieberman (SRI-ARC) 7d2a

RLL 24-FEB-75 15:04 25451

'Final' citation template with complete discussion.

To: ABC DEF GHI 7d2b

Comments: Just a test for fun. 7d2c

MESSAGE: If, indeed, it is delivered, the message text appears here. 7d2d

Received at: 1356PDT:22OCT74: 7d2e

1332-PDT-22OCT74 RLL, A Note on the future of journal citation, <:wg> <JOURNAL,JRNL24,J12345:wg> [Action,Priv,Unrec,Forwarded] 7d3

PDT1332-22OCT74 RLL, A Note on the future of journal citation, <:wg> <JOURNAL,JRNL24,J12345:wg> [Action,Priv,Unrec,Forwarded] 7d4

(open) questions 7d5

The ordering of various statements after MESSAGE. 7d5a

Whether to line up information in field after header. 7d5b

RLL 24-FEB-75 15:04 25451

'Final' citation template with complete discussion.

(J25451) 24-FEB-75 15:04;;;; Title: Author(s): Robert N. Lieberman/RLL; Distribution: /ARC-LOG([ACTION]) SRI-ARC([INFO-ONLY]) ; Sub-Collections: SRI-ARC ARC-LOG; Clerk: RLL; Origin: < LIEBERMAN, HEADERS.NLS;59, >, 24-FEB-75 14:54 RLL ;;;;####;

KIRK 24-FEB-75 21:44 25452

Comments on the 'final' journal citation

In general looks very good. Major bad thing is a time that cannot be used for statement name (how about PDT1332 22-OCT-75) ? This would give you a logical ordering of time elements (from small to large) and allow access by statementname. Jump to name next would always find the most recent one if the time happened to be duplicated.

One other thing, you should recommend that the Insert Sendmail (form) and Process Sendmail (form) commands use the same format in the same order. Good show. 1

KIRK 24-FEB-75 21:44 25452

Comments on the 'final' journal citation

(J25452) 24-FEB-75 21:44;;;; Title: Author(s): Kirk E. Kelley/KIRK; Distribution: /RLL([ACTION]) ; Sub-Collections: SRI-ARC; Clerk: KIRK;

JBP 24-FEB-75 22:35 25453

Journal Citations vs. ARPA Network Standards

it might be useful to cite the ARPA network standard for message headers for reference during the discussion of new journal headers. The reference is RFC 561 <,18516,>. --jon. 1

JBP 24-FEB-75 22:35 25453

Journal Citations vs. ARPA Network standards

(J25453) 24-FEB-75 22:35;;;; Title: Author(s): Jonathan B. Postel/JBP; Distribution: /RLL([ACTION]) SRI-ARC([INFO-ONLY]) ; Sub-Collections: SRI-ARC; Clerk: JBP;

PI-Write-up, Amarel

RESEARCH ON SECURE OPERATING SYSTEMS AND DATA BASE SYSTEMS AND ON AUTOMATIC PROGRAMMING
1974 ARPA Project Summary

Prepared for: ARPA IPT Principal Investigators Conference
San Diego, Mar. 12-14, 1975

Prepared by: Saul Amarel and C. V. Srinivasan
Department of Computer Science
Rutgers University
New Brunswick, N. J. 08903

This summary covers work done during calendar year 1974 in the areas of Secure Systems and Automatic Programming.

I. SECURE SYSTEMS

1. Protection and Integrity of Data Bases (Minsky)

Our research has centered on the process of user - data base (DB) interaction, and on the structure of the DB. The conventional protection techniques - usually called access control - were found to be insufficient. The concept of intentional resolution was defined, and was shown to be an important aspect of protection. The DB is conceived as a programming system which has procedural as well as structural components. We started work on the design of a Data Base Language (DBL) for constructing such a system. In parallel, We are planning an experimental design of a DB system using the SIMULA language. This work has been documented in the following SOSAP reports by Minsky: TR-7 "On the Interaction with Data Bases", TR-8 "Comments on Privacy of Data Bases", TR-9 "On the Resolution Power of Privacy Protection in Data Base Systems" (also to appear in Comm. ACM), TR-10 "On the Formation of Abstract Data Types", TR-11 "Protection of Data-Bases, and the Process of User Data-Base Interaction", and TM-6 "Another look at Data Bases".

2. Generating Valid Implementations (Welsch)

Our approach has been to specify a kernel of an operating system, and to use a precondition generator to validate properties of the kernel. Experimental work on validation has pointed out difficulties in stating formal assertions for large programs. A critical review of this approach is now underway.

3. Resource Enhancement for Operating Systems Support (Ruschitzka) 5e

Exploratory work has begun on architectural features which would support an operating system in maintaining its integrity and privacy characteristics. 5f

II. AUTOMATIC PROGRAMMING 6

1. Studies and Systems in Specific Domains 6a

1.1 Use of Finite State Machine Theory to Synthesize Efficient Programs (Wilkens) 6a1

We have been working on the development of a program to produce the best code assignment for the states of a program described as a finite state system. The work of consolidating space and time expenditures in the state code optimization program has been largely completed. 6a2

1.2 Formulation and Manipulation of Enumeration Based Algorithms (Paull) 6a3

We are building a system which is intended to aid a user in the formulation of a recursive definition, and then to provide him with one or more "good" algorithms that implement the definition and/or suggestions about the redesign of the definition. To produce a "good" algorithm we look for certain significant properties. The search for some of these has been automated. Recent theoretical work has resulted in the identification of additional significant properties. This work is described in TM-5 by Paull, "properties which allow Optimization of Recursive Definitions ...". 6a4

1.3 Design of Non-adaptive Comparator Algorithms (Levy) 6a5

We have implemented most of the functional components of a system for synthesizing programs to find order statistics - e.g. to find the ith largest element in a list. The design of the control and evaluation subsystems is now underway. 6a6

1.4 Automatic Program Formation from Problem Specifications (Amarel) 6a7

We are continuing to explore systems that accept a problem statement in non-procedural form and form a program by using AI methods of problem solving. In addition to problems of sorting and reasoning about actions, we are working on a problem in the area of partially ordered sets which is presented in the form of input-output correspondences. 6a8

Several approaches to the latter problem have been programmed. Amarel organized a one-day session on the "Inference of Programs from Sample Computations" at the Nato Advanced Study Institute on Computer Oriented Learning Processes, Bonas, France in August. 6a9

2. General Systems for Automatic Programming (Srinivasan) 6b

Our objective is to create a meta system that can specialize itself to be an efficient problem solver in a domain based on the descriptions of knowledge in the domain. The system is called Meta Description System (MDS). The architecture of MDS is described by Srinivasan in TR-20 "A Coherent Information System" and in TR-13 "The Meta Description System". The nature of the use of MDS for Automatic Programming is discussed in TM-4 "Programming over a Knowledge Base". A major program development effort was carried out (in INTERLISP) at the ISI TENEX and at the Stanford SUMEX-AIM System throughout the year. Substantial progress was made in the implementation of the CHECKER and the INSTANTIATOR. A novel concept of a Theorem Prover for MDS was developed; it is discussed via examples in TR-25 "A New Approach to Theorem Proving by Synthesis". This effort is now moving to the program design stage. Other activities include work on data structure optimization; TR-12 by Srinivasan covers this work. 6c

ACM 25-FEB-75 08:05 25454

PI-Write-up, Amarel

(J25454) 25-FEB-75 08:05;;;; Title: Author(s): ADRIAN C. MCGINNIS/ACM; Distribution: /ACM([INFO-ONLY]) ; Sub-Collections: SRI-ARC; Clerk: ACM; Origin: < PI, AMAREL.NLS;7, >, 23-FEB-75 19:05 JAKE ;;;; ####;

PI-Write-up, Bernstein

Distributed Computation/TENEX Project
1974 ARPA Project Summary

Prepared for: ARPA IPT Principal Investigators Conference
San Diego, Mar. 12-14, 1975

Prepared by: Jerry Burchfiel
Bolt Beranek and Newman Inc.
50 Moulton Street
Cambridge, Mass. 02138

Our work during 1974 has resulted in significant accomplishments in the following areas:

Prototype, multi-machine, program execution environment.

We have developed and are continuing to improve a program execution environment for ARPANET TENEX hosts that includes a networkwide file system. This execution environment makes it possible for existing application programs to operate in a context that includes the file systems of the entire collection of network machines, without requiring that the programs themselves be rewritten. The initial prototype implementation of this environment was accomplished within the context of the RSEXEC (Resource Sharing Executive) system [1] and it makes use of a mechanism for intercepting selected operating system calls made by the application programs [2].

Access Control and Accounting for Terminal IMPs

Together with the Computer Systems Division at BBN we have developed a login and accounting system for ARPANET TIPs. Prior to development of this system, anyone with a terminal and data set who knew the telephone number for a TIP dial-up port had free and uncontrolled access to the ARPANET. TIP login corrects this situation by requiring that a TIP user establish his authorization to use the network by supplying a valid network user name and password. If the user successfully passes this access control check, accounting procedures for his TIP session are initiated and he is free to use the TIP in the usual manner.

TIP login and accounting was implemented by building upon the existing TIPSER-RSEXEC system which provides a means for TIPs to support what are usually thought of as "large host" functions by sharing some of the resources of ARPANET TENEX hosts. In order to satisfy reliability requirements and to achieve a degree of load leveling, the TIPSER-RSEXEC is implemented as a distributed, multi-computer system.

Management of Distributed Data Bases. 10

We have developed a method for maintaining multiple, distributed copies of a data base in the presence of distributed data base updating in a manner that guarantees the mutual consistency of all copies of the data base. Although this work was motivated by the reliability and efficiency requirements of the TIP login system which dictated that the Network user data base be maintained in this manner, we believe that the method has applicability beyond the TIP login system. The method is completely distributed in the sense that it requires no centralized control nor does it require that all copies of the data base be locked simultaneously in order to accomplish the updates. 11

The method, which is described in detail in [3], consists of two parts: a reliable, data independent, update transmission and distribution mechanism which guarantees that all data base updates reach all data base sites; and, a data dependent update procedure which is activated at data base sites when update commands arrive. The update procedure makes use of a "time stamping" scheme which enables data base sites to regenerate a sufficient portion of the time sequence of update events to determine how a particular update command should be incorporated into their copies in a consistent manner. 12

Network Protocol Research 13

We have developed a prototype implementation of the Cerf-Kahn Internetwork Protocol [4] as a TENEX facility which will support communication with hosts on the ARPANET and other networks, (e.g. Packet Radio Net). We have also developed a prototype of the new TELNET RCTE (Remote-controlled echoing and transmission) option in TENEX to provide responsive terminal connections even through satellite links. 14

Security 15

We have provided new TENEX mechanisms for creating a new encapsulated capabilities domain for either a process or an entire job: servers operate by creating a new domain for each instance of service, setting the capabilities of that domain to match the qualifications of the authenticated user. 16

Resource Allocation 17

The TENEX pie-slice scheduler is a novel approach to the resource allocation problem which removes administrative policies from the regulator mechanism. It provides a guaranteed level of CPU service to each group of users based on tables maintained by the

facility administration, and it permits sale of a "slice" of the processor to each subscribing organization.

[1] Thomas, R.H., "A resource sharing executive for the ARPANET", AFIPS Conference Proceedings, Vol 42, June 1973. 19

[2] Thomas, R.H., "JSYS traps - a TENEX mechanism for encapsulation of user processes", to be presented 1975 National Computer Conference. 20

[3] Johnson, P.R. and R.H. Thomas, "The maintenance of duplicate databases", ARPA Network Working Groups RFC 677, January 1975. 21

[4] Cerf, V. and R. Kahn, "A Protocol for Packet Network Intercommunication", IEEE Transaction on Communication, May 1974. 22

PI-Write-up, Bernstein

(J25455) 25-FEB-75 08:07;;;; Title: Author(s): ADRIAN C, MCGINNIS/ACM; Distribution: /ACM([INFO-ONLY]) ; Sub-Collections: SRI-ARC; Clerk: ACM; Origin: < PI, BURCHFIEL,NLS;11, >, 23-FEB-75 00:05 JAKE ;;;; ####;

ACM 25-FEB-75 08:10 25456

PI-Write-uP, Culler

Network Speech Compression
1974 ARPA Project Summary

Prepared for: ARPA IPT Principal Investigators Conference
San Diego, Mar. 12-14, 1975

Prepared by: Glen J. Culler
150A Aero Camino
Goleta, California 93017

The work undertaken by CHI may be summarized as threeseparate tasks, although they were directly coordinated andmutually supportive. These are:

1. Development of an interactive signal processing system of significant power.

2. Real time implementation of the Markel algorithm on the ARPANET.

3. Basic research on the application of discrete wave theory to speech signal processing.

In descriptive terms, the hardware of the signal processing system was completed and checked out during the early part of the year. The connection to the network in hardware and software came up in November. The real time implementation of network speech compression was demonstrated jointly with Lincoln Lab in December. The part of our program which is in basic research stands on the shoulders of the foregoing and got underway in December. It will be our primary activity for the remainder of our contract year (which ends September 1).

SUMMARY:

1. A System for Interactive Signal processing Hardware (R. Bjorkman, J. Vanderford, B. Lum)
   Software (M. MCCammon, D. Taylor, G. Ball)

   A. This system has a VDH-connection to the UCSB-IMP. The hardware consists of a pair of micro-programmable processors, four user stations that are graphics consoles with function keyboards, 64K of 1/2 microsecond, 18-bit word memory, three 2314-type disk drives, and an analog subsystem currently being extended to control an array of 6 microphones in a sound tunnel.

B. The operating system provides a time-sharing facility with interactive features in the foreground and signal processing, library transfers and system processes in the background. Real time applications temporarily lock out all other processes when required. Each user station is cued by a lock out light when this occurs. 7b

C. The languages supporting the system consist of a micro-programming language, a macro-assembly language and a user interactive language tailored to the needs of signal processing research, and which includes a console programming facility. Armed with this capability, we can select the nature of programming best related to the requirements of the computational tasks desired to be implemented. 7c

2. Real Time, Packet Speech - NSC Prototype
(M. McCammon, D. Taylor, G. Ball) 8

As a means to guarantee an early capability, the NSC-group selected the LPC algorithm defeloped by J. Markel of SCRL. A pair of sites, Lincoln Lab and CHI, were selected to carry out a prototype experiment for real time LPC experience. A simplified form of the Network Voice Protocol and a parcel format of 67 bits per 20 milliseconds speech frame were used. Aside from some hangups, mostly concerned with the way the UCSB-IMP treated our VDH connection, the whole thing went very well. Expected difficulties with network delays were validated and an effort to improve several aspects of the overall process have begun. These include: 8a

a. Improvement of the IMP-VDH buffering.
b. Further study of network delays by appropriate sites.
c. Better matching of LPC algorithms at different sites.
d. Improvement of quality of LPC analysis.
e. Investigation of type 3 message usage.
f. Development of better packet handling for network speech communication. 8a1

3. Discrete Wave Theory Applied to Speech Signal Processing
(G. Culler, J. McGill) 9

PI-Write-up, Culler

Consider a sound wave propagating from a small source into a domain bounded by walls with separations less than acoustical wave lengths associated with speech signals. If an array of microphones is placed inside this domain or imbedded in its walls, then the data collected by synchronously sampling the outputs of these microphones
comprises a discrete wave on multiple indices, one for time and the rest for space. If the array is linear and oriented outward from the source, then we have a discrete wave on two indices. The kick-off for a theory of discrete waves on two indices is the following theorem: 9a

> "The discrete Fourier transform with respect to a time index of finite extent satisfies one and (up to common factors) only one linear, second order difference equation with real coefficients." 9a1

In the cases of primary interest, these coefficients are a function of the geometry of the domain and thus, with a computer system providing synchronized D/A stimulation of the source and A/D sampling of the microphone array, we have a direct phenomenological means of deriving discrete difference equations of compound cavities. Research is under way to determine such equations for cavities of interest in speech generation and relate them to area functions as determined by the lpc technique, our hope is that through a better understanding of discrete wave equations, we may improve the relationship of speech quality to data rate in representation. 9b

PI-Write-up, Culler

(J25456) 25-FEB-75 08:10;;;; Title: Author(s): ADRIAN C. MCGINNIS/ACM; Distribution: /ACM([INFO-ONLY]) ; Sub-Collections: SRI-ARC; Clerk: ACM; Origin: < PI, CULLER,NLS;2, >, 23-FEB-75 00:54 JAKE ;;;; ####;

PI-Write-up, Farber

PACKET RADIO CHANNEL MEASUREMENT AND CHARACTERIZATION
1974 ARPA Project Summary

Prepared for: ARPA IPT Principal Investigators Conference
San Diego, Mar. 12-14, 1975

Prepared by: Stanley C. Fralick
Stanford Research Institute
Menlo Park, California 94025

One of the long range objectives of the Packet Radio project is to prove that packet-switched radio networks are technologically feasible and viable in a military context. SRI has undertaken the task of coordinating and integrating an experimental packet radio network being developed by a group of ARPA IPTO contractors during CY '74 and '75. The network will be used to demonstrate feasibility and to support application-oriented measurements. During CY '74 our activities have included:

1. Mobile Instrumented Packet Radio Repeater.

During CY '74 a flexible and highly instrumented mobile van facility was developed. In addition to an experimental packet radio spread-spectrum receiver, the van is equipped with considerable RF instrumentation and a minicomputer-based data acquisition system. This van was used to obtain propagation and noise measurements and will soon be used as an instrumented repeater for RF-link measurements and network testing. This facility is described in SRI Packet Radio Note (PRN)3, "A Measurement Program for Packet Radio Channel Characterization", by D. L. Nielson and R. A. Shepherd.

2. Packet Radio Propagation and Noise Measurements.

Introducing a wide-band digital radio communications system such as packet radio into the urban and suburban environment requires a knowledge of the limitations imposed by that environment on a communications signal. We collected and analyzed sufficient propagation measurement data to quantify, with high resolution and over a wide range of urbanization, distortion caused by multiple transmitter-receiver paths. We described the impulse distortion, the time variability, and the spatial coherence of the signal at street level--the latter being of importance to space-diversity reception. The noise inherent to the urban and suburban environment was found to be almost totally due to automobile ignition systems.

We made the first amplitude and time characterization of that noise in the frequency range above 1000 MHz. The results of these measurements are documented in SRI PRN 4, "Microwave Propagation and Noise Measurements for Mobile Digital Radio Application", by D. L. Nielson. 9

3. Packet Radio Link Analysis. 10

The results of the measurements have been used to support packet radio network RF link design. SRI consulted with and provided data to Collins Radio Group of Rockwell International to establish a preliminary design that will be tested during CY '75. We analyzed and compared modulation schemes and random-access methods to determine those that are feasible and to predict the effect of the radio environment on performance. This analysis was required to arrive at a design for the experimental network; however, it has broader implications to a large variety of military and commercial digital communications networks since it compares a variety of modulation schemes and network access modes in a realistic environment. These results are documented in SRI PRN 1, "RF Channel Capacity Considerations" by S. C. Fralick, SRI PRN 2, "Study of Throughput and Delay of Spread Spectrum Multiple Access Modes", by S. C. Fralick and J. K. Leung, and SRI PRN 7, "Technological Considerations for Packet Radio Networks" by S. C. Fralick and J. C. Garrett (Garrett is with the Collins Radio Group). 11

4. Packet Radio Traffic Sources and Terminals. 12

To provide controlled sources to generate required time- and geographic-traffic patterns for planned network measurements, we developed a microprocessor-controlled portable (suitcase-size, 30 lb.) traffic source. The traffic source has a full ASCII keyboard, 80 characters of display, and a 20 char/line printer so that it can double as a terminal. The microprocessor is programmed to format messages into packets and to support minor text editing tasks. The microprocessor will provide a simple but powerful tool to generate packets with a wide (and software changeable) variety of lengths, formats, etc. This work is documented in "The Role of Microprocessors in High Speed Portable Data Communications Terminals" by S. C. Fralick and D. Brandin, Proceedings of Journees d' Electronique, Lausanne, SW, 1974, and SRI PRN 6, "Digital Terminals for Packet Broadcasting by S. C. Fralick, D. H. Brandin (both of SRI) and F. F. Kuo, and C. Harrison (both of the ALOHA system, University of Hawaii). 13

PI-Write-up, Farber

(J25457) 25-FEB-75 08:12;;;; Title: Author(s): ADRIAN C. MCGINNIS/ACM; Distribution: /ACM([INFO-ONLY]) ; Sub-Collections: SRI-ARC; Clerk: ACM; Origin: < PI, FRALICK,NLS;3, >, 23-FEB-75 19:16 JAKE ;;;; ####;

PI-Write-up, Frank

THE PRACTICAL IMPACT OF RECENT COMPUTER ADVANCES ON THE ANALYSIS AND DESIGN OF LARGE SCALE NETWORKS
1974 ARPA Project Summary

Prepared for: ARPA IPT Principal Investigators Conference
San Diego, Mar. 12-14, 1975

Prepared by: Howard Frank
Network Analysis Corporation
Beechwood, Old Tappan Road
Glen Cove, New York 11542
(516) 671-9580

This summary describes Network Analysis Corporation's accomplishments in the study of local, regional and large scale data communications problems.

PACKET RADIO SYSTEM NETWORK STUDIES:

Efforts during the past contract year were aimed at establishing base performance characteristics of a single station, fixed repeater location Packet Radio System and to evaluate the effects on performance of a number of fundamental hardware design decisions. Analytic and simulation studies of throughput and delay were conducted to enable various design decisions including: use of multiple or single detectors at repeaters and stations, evaluation of tradeoffs between range, power and interference, incorporation of single or dual data rate repeaters, common versus split channel operation, and the use of omni versus directional antennas. In addition, numerous studies were performed to quantify system delay, throughput and blocking under various routing alternatives, acknowledgement schemes, repeater network organization and to insure that gross system performance using unoptimized operating parameters and algorithms was within a level that would justify further design efforts.

PACKET RADIO SYSTEM NETWORK ALGORITHMS AND CONTROL:

During the year, the main effort has been towards developing workable network algorithms, to insure order of magnitude performance and design robustness for a single station multiple repeater, multiple terminal network. Preliminary designs of eleven routing algorithms were evaluated using combinatorial analysis, three were selected for detailed design, and two of these were simulated and tested, and based on these tests, recommended for implementation. Single station, multirepeater initialization, network mapping, and transmission algorithms were proposed.

Hop-by-hop and end-to-end acknowledgement schemes were developed, simulated and tested. Simple terminal search and local terminal control algorithms were developed and simulated. In addition, a repeater location optimization algorithm was developed, programmed, and tested. The above family of algorithms provided a basis for demonstrating the reliable transmission of packets within the Packet Radio System, but further work is required to improve efficiency, to handle multiple stations, and to increase the number of types of terminals that can be handled by the system. 9

LOCAL AND REGIONAL DATA NETWORK PERFORMANCE, COST COMPARISONS AND ALTERNATIVES: 10

A variety of tools have been developed to allow economical cost/performance tradeoff studies. Accomplishments include: the practical demonstration that low cost terminal access can be achieved by hardware multiplexing at TIPs; the proof of the cost-effectiveness of multipoint lines for connecting low and medium speed terminals into ARPANET; the demonstration of the use of software demultiplexing as a means of increasing the terminal handling capacity of a TIP by a factor of 10; and the theoretical calculation of capacity, error rates and delay to establish of feasibility incorporating broadcast packet radio techniques on a wideband coaxial cable local distribution network to serve a large group of densely located military users. 11

INTEGRATED LARGE SCALE PACKET-SWITCHED NETWORK COST AND PERFORMANCE: 12

During the year, the groundwork was laid to complete the study of cost and performance tradeoffs in large scale packet-switched networks. Basic analysis and design algorithms for optimization of terminal processor location, topological optimization, throughput and delay analysis, and reliability analysis were completed. In addition, a number of cost/performance studies were completed. These include the proof of the cost effectiveness of using satellites to increase the capacity of ARPANET, the establishment of the feasibility of a 1,000 IMP packet-switched network using terrestrial links, and studies of the cost/effectiveness of packet-switching within an environment containing several thousand terminals. These studies are expected to lead to methods for handling large numbers of both terminals and processors and various packet access methods implemented within different hierarchy levels of large integrated command and control communication networks for the DOD. 13

PI-Write-up, Frank

SUPPORT FACILITY DEVELOPMENT: 14

During the past year, a basic packet radio simulator was developed. The simulator handles a single station, up to 48 repeaters and several hundred terminals of the same type. Imbedded in the simulator are models of the repeater, station, and terminals, two routing algorithms, non-persistent carrier sense and unslotted ALOHA random access schemes, zero capture receivers, single and dual data rate channels, omnidirectional antennas, and an interactive terminal to station protocol. All device actions required to initiate, relay, and receive a packet are simulated in the same sequence of events that would occur in the actual packet radio system. Last year's experience showed that for systems like packet radio, interactive, graphical display can greatly reduce the time required to carry out certain forms of system studies such as repeater data rate, power, and operating parameter variations. During the contract period, the first phase of a graphical display system, specifically designed to deal with network problems was developed. In addition, several stand alone analysis and design algorithms and programs were developed, including a repeater location algorithm and a basic network editor. 15

PI-Write-up, Frank

(J25458) 25-FEB-75 08:15;;;; Title: Author(s): ADRIAN C. MCGINNIS/ACM; Distribution: /ACM([INFO-ONLY]) ; Sub-Collections: SRI-ARC; Clerk: ACM; Origin: < PI, FRANK,NLS;4, >, 23-FEB-75 19:34 JAKE ;;;; ####;

PI-Write-up, Kirstein

1974 ARPA Project Summary

Prepared for: ARPA IPT Principal Investigators Conference
San Diego, Mar. 12-14, 1975

Prepared by: Peter Kirstein
Department of Statistics and Computer Science
44 Gordon Sq
London, W.C.1
U.K.

During 1974 our activities have concentrated on the attachment of Hosts by means of a front-end computer with the minimum of software modification in the main Host, measurement and evaluation of the Network in our environment, investigation of the requirements for support activities, investigation of the management problems in the international environment, and the investigation of the requirements for internetworking. It should be noted that although this project has access to ARPA provided facilities, it is largely funded from other sources. Our activities are discussed with, and reported to IPTO; however only certain aspects of the work belong to main IPTO research program.

1. FRONT-END ATTACHMENT OF HOSTS

A considerable effort has gone into improving the attachment of the Rutherford Laboratory (RL) IBM 360/195 as a Host via a front-end PDP 9 computer. the Host is now attached to ARPANET in a rugged manner, and File Transfer is possible. Users connected directly to the RL 360 can get out to access ARPANET Hosts. The excercise showed where certain changes were required for the network environment--and improved, when the changes were implemented, local facilities also. Examples of the the improvements required are better flow control, HELP facilities and Status information.

The Cambridge Computer Aided Design Center (CADC) ATLAS Computer was attached also in a preliminary way; the PDP 9 provided a single TELNET channel. The technique was shown to work also in attaching the University of London Computer Center (ULCC) CDC 6000/7000 complex. These Hosts are not being incorporated operationally yet, since to have several Hosts attached simultaneously via the PDP 9 in this way requires some operating system modifications; these will be completed during 1975.

PI-Write-up, Kirstein

2. MEASUREMENT AND EVALUATION

In order to measure and evaluate ARPANET in our environment, it was necessary to build up a significant level of usage. An adequately diverse user community has been built up--most in projects which involve cooperation between UK and US research groups. We are analysing which features of networks have been most significant for our communities. We are preparing to measure the overhead in the different levels of protocol, and the traffic characteristics of users as a function of their applications. In this we have only developed much of the infrastructure during 1974.

3. SUPPORT ACTIVITIES

In order to develop the User Community of s2, and even for many administrative activities, a number of support activities are necessary. An on-line catalogue of documents is being prepared, and the documents distributed by the British Library. The POST System permitting the sharing of of an account by several users for mail purposes has been improved. A number of short FACT cards have been produced, and courses run. It has become clear that facsimile transmission is required in the coordination of certain projects--hence an activity of incorporating facsimile transmission into the message facilities has been started.

4.MANAGEMENT PROBLEMS

It has become clear that in this international environment, "Balance of payments" issues become very serious. With the number of government agencies involved, and international restrictions on payments, even finding criteria to measure a balance of payments problem is difficult. Some initial papers have been prepared on this subject, and are being discussed with various bodies in the US and UK.

5. INTERNETWORK ACTIVITIES

We have started preparing to implement the HOST-HOST protocols of the Internetwork Protocol proposed by Cerf and Kahn as part of a joint experiment with Stanford U and BBN. Independently, we have considered what the salient factors might be in the interconnection of networks, and have concluded a virtual circuit connection at gateways , with protocol mapping there, looks the most promising. Following this approach , we have started simulating the operation of the Packet Switch on the proposed British Post Office Experimental Packet Switching Service (EPSS), and are starting to implement the link to the CADC ATLAS as if it was via an Internetwork Gateway and EPSS. When EPSS becomes operational in late 1975, this interconnection will be implemented in earnest.

PI-Write-uP, Kirstein

(J25459) 25-FEB-75 08:18;;;; Title: Author(s): ADRIAN C. MCGINNIS/ACM; Distribution: /ACM([INFO-ONLY]) ; Sub-Collections: SRI-ARC; Clerk: ACM; Origin: < PI, KIRSTEIN.NLS;4, >, 23-FEB-75 21:25 JAKE ;;;; ####;

PI-Write-up, Lebow

Information Processing Techniques Research
1974 ARPA Project Summary

Prepared for: ARPA IPT Principal Investigators Conference
San Diego, Mar. 12-14, 1975

Prepared by: Irwin L. Lebow
Data Systems Division
M.I.T. Lincoln Laboratory
Box 73, Lexington, Ma. 02173

The following is a summary of Lincoln project activities during CY 74 in the four areas: A) Network Speech Compression, B) Speech Understanding, C) Surface-Acoustic Wave Convolvers for Packet Radio, and D) Airborne Command and Control.

A) NETWORK SPEECH COMPRESSION (B. Gold)

The overall goal of the Network Speech Compression (NSC) program is to investigate and demonstrate the technology required to carry speech over packet-switched networks. A potentially large economic gain can be realized if secure digital voice and data can be carried over a single integrated packet switched network. To achieve this goal, the NSC group is investigating the delay and throughput characteristics of the ARPANET for speech at different rates and is developing speech compression algorithms matched to Network properties. Lincoln is contributing to the areas described below:

1. Network Delay Measurements. Using the ARPANET "fake host" facility we have obtained measurements of fixed and random components of network transmission delays as well as delays caused by network flow control mechanisms. These results have helped focus attention on ongoing speech-oriented network modification.

2. CVSD Experiments on ARPANET. Lincoln and ISI communicated via CVSD at a 10 Kbps rate. As a result of this experiment, several specific network changes have been implemented to increase throughput.

3, LPC Speech Demonstration on ARPANET, In Dec, 1974, the first successful network speech communications demonstration using LPC was carried out between Lincoln and CHI at 3450 bps, This experiment involved the use of a new Network Voice Protocol designed at ISI, Single-packet messages were used avoiding the reservation delay of the higher-rate multi-packet CVSD messages, The LPC speech at 3450 bps was of much higher quality than CVSD speech at 10 Kbps, and it was generally agreed that this speech link could be used without significant annoyance due to delays or speech quality. 9

4, Conferencing, Lincoln has specified and procured from industry 12 CVSD equipments, These will be used initially for conferencing experiments between Lincoln and ISI. 10

5, Voice Excited Linear Prediction Vocoders, A voice-excited LPC system is being implemented on the FDP to run at 8 Kbps, This data rate will permit specific comparisons between this system and the better known adaptive predictive coding (APC) algorithm. 11

6, Variable Rate LPC Processors, In packet communication, channel bandwidth utilization is adjusted automatically to the current trans- mission rate, which facilitates bandwidth reduction via variable rate coding techniques, We have achieved reasonable quality speech at 1400 bps by eliding silences, using decreased rates during voiceless sounds, and speaker adaptation. 12

B) SPEECH UNDERSTANDING (J, W, Forgie) 13

In April 1974, Lincoln Laboratory successfully demonstrated its mid-term speech understanding system for the government's Joint Advisory Committee for the Laboratory and later for other groups including the SUR Steering Committee, The system recognized sentences which were constrained to be appropriate to a particular limited task domain and a 250 word vocabulary, The system correctly recognized sentences from a large number of speakers without prior training or speaker-dependent adjustments, Informal testing showed about 75% correct sentence recognition, Controlled testing with more difficult sentence material (275 sentences from 6 speakers) showed approximately 50% completely correct with another 30% having errors in only one word or phrase, Processing time for a typical 3 to 4 second sentence was usually less than one minute. 14

C) SURFACE ACOUSTIC-WAVE CONVOLVERS for PACKET RADIO (E, Stern) 15

PI-Write-up, Lebow

In the second half of CY 74, a program was begun at Lincoln Laboratory to develop advanced acoustic convolvers for use as matched filters in Packet Radio. Our goal is to achieve high-time-bandwidth (TW) product systems which synchronize rapidly for protection against interference, jamming and interception. Conventional high-TW matched filters require long sync times. As a result, these systems often give up jamming and/or interception resistance to preserve reasonable access times. Our studies indicate that a SAW convolver which spreads 100 Kbps data over 100 MHz (TW = 1000) should synchronize in under one msec. 16

Furthermore, a code could be implemented with a structure which could be changed with sufficient rapidity to make cryptographic analysis and subsequent interception virtually impossible. In a preliminary experiment a data stream of 140 Kbps spread over 67 MHz (TW = 500) with a changing code was successfully decoded. We are currently perfecting a convolver with TW = 1000. 17

D) AIRBORNE COMMAND and CONTROL (A. J. McLaughlin) 18

Early in CY 74, a study was undertaken of aircraft digital communications with emphasis on satellite links. A report summarizing this work was delivered to ARPA. It was generally concluded that satellites provide the only means of achieving highly reliable long range communications to aircraft. Major increases in system data rates should be possible by exploitation of electronically steered, high gain satellite antennas and by efficient sharing of network capacity by packet access techniques. 19

During the second half of CY 74, a study was begun to investigate the applicability of computer networking technology to the Airborne Command Post Command and Control problem. It has been concluded that netting the computers of several airborne command posts and ground facilities provides the framework for achieving significantly enhanced performance. A series of experiments is being defined using the ARPANET as an R&D test bed to validate and demonstrate this conclusion in an environment in which both the ADP capacities and the communication rates are constrained. In these experiments some of the nodes will be airborne and some simulated by ground nodes on the network. The experimental program will permit evaluation and refinement of developmental techniques of data management, resource sharing, and packet communications in a realistic environment. 20

PI-Write-up, LebOW

(J25460) 25-FEB-75 08:20;;;; Title: Author(s): ADRIAN C. MCGINNIS/ACM; Distribution: /ACM([INFO-ONLY]) ; Sub-Collections: SRI-ARC; Clerk: ACM; Origin: < PI, LEBOW,NLS;3, >, 23-FEB-75 21:37 JAKE ;;;; ####;

PI-Write-up, Magill

SPEECH DIGITIZATION AND TRANSMISSION ON THE ARPANET BY ADAPTIVE LPC TECHNIQUES 1974 ARPA Project Summary

Prepared for: ARPA IPT Principal Investigators Conference
San Diego, Mar. 12-14, 1975

Prepared by: D.T. MAGILL
STANFORD RESEARCH INSTITUTE,BLDG. 306A
333 RAVENSWOOD AVE.
MENLO PARK,CA. 94025

THIS SUMMARY COVERS WORK DONE DURING CALENDAR YEAR 1974. OUR RESEARCH HAS BEEN CONCENTRATED IN TWO THEORETICAL AREAS. IN ADDITION, CONSIDERABLE EFFORT HAS BEEN DEVOTED TO THE DEVELOPMENT OF A COMPUTER FACILITY THAT WILL PERMIT REAL-TIME, LOW-RATE DIGITIZED SPEECH TRANSMISSION ON THE ARPANET.

BROADLY SPEAKING OUR OBJECTIVE HAS BEEN THE DEVELOPMENT OF BETTER QUALITY AND LOWER DATA RATE VOICE DIGITIZERS. THE BASIC APPLICATION IS TO THE PROBLEM OF ECONOMICALLY ACHIEVING SECURE COMMUNICATION WITH HIGH INTELLIGIBILITY AND GOOD QUALITY. OUR RESEARCH EFFORT HAS BEEN IDENTIFIED IN TWO MAJOR TASKS WHICH ARE DESCRIBED SEPARATELY BELOW. IT SHOULD BE NOTED THAT PRIOR TO 1975 OUR MAJOR SIMULATION RESULTS HAVE BEEN ACHIEVED IN NON-REAL TIME. REAL-TIME DEMONSTRATIONS ARE PLANNED IN EARLY 1975.

A. SPEECH DIGITIZATION BY LPC ESTIMATION TECHNIQUES

THE OBJECTIVE OF THIS TASK HAS BEEN THE DEVELOPMENT OF AN LPC SPEECH DIGITIZATION SYSTEM THAT ACHIEVES LOWER DATA RATES(WHILE MAINTAINING HIGH QUALITY) THAN PREVIOUS SYSTEMS. THE RESULT OF OUR EFFORTS HAS BEEN THE DEVELOPMENT OF THE DELCO ALGORITHM FOR SPEECH ENCODING. DELCO RECOGNIZES REDUNDANCIES IN THE LPC PARA- METERS AND REMOVES THEM. CONSEQUENTLY, THE DATA COMPRESSION IS INCREASED BEYOND THAT ACHIEVED WITH CONVENTIONAL LPC TECHNIQUES. AN ADDITIONAL REDUCTION OF APPROXIMATELY 3 TO 1 HAS BEEN DEMONSTRATED. DELCO PRODUCES ASYNCHRONOUS DATA TRANSMISSIONS AS DO MOST GOOD COMPRESSION TECHNIQUES. PACKET COMMUNICATION SYSTEMS, EITHER PACKET SWITCHING OR RADIO, ARE IDEALLY SUITED TO CAPITOLIZE ON SUCH TECHNIQUES. IN SUMMARY, DELCO HAS BEEN DEMONSTRATED TO PROVIDE A REDUCTION OF TRANSMITTED BIT RATE(FOR LPC PARAMETERS) OF APPROXIMATELY THREE TO ONE WITH ESSENTIALLY NO SPEECH QUALITY DEGRADATION.

PI-Write-up, Magill

B, SPEECH DIGITIZATION EXCITATION STUDY 8

THE OBJECTIVE OF THIS TASK HAS BEEN TO DEVELOP MORE EFFECTIVE METHODS OF ENCODING THE EXCITATION SIGNAL USED TO DRIVE THE LPC SYNTHESIZING FILTER AT THE RECEIVER. PREVIOUS TECHNIQUES HAVE EITHER REQUIRED TOO HIGH A BIT RATE OR HAVE SUFFERED FROM THE WELL-KNOWN PROBLEMS OF PITCH EXTRACTION. OUR INITIAL RESEARCH CONSIDERED SOME METHODS OF IMPROVING THE PITCH EXTRACTION PROCESS. HOWEVER, OUR MAJOR EFFORT HAS BEEN DEVOTED TO MORE ROBUST METHODS OF ENCODING THE EXCITATION SIGNAL. THAT IS, WE HAVE CONCENTRATED ON THE DEVELOPMENT OF AN ENCODING SYSTEM THAT IS CAPABLE OF OPERATING IN THE PRESENCE OF BACKGROUND NOISE AND/OR MULTIPLE SPEAKERS. TWO SYSTEMS HAVE BEEN DEVELOPED AND DEMONSTRATED AS A RESULT OF THIS EFFORT. BOTH DIGITIZERS ARE BASED ON THE SAME FUNDAMENTAL CONCEPT. 9

NIC24952
PART OF NIC 24980 9a

THESE DIGITIZERS ARE BASED ON SHORT-TERM POWER SPECTRUM MATCHING AND THE PRINCIPLE OF THE VEV. BOTH SYSTEMS USE RESIDUAL ENCODING AND LINEAR PREDICTION AND ARE KNOWN AS RELP SYSTEMS. THE FIRST USES ADAPTIVE DELTA MODULATION(ADM) FOR ENCODING THE RESIDUAL WHILE THE SECOND USES ADAPTIVE DIFFERENTIAL PULSE CODE MODULATION(ADPCM). THE RELP/ADM SYSTEM HAS BEEN DEMONSTRATED TO PROVIDE VERY GOOD QUALITY IN THE RANGE OF 8 TO 9.6 KBPS. FURTHERMORE, IT HAS BEEN DEMONSTRATED TO OPERATE SUCCESSFULLY WITH TWO SIMULTANEOUS SPEAKERS. THE RELP/ADM SYSTEM WAS THE FIRST LPC EQUIVALENT TO THE VEV TO BE DEMONSTRATED. 10

THE RELP/ADPCM SYSTEM HAS ALSO BEEN DEMONSTRATED. THE MOTIVTION FOR THIS SYSTEM WAS TWO-FOLD. FIRST, IT WAS DESIRED TO COMPARE THE QUALITY DIFFERENCES BETWEEN THE TWO ENCODING SCHEMES. SECOND, IT MAY BE POSSIBLE TO ACHIEVE 4800 BPS OPERATION WITH THE RELP/ADPCM SYSTEM WHILE PROVIDING ACCEPTABLE QUALITY. WE HAVE DEMONSTRATED THAT THE ADM SYSTEM PROVIDES BETTER HIGH FREQUENCY CONTENT IN THE SYNTHETIC SPEECH THAN THE ADPCM SYSTEM. HOWEVER, THE LATTER APPEARS TO BE ACCEPTABLE. WE HAVE THEORETICALLY SHOWN THAT 4800 BPS OPERATION SHOULD BE POSSIBLE; HOWEVER, ADEQUATE QUALITY HAS YET TO BE DEMONSTRATED. 11

IN SUMMARY, TWO FORMS OF THE RELP SYSTEM HAVE BEEN DEMONSTRATED TO PROVIDE VERY GOOD QUALITY IN THE 8 TO 9.6 KBPS RANGE. FURTHERMORE, THESE RELP SYSTEMS HAVE BEEN DEMONSTRATED TO OPERATE SUCCESSFULLY IN PRACTICAL ENVIRONMENTS THAT GIVE CONVENTIONAL VOCODERS GREAT DIFFICULTY. 12

PI-Write-uP, Magill

(J25461) 25-FEB-75 08:22;;;; Title: Author(s): ADRIAN C. MCGINNIS/ACM; Distribution: /ACM([INFO-ONLY]) ; Sub-Collections: SRI-ARC; Clerk: ACM; Origin: < PI, MAGILL,NLS;3, >, 23-FEB-75 21:45 JAKE ;;;; ####;

PI-Write-up, Nilsson

Artificial Intelligence--Research and Applications (Computer-Based Consultant Project) 1974 ARPA Project Summary

Prepared for: ARPA IPT Principal Investigators Conference
San Diego, Mar. 12-14, 1975

Prepared by: Nils J. Nilsson
Artificial Intelligence Center
Stanford Research Institute
Menlo Park, California 94025

The Computer-Based Consultant (CBC) project at SRI has as its goal the development of a computer system that can engage in a spoken dialog with a human user to give him detailed advice about some particular subject area. We have selected maintenance, assembly/disassembly, troubleshooting, repair and operation of electromechanical equipment as a subject. To create a CBC system requires the integration of subsystems for natural language input and output, vision, diagnosis of faults, planning assembly/disassembly sequences and information retrieval. We are conducting research in each of these areas, and in addition, in the area of integrating these abilities into a coherent system. To provide specific goals and focal points for our research we have planned a series of demonstrations to occur in April of each year 1975 through 1978 inclusive. The final demonstration is planned to illustrate the feasibility of applying this technology to any of several DOD problem situations requiring interactive expertise.

During calendar 1974 we achieved the following specific results:

1. PROCEDURAL NET SYSTEM -- During 1974 we developed a prototype version of an integrated problem-solving and execution-monitoring system. The system uses a new method of storing in a computer memory information about actions. The new representation, called the "procedural net," represents actions in a structured way, so that the same action appears several times, represented at different levels of detail. The problem solving portion of the system easily solves some problems involving simultaneous goals and long chains of actions. The execution monitoring system engages in a dialog with a novice mechanic, varying the level of detail in response to the mechanic's needs.

2. MODELING -- We have designed and implemented a modeling system for describing the changing physical states of the workstation environment as tasks are being performed. This system allows one to specify in a highly modular form relations, predicates, derivation functions, state transition functions, and models of the actions that a human can be asked to do. Furthermore, we have defined in this system a set of standard relations (such as ATTACHED and REMOVED) and actions (such as INSTALL and CONNECT) that in effect provide a descriptive language in which electromechanical equipment and assembly/disassembly tasks can be described. This modeling package allows the system to maintain a coherent description of the workstation both while monitoring actual operations being done by a human and while considering hypothetical operation sequences during planning. 7

3. SELECTION OF VOCABULARY AND SEMANTIC CONCEPTS -- We have selected a vocabulary of about 650 English words extracted from protocols between expert consultants and novice mechanics. These have been grouped into semantic categories to help define the key concepts to be used in dialogs. This achievement is important because it permits us to begin work on the programs for syntactic and semantic analysis of natural language dialog in the computer consultant system. 8

4. SCANNING LASER RANGEFINDER -- We have implemented a laser rangefinder device that works like a radar to measure distances to objects in a scene. The device uses mirrors to scan a raster of points in a scene and determines range to each point by measuring the time of flight of a modulated CW laser signal. The range finder is playing an important role in our automatic scene analysis work because it provides a crucial additional parameter, range, that can be used with color and brightness data to interpret visual information. 9

5. POINTING SYSTEM -- We have implemented a pointing system that 1) points a laser beam at an object named by the user and 2) identifies an object pointed at by the user. The system can point at any of about a dozen parts of an air compressor that the user requests by voice input. It also can identify, by voice output, any of these same parts that the user might point at using a wand with a lightbulb on the end. The system uses a TV camera and a stored internal model of the compressor to control its pointing behavior. This system is an important I/O tool in our Computer-Based Consultant project and achieves several functions directly that would be much more cumbersome to achieve by conventional graphics. 10

6. DISTINGUISHING FEATURES SCENE ANALYSIS SYSTEM -- We have implemented a scene analysis system that takes as input a multisensory (i.e., range, intensity and color) image and locates objects in the scene based on the most distinguishing sensory properties of the object. For any problem, the system itself automatically generates the best strategy for finding an object based on internal models of its own perceptual abilities. Presently, the system can locate several objects and parts of objects in office scenes (desk tops, chairs, chair seats, doorways, etc.). 11

7. COMPILING QLISP USER CODE -- The computer language QLISP has been enhanced by the addition of the ability to compile user code containing QLISP. Previously, any part of the user's program which contained any QLISP at all could only be executed through the interpretative facilities provided by QLISP, but now the flexibility of the INTERLISP system has been used to interface the standard compiler to the particular ways in which QLISP extends the INTERLISP language. Our preliminary measurements show that compiled QLISP runs about twice as fast as noncompiled, but the main advantage should show up in the way users can now freely intermix QLISP code with their regular LISP without the need to introduce artificial separations for the sake of efficiency. 12

8. DEMONSTRATION SYSTEM -- We have put together a preliminary computer consultant demonstration system with rudimentary abilities to give instructions about assembly and disassembly of an air compressor. It also combines the laser pointer system (item #5 above) and can answer certain questions about the status of the compressor. This initial version will serve as a base for a much more elaborate system to be ready in April 1975. 13

ACM 25-FEB-75 08:26 25462

PI-Write-up, Nilsson

(J25462) 25-FEB-75 08:26;;;; Title: Author(s): ADRIAN C. MCGINNIS/ACM; Distribution: /ACM([INFO-ONLY]) ; Sub-Collections: SRI-ARC; Clerk: ACM; Origin: < PI, NILSSON.NLS;2, >, 23-FEB-75 01:55 JAKE ;;;; ####;

PI-Write-up, Pirtle

INSTITUTE FOR ADVANCED COMPUTATION
1974 ARPA Project Summary

Prepared for: ARPA IPT Principal Investigators Conference
San Diego, Mar. 12-14, 1975

Prepared by: DR. MEL PIRTLE
NASA AMES RESEARCH CENTER
MOFFETT FIELD, CALIFORNIA 94035

GENERAL:

The Institute for Advanced Computation (IAC) is a NASA/AMES Research Center Institute established under a NASA-ARPA inter- agency agreement with the charter to develop and operate a large computing and information storage facility for NASA, ARPA and other groups invited by either of these two. The major equipment of the institute is the ILLIAC IV, PDP-10/TENEX, the B6700 and the UNICON 690. This equipment, except for the B6700, is incorporated into a single system which also includes several PDP-11 management processors, small capacity rotating memories and assorted peripheral devices. the B6700 is operated as a secondary facility and is utilized for certain ILLIAC program compilations and for some test programs.

SUMMARY OF ACTIVITIES:

The primary resource in the IAC system today is the ILLIAC IV. We had two major objectives for the ILLIAC IV during this past year. These were:

1. To provide an ILLIAC IV service to network users; and
2. To continue the checkout of the machine with emphasis on improved reliability and maintainability.

There were significant accomplishments in both of these areas. At the beginning of 1974, we were providing about 4 hours of ILLIAC time daily to about a dozen ARPA and NASA users. at that time, the quality of this service, particularly the state of the ILLIAC IV, was uneven. Today, we schedule about 10 hours of ILLIAC IV time daily to a group of 18-20 ARPA and NASA users. The quality of this service is relatively uniform and the state of the ILLIAC IV is good. The results the users are getting are almost always correct when the ILLIAC IV is up. (The "ILLIAC IV" here refers to the I4 processor, array memory, and one-half of the total I4 disk memory capacity.) Some specific accomplishments in these two general areas are:

PI-Write-up, Pirtle

USER SERVICES: 9

Several notable ILLIAC IV user successes have been accomplished this year. For example, RAND has successfully completed a 30-day global climate simulation which runs for 2 hours on the I4. NASA'S GODDARD INSTITUTE FOR SPACE STUDIES (GISS) has successfully run 2-week weather simulations. The NAVAL RESEARCH LABS CASE PROGRAM (SIGNAL PROCESSING) became operational on the ILLIAC IV in November of this year. NRL has about 100 raw data sets to process; each data set takes about 1 hour of I4 processing time. SYSTEMS, SCIENCES AND SOFTWARE (SSS) has run several 3-D finite element calculations on the ILLIAC IV, each of which takes in excess of 1 hour processing time on the machine. SDAC successfully converted the first phase of thier "Long Wave" analysis programs to the ILLIAC IV. In general, all users have had successful runs on the ILLIAC IV with increasing frequency and of longer duration. Runs of 30 to 120 minutes are becoming common as compated to runs of 2-3 minutes at the beginning of the year. 10

ILLIAC CHECKOUT 11

The main objective was to increase reliability and maintainability. In this regard, many hardware modifications were made to replace faulty components and to correct design errors. Specific examples include: 12

> The design, fabrication and replacement of several boards in the control unit and in the processing elements (PE) and the setup of an "assembly line" modification to all PE'S which includes replacement of all terminators, sleeving of the back plane pins, and some logic corrections. 12a

In order to improve our ability to maintain the machine, IAC designed and developed a PE simulator (PESO). This simulator, which runs on the ILLIAC IV, accepts fault detection test data as input, simulates the execution of a PE, and produces as output specifically identified component failures consistent with the input test data. With this sophisticated diagnostic tool most PE faults can be quickly isolated to a specific component for corrective repair action. 13

In the early part of this year, IAC established (in conjunction with the owners) the objective of having one half of the I4 disk memory capacity solid, and routinely available for users. To achieve this objective, both of the disk memory subsystems were extensively modified. These modifications were principally in redistribution of power, adding capacitors, and logic error corrections. One disk system is relatively solid today, and is rountinely used successfully by I4 users. The second sub-system with further improvements is in final testing. A comprehensive I4 disk memory test was also developed. 14

PI-Write-up, Pirtle

UNICON

IAC'S objective for the UNICON memory this year was to make the device reliable and, by the end of the year, available for the storage of data files associated with ILLIAC IV applications. During the year, the UNICON controller (designed and fabricated last year) was checked out and numerous modifications were made to the laser recording unit. These efforts have significantly increased the stability of the device and have provided for verification of correct recording during the write operation. A "clean room" was built around the device, providing a clean environment for both the laser recording unit and the off-line storage of recording strips. The UNICON has been used for the storage of selected ILLIAC I4 user data files since November.

CENTRAL SYSTEM

The major accomplishment in the central (e.g. TENEX) IAC System has been the routine provision of a stable PDP-10/TENEX service to ILLIAC IV and selected network users. Specific enhancements in this Central System include:

1. The addition of a second PDP-10/TENEX system in May of this year.

2. The implementation of a magnetic tape facility for ILLIAC IV users. This implementation included the design and integration of hardware, and the design and development of diagnostic and operating software.

3. Design, development, and implementation of an "Operator-11" facility which runs on a PDP-11. The "Operator-11" greatly simplifies the IAC system opera- tors function by performing real time system status monitoring and providing a single interface to the various devices and software in the system.

ORGANIZATIONAL

Considerable effort has been spent over the year to carry out the Transition from a development to an operational system. Organizationally, these efforts have included the establishment and staffing of an administration group, increasing the user support staff and extensively changing the operations group including the addition of personnel, retraining personnel, and restructuring the group. Key personnel additions have occurred at all levels in the Institute, notably with the addition of experienced management in the operation groups.

PI-Write-up, Pirtle

Future plans for the Institute are under study and development. Discussions have begun with both ARPA and NASA, with increased frequency in the latter half of the year. This planning activity involves a significant outlay of IAC management time. 21

MISCELLANEOUS 22

In September, IAC initiated a survey of application areas for the ILLIAC IV. Initial results were presented to ARPA in November. This survey will be completed in April or May of 1975. 23

Plans for accomodating classified data on the I4 are progressing and a preliminary approach has been reviewed with representatives from ARPA, the NAVY and the ARC facility contractor. 24

PI-Write-up, Pirtle

(J25463) 25-FEB-75 08:34;;;; Title: Author(s): ADRIAN C. MCGINNIS/ACM; Distribution: /ACM([INFO-ONLY]) ; Sub-Collections: SRI-ARC; Clerk: ACM; Origin: < PI, PIRTLE.NLS;3, >, 23-FEB-75 21:51 JAKE ;;;; ####;

PI-Write-up, Pratt

IMAGE PROCESSING RESEARCH AT THE UNIVERSITY OF SOUTHERN CALIFORNIA IMAGE PROCESSING INSTITUTE 1974 ARPA Project Summary

Prepared for: ARPA IPT Principal Investigators Conference
San Diego, Mar. 12-14, 1975

Prepared by: William K. Pratt
Image Processing Institute
University of Southern California
Powell Hall 306 - University Park
Los Angeles, California 90007

The research project in image processing is concerned with the analysis and development of techniques for efficiently generating, processing, interpreting, transmitting, and displaying visual images and two dimensional arrays of data.

IMAGE CODING:

During 1974 initial steps were taken by various federal and commercial organizations toward the implementation of image coding systems based upon the adaptive linear predictive coding and transform coding concepts developed at the USC Image Processing Institute. Further research at USC in 1974 has led to the discovery of a new reconstruction algorithm for linear predictive and transform image coding systems. This algorithm which involves joint linear processing of groups of quantized image variables can reduce the mean square coding error by 20% to 50% and improve subjective quality as compared to conventional processing techniques. The hybrid DPCM/transform coding technique previously developed for coding individual image frames has been successfully extended to the removal of image redundancy between television or movie frames. In this system a two dimensional image transform is taken over small image blocks in each frame and differential pulse coding is performed on the coefficients between frames. Only a single frame of data storage is required. Bandwidth reductions of about 15:1 to 20:1 have been demonstrated.

IMAGE RESTORATION AND ENHANCEMENT:

A new method of computer image restoration has been developed to correct for astigmatism and curvature of field aberrations caused by imperfect optical systems. Neither type of aberration error can be removed by conventional filtering techniques because the error is space variant.

PI-write-up, Pratt

The new restoration method involves an inverse geometric correction, space invariant image restoration, followed by another inverse geometric correction to compensate for the aberrations. A novel image restoration technique has also been discovered for the restoration of images degraded by general forms of space variant blur. This technique, called singular value decomposition, involves decomposing a blurred image into a series of sub-images of increasing resolution which are sequentially processed and recombined to yield the restored image. The beauty of the restoration technique is its ability to avoid numerical errors which plague conventional restoration methods. 9

IMAGE DATA EXTRACTION: 10

A prototype laser/computer optical feature extraction system has been built and is presently undergoing applications testing. This system consists of a minicomputer, electronic image scanning camera, and laser optical device which act together to detect and locate optical features in an image. The computer driven scanner searches for and locates gross objects or regions within a picture. Then the computer directed laser beam performs a high resolution spatial frequency analysis of the region. The spectral data is processed by a pattern recognition program on the computer to quantitatively determine the location and character of objects within a picture. The overall system is capable of analyzing large size, high resolution pictures in under five minutes. The optical processing technique has been combined with digital edge and texture analysis algorithms for image recognition and interpretation. This combined processing exploits the parallel processing capbility of the optical system and the adaptive nonlinear attributes of computer image manipulation. 11

IMAGE ANALYSIS: 12

A new model of the human visual system for color images has been found. This model accurately predicts known visual phenomena such as color sensitivity and color constancy under luminance changes. The major attribute of the model, in addition to its modelling accuracy, is its relative simplicity. The model has led to a form of image pre-processing in which a simple nonlinear operation is performed on a color image before conventional coding, filtering, enhancement, etc. The addition of this simple pre-processing, dictated by the model, has resulted in improved color image quantization, better subjective filtering results, and an additional bandwidth reduction of 2:1 for transform coding of color images. 13

PI-Write-up, Pratt

IMAGE PROCESSING FACILITIES: 14

In August 1974 a PDP-KI10 computer operating under TENEX was added to the USC Engineering Computer Laboratory for support of the image processing research program. The initial stages of implementation of a front end image processing software system on the PDP-10 have begun. The objective of the software system is to handle file manipulation for an image processing user and permit transparent access to large scale network computers for image processing tasks. Construction of a real time color image display TIP terminal was completed in 1974. Implementation of a real time color image magnetic tape recorder/playback unit is also underway. This unit is capable of recording a one minute segment of real time color television data at conventional scan rates and playing back the data at a slow rate for computer entry. The inverse operation of transferring digital pictures from a computer to a real time display is also possible. 15

PI-Write-up, Pratt

(J25464) 25-FEB-75 08:39;;;; Title: Author(s): ADRIAN C. MCGINNIS/ACM; Distribution: /ACM([INFO-ONLY]) ; Sub-Collections: SRI-ARC; Clerk: ACM; Origin: < PI, PRATT,NLS;6, >, 23-FEB-75 22:57 JAKE ;;;; ####;

PI-Write-up, Shoup

Research on Automated Speech Analysis
1974 ARPA Project Summary

Prepared for: ARPA IPT Principal Investigators Conference
San Diego, Mar. 12-14, 1975

Prepared by: Drs. June Shoup-Hummel, David Retz, and
John Markel
Speech Communications Research Laboratory
800 A Miramonte Drive
Santa Barbara, California 93109

1. Natural Speech Analysis - J. E. Shoup-Hummel

The primary goal of this task is to determine how the utterances of natural speech are divergent from carefully enunciated "dictionary" pronunciation in an effort to formulate generalizations and rules about the phonetic strings of natural speech.

The major accomplishment in this area during 1974 was the building of an extensive computerized natural language data base and the formulation of computer programs for automatically analyzing this data base for phonological phenomena. When the ARPA SUR project was initiated some three years ago there were virtually no large collections, transcriptions, nor analysis programs of speech material available anywhere. For system development and for speech research it is essential that such a data base exist and that it be analyzed extensively and rapidly. SCRL has transcribed orthographically and ARPAbetically 31,055 words from a total of 32 speakers and has developed a package of processing and analyzing computer programs to obtain certain phonological results of interest to the SUR project. This data base not only is useful for phonological study, but can also be used by system builders and researchers for acoustic information if the recordings are digitally stored, extracted with relevant acoustic measures, and then related by time frames to the ARPAbetic transcriptions.

2. ELF System Development - D. L. Retz

The objective of this task is to develop an operating system (called ELF) as a flexible interface to the ARPANET, using the PDP-11 computer. The system provides terminal facilities for user access as well as special-purpose support functions. ELF is a multiprogrammed system with rich process synchronization and inter-communication capabilities.

A number of subtasks have been accomplished. The system has been designed to provide for the continued development of a virtual memory structure, allowing programs to run in the PDP-11 and utilize resources available in the network. A Network Control Program is included in the system, allowing communication with other network computers using the standard ARPANET Host-Host protocol. In addition, a set of system calls are provided for the development of experimental protocols; this facility is being used in the transmission of packetized speech in the ARPANET. A user interface called the EXEC has been developed to allow programs to be run under the system. One such program is User-Telnet, which allows users to establish terminal connections to various sites on the network. ELF is being used to provide a network interface to a number of special-purpose digital signal processors (SPS-41's) which provide signal processing capability for speech research applications, but are structurally unsuited to direct connection to the network. An ELF System Programmer's Guide which describes the internal structure of the system has been completed and is now available. 9

3. Finite Word Length Problems in Linear Prediction - J. D. Markel 10

The objectives of this task have been (1) to determine how algorithms (programs) used in linear prediction speech compression systems are affected by numerical accuracy in their computation and (2) to develop algorithms for use in the Network Speech Compression (NSC) program. Both objectives have been accomplished. 11

A rather complete theoretical and experimental computer roundoff noise analysis of the most important portions of linear prediction speech transmission systems has been performed. The results have shown, for example, which forms of sysnthesizer filters are best suited for computer implementation. The results of these studies led to the definition of a complete linear prediction speech compression program. This program is now being implemented in the SPS-41 computers at several sites as the NSC system for speech compression on the ARPANET (the SCAN system). 12

PI-Write-up, Shoup

(J25465) 25-FEB-75 08:42;;;; Title: Author(s): ADRIAN C. MCGINNIS/ACM; Distribution: /ACM([INFO-ONLY]) ; Sub-Collections: SRI-ARC; Clerk: ACM; Origin: < PI, SHOUP,NLS;5, >, 23-FEB-75 03:35 JAKE ;;;; ####;

PI-Write-up, Sutherland

Research on Command and Control Related Computer Technology
1974 ARPA Project Summary

Prepared for: ARPA IPT Principal Investigators Conference
San Diego, Mar. 12-14, 1975

Prepared by: William R. Sutherland
Bolt Beranek and Newman Inc.
50 Moulton Street
Cambridge, Massachusetts 02138

This summary covers work done during the calendar year 1974.

I. Speech Compression - John I. Makhoul

In our speech compression research we have developed a time-asynchronous linear predictive vocoder that transmits high quality speech at low bit rates. The transmission rate varies according to the properties of the incoming speech signal. We have developed several methods for reducing the redundancy in the speech signal without sacrificing speech quality. Included among these methods are:

1) Adaptive optimal selection of predictor order. A new information theoretic criterion was employed to determine the optimal (lowest) order that adequately represents the speech signal in each analysis frame.

2) Optimal selection and quantization of transmission parameters. The reflection coefficients were judged to be the best for use as transmission parameters. An optimal procedure for quantizing the reflection coefficients was developed by minimizing the maximum spectral error due to quantization.

3) Variable frame rate transmission. A scheme was used to transmit speech parameters at variable rates in accordance with the changing characteristics of the incoming speech.

4) Optimal encoding. Variable length (Huffman) coding was used to encode the parameters at the lowest bit rate possible for a given quantization scheme.

5) Improved synthesis methodology. We found that with the time-synchronous method of analysis, improved speech quality was obtained when synthesis was also done time-synchronously.

II. Packet Radio Network - Jerry D. Burchfiel

PI-Write-up, Sutherland

The Packet Radio Network, an ARPA project in the CCC Program, is developing techniques for secure mobile digital communications which are inexpensive, difficult to detect or jam, and which permit a high degree of coexistence with existing applications of a broadcast band. The Packet Radio Network (PRN) consists of a shared common broadcast channel, fixed and mobile terminals which are sources and sinks of digital information, (e.g. test, graphics, encrypted compressed voice) repeaters which provide area coverage for mobile terminals by store-and-forward techniques, and stations which provide centralized control of network routing, statistics, debugging, and connections to other networks. 8

BBN is responsible for development of the PRN Station and the protocols which support interprocess communication between processes (terminals and hosts) of the PRN and other processes on the PRN or other networks. We are active in design of systemwide protocols, and have published numerous Packet Radio temporary notes in this area. Initial integration of Station hardware will begin at BBN in March 1975, and an initial demonstration of working Station-terminal protocols is planned for August 1975. 9

10

ACM 25-FEB-75 08:44 25466

PI-Write-up, Sutherland

(J25466) 25-FEB-75 08:44;;;; Title: Author(s): ADRIAN C. MCGINNIS/ACM; Distribution: /ACM([INFO-ONLY]) ; Sub-Collections: SRI-ARC; Clerk: ACM; Origin: < PI, SUTHERLAND,NLS;6, >, 23-FEB-75 22:02 JAKE ;;;; ####;

PI-Write-up, Walker

SRI SPEECH UNDERSTANDING RESEARCH
1974 ARPA Project Summary

Prepared for: ARPA IPT Principal Investigators Conference
San Diego, Mar. 12-14, 1975

Prepared by: Donald E. Walker
Artificial Intelligence Center
Stanford Research Institute
Menlo Park, California 94025

INTRODUCTION -- There have been five major accomplishments in the Speech Understanding Research Project at SRI this year. First, we have completed with the System Development Corporation the initial implementation of a system being built jointly by the two contractors. Second, within this system we have developed a control strategy, embedded in the parser, that is able to focus the operation of the system and to reduce time spent on incorrect interpretations. Third, we have written a performance grammar, based on studies of task-oriented dialogs, that relates information about meaning and about stress and intonation patterns to that of syntax in the process of analyzing an utterance. Fourth, we have developed a way of partitioning spaces in a network representation for semantic structures that is particularly well-suited for working with complex task domains. Fifth, we have introduced procedures, building on the semantics, that allow us to establish a discourse history, that is, to use information from previous utterances in the analysis of the current one.

1. SYSTEM IMPLEMENTATION -- In the joint system, SRI is concentrating on grammar, semantics, pragmatics (information about a situation that is changing dynamically), and the integration of these components through a parser to provide analyses of the structure of English questions, statements, and commands so that they can be interpreted and an appropriate response made. The parser also constitutes the mechanism for coordinating knowledge about acoustics, phonetics, and phonology toward the analysis of spoken language. The system will allow the efficient use of many different kinds of knowledge in processing an utterance. Currently, we are working on two task domains: one provides data management capabilities for querying a file of information on attributes of ships; the second involves using the computer as a consultant to guide a technician in the repair of electro-mechanical equipment.

2. A FOCUSED PARSER -- The lack of separation between words in fluent speech and the variability in pronunciation as a function of context require a different parsing strategy for speech understanding than that needed for text understanding and question answering. Consequently, we have developed a parser that both can predict words or phrases on the basis of context and can build up phrases and clauses from words that have been identified acoustically at some place in an utterance. The parser coordinates knowledge relating to the structure of English, to the nature of the task being undertaken, to the relevant features in the world of the task domain, to previous conversations, to variations in stress and intonation (prosodic features), to the effects of noise, and to individual differences in speaking, to mention only some of the critical elements involved. The uncertainty of the input and the variety of kinds of knowledge required can lead to consideration of a large range of interpretations in the analysis of an utterance. The parser contains mechanisms that enable it to examine the most reasonable alternatives first and to focus its activities with respect both to processing time and to space used in the computer. 6

3. A PERFORMANCE GRAMMAR -- The grammar developed for the system differs from other grammars in several important ways. First, it is based on a careful study of protocols recorded of people performing tasks like those in the area of intended application. Thus it reflects the way people actually talk, rather than how they should talk. Second, the grammar is written so that it is not restricted to a particular kind of parsing strategy. That is, it can be used both in building up more complex grammatical structures from words that have been identified acoustically, and in working down from a grammatical structure to the words it contains. Third, the grammar incorporates in its rule statements information on semantic and prosodic features, as well as on grammatical ones. Thus, when the grammar is compiled with the lexicon into an internal representation that the parser operates on, it results in a more efficient use of knowledge sources in the system. 7

4. PARTITIONED SEMANTIC NET SPACES -- Semantic information, which is directly coordinated with the grammar, is embodied in a network in which the nodes represent concepts--objects or events--and the arcs represent structural relations among the concepts. Our semantic nets differ from other network representations in the way nodes can contain structural relations and in the partitioning of nodes and arcs into net spaces. Net spaces provide a uniform mechanism for distinguishing hypothetical and imaginary situations from reality. The result is a more effective procedure for encoding the multiple alternative states of a changing task or situation. The hierarchical structure of the net spaces results in a more economical storage of information, because elements common to related nodes can be stored once for all of them. This mechanism allows attention to be focused on particular levels of detail as appropriate. In addition, the net space partitioning makes it much easier to handle general statements and rules, items that have caused considerable difficulty in previous programs for doing semantics. 8

5. DISCOURSE ANALYSIS -- In discourse, whether spoken or written, a given utterance or statement may depend directly on what has already been said or written for even a minimal understanding of the content. Pronouns are used to avoid having to repeat the names of people or objects, and, particularly in spoken language, the subject or predicate may be omitted and the listener expected to recover it from the context. For our speech understanding system, we are developing procedures that can handle instances of anaphoric reference and of ellipsis. We now have programs that provide these kinds of information based on an analysis of the previous utterance. We intend to extend these mechanisms so that for complex goal-oriented tasks we will be able to predict what a person is saying and to use that information to increase the efficiency of the system. 9

PI-Write-up, Walker

(J25467) 25-FEB-75 08:47;;;; Title: Author(s): ADRIAN C. MCGINNIS/ACM; Distribution: /ACM([INFO-ONLY]) ; Sub-Collections: SRI-ARC; Clerk: ACM; Origin: < PI, WALKER.NLS;2, >, 23-FEB-75 14:34 JAKE ;;;; ####;

PI-Write-uP, Watson

SRI Augmentation Research Center
1974 ARPA Project Summary

Prepared for: ARPA IPT Principal Investigators Conference
San Diego, Mar. 12-14, 1975

Prepared by: Richard W. Watson
Augmentation Research Center
Stanford Research Institute
Menlo Park, California 94025

MAJOR R&D ACCOMPLISHMENTS FOR CALENDAR YEAR 1974

1) Released a Major New Version of NLS (NLS-8)

The main design goals of this system were listed in last year's accomplishments. The significance of this year's accomplishment was their successful implementation, checkout, documentation, and user training.

NLS-8 from the user point of view consists of new capabilities for tailoring the interaction to user preferences through a User Profile database; a multilevel Help capability, providing prompting and optional showing of next-alternative command terms, command syntax, or relevant entry into a Help database with a simple query facility for full online documentation (Hardcopy documentation is derived from these facilities as well); greater consistency in command language forms; new commands where there was a strong need; and the ability to write sequences of commands and have them executed from a file.

From a system point of view, NLS-8 has a number of structural changes and ideas for specification of the user interaction at a high level, compilation of this specification into a data structure that in conjunction with the User Profile controls an interpreter. These ideas are being adopted in other ARPA programs such as the National Software Works (NSW), ISI message system, and are under consideration in ARPA programs under plan.

2) Released Line Processors to Support DNLS on Cheap, Commercial CRT Terminals

Last year we designed a micro computer based box that would adapt a class of low cost commercially available alphanumeric CRT systems into true two dimensional devices for output (multi-window split screen operation) and allow use of two dimensional input pointing devices.

This year a number of these devices are in field use supporting terminals of four different manufacturers. The Air Force through the NSW program will be exploring their use. The basic display techniques and communication protocols were published and have influenced other ARPA contractors in their design of terminal control systems. 6b

The Line Processor is now being adapted to handle general graphics displays as well as offline cassette devices. 6c

3) Designed Advanced Protocols for Resource Sharing on the ARPANET 7

As part of the work for NSW, a new approach to protocols has been designed and thoroughly documented for inter-process and/or interhost communication and control. We call the approach a Procedure Call Protocol. It creates a distributed programming and process control environment. In effect it makes procedures and data structures of remote software systems as accessible to the programmer as those within his own system. 7a

This approach will make it quite easy for new systems to be constructed from appropriate parts of existing systems and should greatly facilitate crossnet and cross process resource sharing. 7b

4) Designed a Distributed-Service Frontend System 8

A mini-computer system has been designed to provide a coherent command language environment for the multi-tool NSW system. We expect this approach to have considerable impact on system organizations of other systems to operate within an ARPANET like marketplace of information services. It will not only supply services to users to simplify the number of conventions they have to know when using a variety of ARPANET tools, but also provide services for tool builders to greatly simplify the task of specifying the user interface. The Frontend will provide all terminal handling and command parsing facilities and thus decrease the cost of providing new tools. 8a

The initial Frontend will be implemented on a PDP-11 running the ELF operating system. We have developed a cross compiler and debugging environment for use of our system programming language L-10 for use with the PDP-11. 8b

5) Designed a Distributed-service Operating System Interface 9

One important goal of the work ARC is doing on NLS and the NSW Frontend is to provide mechanisms to simplify and decrease the cost of movement of the programs developed to a variety of machines and operating system environments. To this end we have designed a virtual environment that all application level programs will see as their operating System Interface (OSI). The OSI will in turn contain the actual calls on a given operating system. 9a

6) Designed Extensions for the NLS File System 10

Designs have been completed that will enable NLS to support text and other media such as graphics, voice and so forth in an integrated fashion. Many systems support text, or speech, or graphics, but this development will open the way for tool developments that utilize multimedia. 10a

7) Designed Access Support for R&D Software Workers from ARPANET Sources 11

We made the plans and ordered the hardware necessary to allow us to obtain the computer needed by our development staff from ARPANET hosts. 11a

The significance of this development is that it is the first case of a fairly large project giving up its local computing capacity to obtain equivalent capacity through the Network, from sites specializing in providing service. 11b

PI-Write-up, Watson

(J25468) 25-FEB-75 08:50;;;; Title: Author(s): ADRIAN C. MCGINNIS/ACM; Distribution: /ACM([INFO-ONLY]) ; Sub-Collections: SRI-ARC; Clerk: ACM; Origin: < PI, WATSON,NLS;5, >, 23-FEB-75 22:34 JAKE ;;;; ####;

There is a substantial and rapidly increasing need within DoD to make use of very large amounts of information via computers, and an APRA program to spur developments of appropriate facets would have a high probability of producing important and useful results. Among the areas of research identified in the report, the use of AI concepts in data base systems was particularly recommended. We are continuing to work with ARPA-IPTO in this program planning effort. 14

4. System Support Activities - Peter Weiner 15

Much of Rand's computer research is being performed on a PDP-11/45 minicomputer, using the UNIX operating system developed by Bell Laboratories. We are developing several support programs to make the facilities of UNIX more useful to the ARPA research community. We have completed a working prototype version of a CRT-oriented text editor (the Rand Editor) which operates within the UNIX environment on Ann Arbor 40-line text terminals. The Rand Editor allows multiple text windows onto one or more files, and movement of two-dimensional chunks of text within a file. We have also started development of a NetWork Access Program (NAP) to interface PDP-11s with UNIX to the ARPANET as a host machine. We expect to complete the UNIX-NAP in May, 1975. 16

PI-Write-up, Weiner

Advanced Computer Science Applied to Defense Needs
1974 ARPA Project Summary

Prepared for: ARPA IPT Principal Investigators Conference
San Diego, Mar. 12-14, 1975

Prepared by: Peter Weiner
The Rand Corporation
1700 Main Street
Santa Monica, California 90406

Rand's current ARPA-IPTO computer research project started 1 July 1974. All research summarized below was performed during the last six months of calendar year 1974.

1. Intelligent Terminal Research - Robert H. Anderson

We have explored the design of "user agents" for intelligent terminals, by creating prototype agents capable of operating on Rand's PDP-11/45 minicomputer. In December 1974 we demonstrated RITA (Rand's Intelligent Terminal Agent), an agent whose behavior is governed entirely by a set of production rules (i.e. pattern-action rules). The design of RITA is heavily influenced by the MYCIN system of E. H. Shortliffe et al. at Stanford University; we have created a MYCIN-like system (but without the ability to state numerical levels of assurance) in the "C" language under the UNIX operating system on the PDP 11. Our rule-based system is capable of either goal-driven behavior, starting with a designated goal rule, or else pattern-driven behavior, in which the pattern parts of rules are scanned until a valid match is found -- and then that cycle is repeated.

We have created rule sets which allow RITA to handle various ARPANET protocols, including logging into remote hosts and executing file transfers automatically. During the next six months, we expect to create sets of rules allowing RITA to handle essentially all of File Transfer Protocol, including the many error conditions which may arise. We also expect to create rule sets implementing a "trickle file" transfer process, in which very large files are automatically broken into smaller segments that are individually transmitted via ARPANET, then re-assembled into a large file at the destination host.

2. ARPA Program Planning Support: Intelligent Terminals - Robert H. Anderson

Rand has assisted ARPA-IPTO in planning a major research program in Intelligent Terminals. Rand was asked to prepare recommendations to ARPA covering such questions as: should ARPA pursue this program and

why? What is the role of industry? What is the unique DOD relevance, if any? What is the projected benefit to the military? What research is being pursued at this time? What critical ideas, accomplishments or technology exist now that make the program possible? What are proper goals, milestones, and program management plans? 10

We completed a report entitled: "Intelligent Terminals: DOD Requirements and Plan for an ARPA Research Program" which addresses these questions. We concluded that a five-year research and development program could lead to Intelligent Terminals having three main important attributes: 11

(1) they are capable of "intelligent" behavior, derived from the use of knowledge bases containing heuristics, assertions, and data about a limited domain. Examples of such domains are: the behavior of external systems and how to deal with them, and an individual user's preferences and characteristics; 11a

(2) they have excellent human factors in the design of the man-machine interface. They are capable of interpreting natural human input signals, such as limited voice commands and hand-printed annotations; 11b

(3) they are capable of handling common, mundane tasks -- such as text management, task management, message management, and calendar-related scheduling -- quickly and efficiently. We have recommended three application areas within DOD for testing of Intelligent Terminal prototypes: intelligence analysis; logistics and maintenance management; and tactical operations information systems. We are continuing to work with ARPA-IPTO in this program planning effort. 11c

3. ARPA Program Planning Support: Very Large Data Bases - R. Stockton Gaines 12

Rand has provided assistance to ARPA-IPTO in developing a research program in the area of Very Large Data Bases. An initial investigation of the area was conducted to determine if such a research program would be appropriate, and to identify some of the central problems the program could attack. In conjunction with this, informal meetings were held at Rand to solicit the views of nationally recognized experts in the fields of data base management, artificial intelligence and cognitive psychology. A report has been prepared as a result of these activities, entitled "Very Large Data Bases: An Emerging Research Area." We have concluded that this area is one in which significant advances in the next few years are likely, and that an ARPA research program could make an important contribution. 13

PI-Write-up, Weiner

There is a substantial and rapidly increasing need within DoD to make use of very large amounts of information via computers, and an APRA program to spur developments of appropriate facets would have a high probability of producing important and useful results. Among the areas of research identified in the report, the use of AI concepts in data base systems was particularly recommended. We are continuing to work with ARPA-IPTO in this program planning effort. 14

4. System Support Activities - Peter Weiner 15

Much of Rand's computer research is being performed on a PDP-11/45 minicomputer, using the UNIX operating system developed by Bell Laboratories. We are developing several support programs to make the facilities of UNIX more useful to the ARPA research community. We have completed a working prototype version of a CRT-oriented text editor (the Rand Editor) which operates within the UNIX environment on Ann Arbor 40-line text terminals. The Rand Editor allows multiple text windows onto one or more files, and movement of two-dimensional chunks of text within a file. We have also started development of a Network Access Program (NAP) to interface PDP-11s with UNIX to the ARPANET as a host machine. We expect to complete the UNIX-NAP in May, 1975. 16

ACM 25-FEB-75 08:52 25469

PI-Write-uP, Weiner

(J25469) 25-FEB-75 08:52;;;; Title: Author(s): ADRIAN C. MCGINNIS/ACM; Distribution: /ACM([INFO-ONLY]) ; Sub-Collections: SRI-ARC; Clerk: ACM; Origin: < PI, WEINER,NLS;5, >, 23-FEB-75 22:26 JAKE ;;;; ####;

RWW 25-FEB-75 10:02 25470

Invitation to an Irish Wake and Birth Shower

On Friday at noon dumps will begin in preparation for the move over the weekend to BBN. Update NLS files before than. Any work done on ARCs machine after that dae that results in file changes will require individual responsibility to move them across.
At 1:30 there will be a short course in how to use ELF etc, followed by an Irish wake for our good and reliable friends, Tasker, PDP 10, and Dataproducts Printer and Welcome for our new friends, Line Processor, ARPANET, and ARPANET Tenex pusher. We'll need the lubrication to make the world we'll face on Monday run smooth. See you there, Dick 1

RWW 25-FEB-75 10:02 25470

Invitation to an Irish Wake and Birth Shower

(J25470) 25-FEB-75 10:02;;;; Title: Author(s): Richard W. Watson/RWW; Distribution: /SRI-ARC([ACTION]) ; Sub-Collections: SRI-ARC; Clerk: RWW;

INTRODUCTION 1

This document records the ways in which the NSW implementation is diverging from its Version 2 documentation. It is a dynamic document of primary interest to implementers of NSW and code which must run in a NSW environment. It is organized by V2 document so that each section can, if desired, be physically stored with the document to which it corresponds. 1a

Comments, corrections, and additions are welcomed. The contents of this document will be used eventually to generate Version 3 documentation. In the interim, the most recent copy will be available on-line in the following forms: 1b

[SRI-ARC]<POSTEL>NSWV2CHANGES.NLS 1b1
[SRI-ARC]<NLS>NSWV2CHANGES.TXT 1b2

The former is an NLS file, the latter an output-processed version suitable for printing on a non-SRI-ARC printer. 1c

HOST 2

CLARIFICATIONS 2a

TYPOS 2b

BUGS 2c

(HOST -- 24581,5) Retransmission Policy 2c1

It is clear that if the sender of data sends multiple messages on a connection, using the four bit sequence numbers in the message identification field to match the RFNMs to the sent messages, and a message results in an Incomplete Transmission; then there is no way for the sender to be sure that the remaining outstanding messages and the retransmission of the undelivered message will be processed in order by the reciever, 2c1a

CHANGES 2d

(HOST -- 24581,5a1) Retransmission policy 2d1

K set to 5 is more reasonable, 2d1a

IDEAS 2e

(HOST -- 24581,5) Retransmission Policy 2e1

The use of the sequence number bits in the message identifier could be used to detect if the host at the other end of the connection knows the new stuff or not, That is if the other host sends sequence numbers then it knows the new stuff so this host can use the new stuff, 2e1a

In particular suppose we wish to use sequence numbers and multi-outstanding messages on a connection to achieve higher bandwidth, If we start out by sending messages using the sequence numbers but only one at a time (that is RFNM limited) and observe whether or not the messages sent by the other guy have sequence numbers, If they do then we can assume that he knows about sequence numbers and can reassemble the messages into the proper order if there is a loss of order by an incomplete transmission, 2e1a1

The retransmissions could be timed in a non linear maner, That is they could be transmitted as follows: 2e1b

first retry -- at once 2e1b1

second retry -- after 1 second 2e1b2

third retry -- after 30 seconds 2e1b3

fourth retry -- after 1 minute 2e1b4

fifth retry -- after 2 minutes, 2e1b5

forget it 2e1b6

BJP 6

CLARIFICATIONS 6a

(BJp -- 24583,3) Introduction 6a1

It should be realized that not only are traditional batch processing facilities to be utilized via the Batch Job package, but that some interactive systems have capabilities whch can usefully be interfaced to a Batch Job package. In this latter catagory are the TENEX RUNFIL and the Multics execcom capabilities. 6a1a

TYPOS 6b

BUGS 6c

CHANGES 6d

(BJP -- 24583,4a4) Add Terminal Streamnames 6d1

TTYIN: the job's primary terminal input stream 6d1a

TTYOUT: the job's primary terminal output stream 6d1b

IDEAS 6e

RJE-MODEL 9

CLARIFICATIONS 9a

(RJE-MODEL -- 24655,3) Expansion of the Model 9a1

Expansion of the Model to cover all types of Batch Jobs. 9a1a

There are two types of batch jobs: those that we typically think of as job entry or remote job entry jobs, and those that are run on interactive systems using input from a file rather than a human at a keyboard. 9a1b

TYPOS 9b

BUGS 9c

CHANGES 9d

(RJE-MODEL -- 24655,4) The Model 9d1

The text of this section is replaced by the following: 9d1a

Here is a scenario of use of a batch tool which is an elaboration of the discussion contained in the RJE-MODEL document. 9d1b

Note that there are two cases for batch jobs in the NSW: one is the traditional batch processing facility which normally expects as its primary input a control card file; the other is an interactive time sharing system which allows input to come from a file instead of interactively from a user at a terminal. 9d1b1

MODEL 9d1c

First we discuss the entities involved in the process of composing a batch job, having it run, and examining the results. 9d1c1

The principal entity is a batch processing facility. This is expected to be an existing hardware & software unit that will be only minimally changed to interface to the NSW.

Examples of batch job proocessing facilities are the B4700 and the IBM 360.

Another type of batch job capability is is the TENEX runfil or the Multics execom facility.

The NSW talks to the batch processing facility via a procedure package called the Batch Job Package (BJP).

The batch job package in a sense referees the flow of information between its PCP callers and the batch processing facility. For example the batch job package collects all the input files that are resident on other hosts before turning the job over to the batch processing facility, and the batch job package may distribute the result files to other hosts when the job is completed by the batch processing facility.

The Batch Job Package interacts with File Packages (FP) to effect the movement of files to and from the Batch Processing Facility.

The call on the batch job package to get a job submitted to a batch processing facility is:

CRTJOB (infiles, outfiles => jobid)

The files referenced in infiles and outfiles are named so that the batch job package can get them from and put them into the directories owned by NSW at various hosts and manipulated by file packages. Thus these files are named by "file-package-filenames".

The user sees only NSW-filenames so there must be a language/grammar that controls the users interaction which results in the generation of a create job call on a batch job package. This processing for the user must include the mediation of the NSW-filenames the user supplies into the file-package-filenames included in the create job call.

The files themselves are created and examined using the text editors (e.g. NLS) available in the NSW.

Some files that are included in a create job call may be standard library files and from the users point of view part of the system. The user may not even be aware of their existence since their names could be supplied by the grammar internally.

The input files are probably in most cases job control files in a particular batch processing facility's specific job control language. There might be grammars/tools to aid the user in constructing such control files for specific batch processing facilities and applications programs.

A scenario for a user creating, submitting, retrieving, and examining a batch job follows: 9d1c2

The user interacts with the front end. The front end contains a command language interpreter that is driven by a grammar. The particular grammar in use for this user at any time depends on which tool the user is accessing.

The user interacts with an editing tool to create a source program and to concatenate it with a standard file of job control information particular to the Batch Processing Facility to which it will be submitted. The concatenation is accomplished using regular editing commands (not batch specific commands).

The user then interacts with the Works Manager and the Batch Job Package mediated by a grammar to submit the file he has created. The grammar and the Batch Job Package will require enough information from the user that the Batch Job Package can retrieve the input files from File Packages, and store the output files. The Batch Job Package will return an identifier for this job which can be used to request status information at a later time.

some of the information needed to run a batch job could be in a standard file that the user always appends his file to, OR this type of information could be in a separate file that is included by the grammar in the create job call automatically, and the grammar could call on a function to edit a standard file to contain user and run specific parameters such as user-name, priority, run-time-limit.

When the job has been processed the user may use an editing tool to examine the output file. Note that the output files have been stored as specified in File Packages and are thus accessible to tools as permitted by the Works manager.

It may be necessary to construct special tools to reformat the output of other tools for presentation on the users terminal.

In particular the tools which were designed to ouput to line printers will produce output difficult to view adaquately on narrower display and teletype terminals.

This is a general problem so we should seek out a general solution.

A discussion of a batch program as a tool. 9d1c3

An applications program which lives on a batch processing facility can be made into a tool in the NSW such that the users of it as a tool do not need to know the control language of the facility where it lives. To do this the tool installer must create a control card file and a grammar which are stored in the Works Manager under the toolname assigned to this program.

When the user accesses the tool the front end gets the grammar from the works manager and follwes it to collect the prameters from the user. Once all the arguments are collected the front end (or the works manager) can call the batch job package. Note that one of the arguments is the name of the control card file. This argument may be built in to the grammar or supplied by the works manager.

A discussion of multi-host batch jobs. 9d1c4

Suppose a user wanted to run a series of batch jobs steps where each step was to be carried out on a different host. It is not difficult to envision a NSW-control-language in which one could say things like:

> "If the previous job step was successful then use its output file WALDO appended to control file DOITTOIT as card input to the batch processing facility ABC and call the printer output file GEORGE".

This requires a tool to "execute" files of this NSW-control-langauge to be written.

This NSW-control-language need not be different form the language the user normally uses in interactive work, in fact it should be identical except for the addition of conditional statements to continue or abort the processing of a multi-step job.

IDEAS 9e

TBH 10

CLARIFICATIONS 10a

(TBH -- 24656,1b2a) System to Process Interface 10a1

The TBH Supervisor has shrunk to be a very small thing. All that is required in that role is a "loader" that can accept a filename and load that file as the code of the PCP process created by the initial connection to the PCP contact socket. 10a1a

TYPOS 10b

BUGS 10c

CHANGES 10d

(TBH -- 24656,1b2a) System to Process Interface 10d1

Socket number 25 (31 octal) has been assigned as the PCP contact socket. 10d1a

IDEAS 10e

NVTP 11

CLARIFICATIONS 11a

(NVTP -- 24827,2) Introduction 11a1

The following discussion is added: 11a1a

Protocol Design Approaches 11a1a1

Several ARPANET applications (i.e. third- and fourth-level) protocols have been designed and implemented since the Host-Host Protocol was adopted in 1970. Most have been bootstrapped from lower-level applications protocols. For example, the File Transfer Protocol (FTP) was built upon TELNET, and the Remote Job Entry Protocol (RJE) upon both TELNET and FTP. The highest-level protocol shared by all such bootstrapped protocols is TELNET.

Although the bootstrapping principle seems a sound basis for Network protocol development, we believe that TELNET, providing little more of use than a character set, is NOT the most appropriate foundation for a large class of applications protocols.

Bootstrapping at a Higher Level 11a1a2

We contend that a Procedure Call Protocol (PCP) -- a Network-standard mechanism for invoking arbitrary named, argument-driven and result-producing procedures in a remote process -- is a much more appropriate and powerful foundation for many applications protocols. We believe that the adoption by the Network community of a PCP as the basis for most applications protocols would have at least the following effects:

1) expedite the specification of applications protocols by permitting their documentation to have a functional, rather than a syntactic orientation,

2) largely eliminate the need for separate, application-specific user processes,

3) reduce the cost of making large, existing software systems available as Network servers by allowing a Network interface more compatible with their internal organization,

4) provide the basis for a more natural interface between local and remote procedures, and therefore

5) encourage the sharing of software, by making procedures on remote hosts as accessible to the programmer as local ones.

This is an attempt to clarify the role of the Network Virtual Terminal Package (NVTP) in interfacing "Old Programs" to the National Software Works (NSW). The discussion here assumes that the reader is familiar with the Procedure Call Protocol (PCP) and the Telnet protocol. 11a1a3

The NSW is composed of two principal entities and a group of auxiliary entities. The principals are a Works Manager (WM) and a Front END (FE). The auxiliaries are called Tool Bearing Hosts (TBHs). 11a1a4

The WM and the FE always communicate with each other and with the TBHs using PCP. This is a simplifying principle that allows for a cleaner and quicker implementation of the WM and the FE. 11a1a5

(We note that at times the same machine that supports the FE may be used in a non-NSW context to communicate with other machines, including those that support the WM or those that are also TBHs, using other protocols. This does not alter our basic simplifying principle since those other communications protocols and programs are completely independent and outside of the NSW.)

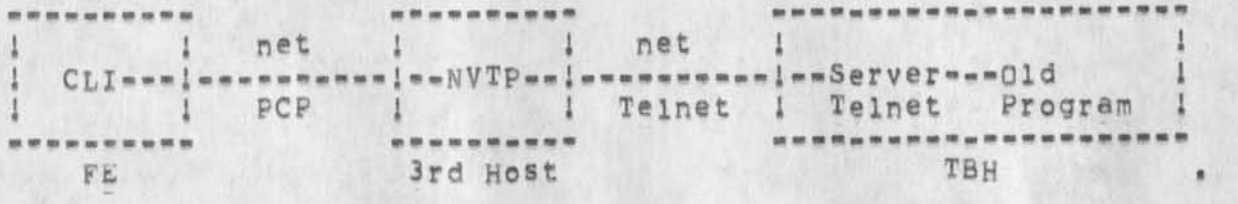
The active agent in the FE that carries out the users requests as interpreted using the Grammar and the user profile is the Command Language Interpreter (CLI). 11a1a6

A Tool is the collection of: a set of computational procedures (sometimes caled a backend or BE), a Grammar, a Help data Base, and Tool specific parts of a User Profile. 11a1a7

The TBHs support applications programs (e.g. text editors, compilers, reformatters, ...) called tool backends. These tools are or will be constructed with the NSW in mind, and will expect to communicate via PCP. Other applications programs, here called "Old Programs", were constructed to communicate only with a controlling teletype. The Telnet protocol has been designed and implemented such that a remote user's terminal can appear to be the controlling teletype when the remote user utilizes a "user Telnet" process to communicate via the network with a "server Telnet" process that directly controls the application program. 11a1a8

To interface such Old programs into the NSW a NVTP has been designed to act as a converter between PCP and Telnet protocol. There are two cases to be distinguished: first the case where the NVTP is in a third host, and second where the NVTP is directly controlling the Old Program. Note that in either case from the point of view of the WM and the FE the NVTP is the tool backend. 11a1a9

Case 1 11a1a10



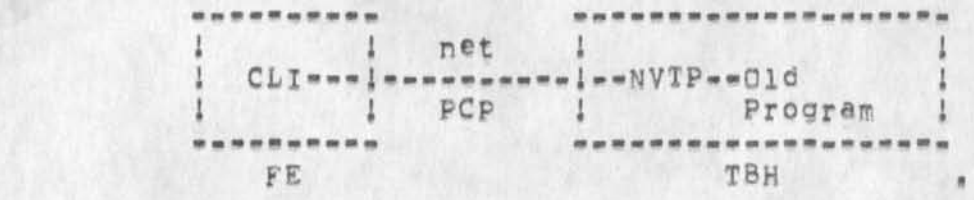
Notes:

CLI only does PCP calls.

NVTP merely copies data.

Server Telnet acts as controlling teletype to Old Program.

Case 2 11a1a11



Notes:

CLI only does PCP calls.

NVTP acts as controlling teletype to Old Program.

NVTP is a SMALL extension of Server Telnet program.

In either case there is a need for a Grammar, a Help Data Base, and a Tool specific User Profile. 11a1a12

In the NSW environment the contol features of Telnet are generally unnecessary since these functions are performed by the FE. 11a1a13

Most of Telnet's control options are for controlling aspects of the user's interaction that can be specified by a Grammar or User Profile. The difference is that in Telnet the parameters are dynamically controlled and transmitted between the user and server for each use of a program; in the NSW Procedure Call Protocol these parameters are incorporated in the grammar and are therefore relatively static, but they are not renegotiated with each use of the tool and thus there is less network traffic. A user should be able to change aspects of the interaction by commands to the FE which do not require network traffic.

For example the most powerful Telnet Option -- Remote Controlled Transmission and Echoing (RCTE) -- is completely replaced by a Grammar tailored to the serving host and tool. And the strategy of dynamic control used in RCTE requires substantially more network traffic than is neccessary in the NSW case.

An alternative communication strategy for Old Programs has been suggested that would have the FE communicate with the Old Program using Telnet protocol. 11a1a14

The WM is the only NSW process that initiates tool processses and the WM always communicates using PCP. It would be quite awkward to have the tool process initiated using PCP and subsequently communicate using Telnet protocol. The Telnet protocol does have a reconnection option (there is only one known implementation of this feature), so that (in theory) control of a process created by a Telnet initiation by the WM could be switched to the FE, such a procedure requires both the WM and the FE to treat Old Programs differently than new tools, and requires both the WM and the FE to implement both PCP and Telnet protocol.

TYPOS 11b

BUGS 11c

CHANGES 11d

IDEAS 11e

NSW Inter-Version (2-3) Documentation
NSWV2CHANGES

25 FEB 75

Jon Postel
Augmentation Research Center

Stanford Research Institute
Menlo Park, California 94025

NSWV2CHANGES records the ways in which the implementation of NSW is diverging from its Version 2 documentation, and should be viewed by implementers of both NSW and code which must run in a NSW environment as a dynamic appendix to the Version 2 PCP-related documents. The reader is of course assumed familiar with the Procedure Call Protocol (PCP -- 24459,).

(J25473) 25-FEB-75 17:13;;;; Title: Author(s): Jonathan B. Postel/JBP; Distribution: /JBP([INFO-ONLY]) ; sub-Collections: SRI-ARC; Clerk: JBP; Origin: < POSTEL, NSWV2CHANGES.NLS;10, >, 29-JAN-75 18:08 JBP ;;;; ####;

protocol-information

J. Postel
(SRI-ARC)
21 January 1975

Protocol Information

INTRODUCTION

This file contains information on the various protocols in the ARPA Network. An effort will be made to keep the information current, but this depends on the cooperation of the users of this file to convey any information about protocol developments, or corrections to this information to Jon Postel at SRI-ARC.

This is a compendium of all the protocol related activity and most of this activity is with experimental protocols, for those protocols which are official standards the designation "[Official]" will be appended to the name.

Much of the documentation of protocols appears as Requests for Comments (RFCs) and many of these are available on line. When a document is accessible on line a pointer to that source will be given. Also note that recent RFCs are on line at Office-1 in directory <NETINFO> with names of the form RFCnnn.TXT where nnn is replaced by the RFC number.

This file is on line as:

Pathname: [SRI-ARC]<POSTEL>PROTOCOL-INFORMATION.TXT

and also [SRI-ARC]<POSTEL>PROTOCOL-INFORMATION.NLS

There are three other on line files that are relevant to protocols:

There is a file that lists Official Host Names and associated information as described in RFC 608, the pathname of this file is:

[Office-1]<NETINFO>HOSTS.TXT

There are two files that list the addresses of the Network Liaisons, one file lists the online message address, and the other the US mail address and phone number. A network liaison is a person designated by a host organization as the contact and coordinator for network technical information for that organization.

21-Jan-75

[Office-1]<NETINFO>LIAISON-SNDMSG.TXT

[Office-1]<NETINFO>LIAISON.TXT

IMP-IMP

surface

Contact:

McKenzie, Alex, (MCKENZIE@BBN)

Documents:

Heart, F, et, al, "The Interface Message Processor for the ARPA Computer Network," AFIPS Conference Proceedings, 36:551-567, SJCC 1970.

McQuillan, J.M, et, al, "Improvements in the Design and Performance of the ARPA Network," AFIPS Conference Proceedings, 41:741-754 FJCC, 1972.

McQuillan, J.M, "Throughput in the ARPA Network -- Analysis and Measurement," BBN Report 2491, the text is also contained in BBN Quarterly Technical Report 16, available from the National Technical Information Service [NTIS] accession number AD7544441.

People:

John McQuillan (MCQUILLAN@BBN)

Schedule:

Comments:

Recent developments:

satellite

Contact:

Randy Rettberg (RETTBERG@BBN)

Documents:

People:

Kahn, Robert, (Kahn@ISI)

Schedule:

Comments:

Recent developments:

IMP-HOST

IMP-Host [Official]

Contact:

McKenzie, A, (McKenzie@BBN)

Documents:

"Specification for the Interconnection of a HOST and an IMP," BBN Report 1822, Revised December 1974,

People:

McKenzie (MCKENZIE@BBN)

Walden (WALDEN@BBN)

Postel (POSTEL@SRI-ARC)

Burchfiel (BURCHFIEL@BBN)

McQuillan (MCQUILLAN@BBN)

Schedule:

Comments:

The "link number" field has been extended form 8 to 12 bits and renamed the "message identification" field.
Message type 6 now is used to indicate a reason for a type 7 (destination dead) message, (See BBN1822),

There has been some recent changes to the Ready line interpretation by the IMP for deciding the alive/dead status of a host.

Important changes to the IMP and IMP/HOST Interface announced in RFC 660 23-Oct-74.

Recent developments:

(31-DEC-74) The change to allow up to eight messages to be in transit between a source host and destination host should be made very soon. This should not effect the hosts at all execpt to provide better thruput and fewer inter-message delays.

(6-JAN-75) BBN Report 1822 updated.

Sections 1, 2, 4, and 5, and Appendix C now include data on the Pluribus IMP. The Pluribus IMP is based on a modular multiprocessor hardware design; it should be capable of much higher bandwidth and greater reliability than other IMP models.

Section 3.1 contains additional information which may be helpful to Host programmers.

Section 3.2 redefines the IMP's view of Host up/down conditions. Changes are backward compatible.

Sections 3.3 and 3.4 add a new type of Host to Host data message, the uncontrolled packet. Section 3.7 has been added to describe the use of this new message type.

Section 3.4 describes changes to the sub-types of IMP to Host message types 6 and 7.

Appendix A has been updated.

Appendix B has been expanded to provide specific recommendations for Host implementation of the Host/IMP interface.

Minor clarifactions have been made in Appendix F. (No changes have been made to Figure F-(or F-9.)

HOST-HOST

ncp - standard host-to-host [Official]

Contact:

Postel, Jon, (POSTEL@SRI-ARC)

Documents:

McKenzie, A, "Host/Host Protocol for the ARPA Network," NIC 8246, [NTIS # AD-757 680], Jan 1972

Postel, J, "Assigned Link Numbers," RFC604, NIC21186, 26-Dec-73,

People:

Postel, Jon, (POSTEL@SRI-ARC)

McKenzie, Alex, (MCKENZIE@BBN)

Schedule:

Comments:

Recent developments:

ncp - host-to-host [Experimental]

Contact:

Postel, Jon, (POSTEL@SRI-ARC)

Documents:

McKenzie, A, "Host/Host Protocol for the ARPA Network," NIC 8246, [NTIS # AD-757 680], Jan 1972

Postel, J, "Assigned Link Numbers," RFC604, NIC21186, 26-Dec-73,

Burchfiel, et, al, "Tip-Tenex Relibility Improvements" RFC 636 NIC 30490 June 1974,

People:

Postel, Jon, (POSTEL@SRI-ARC)

McKenzie, Alex, (MCKENZIE@BBN)

Burchfiel, Jerry (BURCHFIEL@BBN)

Walden, Dave (WALDEN@BBN)

Schedule:

Comments:

The BBN TIP and TENEX groups have specified and are implementing additional protocol commands with the intention of providing better reliablity and surviability over system malfunctions. The additional protocol commands are for cleaning up partly closed connections and resynchronizing the allocation values on open connections. (See RFC 636).

Recent developments:

(31-DEC-74) Tenex 1.32 and the Tips are now running this protocol.

ncp - host-to-host [Experimental]

Contact:

Postel, Jon. (POSTEL@SRI-ARC)

Documents:

McKenzie, A. "Host/Host Protocol for the ARPA Network," NIC 8246, [NTIS # AD-757 680], Jan 1972

Postel, J. "Assigned Link Numbers," RFC604, NIC21186, 26-Dec-73.

Kanodia, R. "A Lost Message Detection and Recovery Protocol," RFC 663, NIC 31387, 29-Nov-74.

[OFFICE-1]<NETINFO>RFC663.TXT

People:

postel, Jon. (POSTEL@SRI-ARC)

McKenzie, Alex. (MCKENZIE@BBN)

Kanodia, Raj (Kanodia.CompNet@MIT-Multics)

Schedule:

Comments:

Recent developments:

(31-DEC-74) This recent proposal is interesting in several features, but some have suggested that it is aimed at a non-problem.

tcp - Transmission Control Protocol

Contact:

Cerf, Vint, (CERF@ISI)

Documents:

Cerf, V, and R, Kahn, "A Protocol for Packet Network Intercommunication," IEEE Transactions on Communication Vol COM-22 No 5, May 1974.

Mader, E, "A Protocol Experiment," RFC 700, NIC 31020.

[OFFICE-1]<NETINFO>RFC700.TXT

Cerf, V, Y, Dalal, and C, Sunshine, "Specification of Internet Transmission Control Program," RFC 675, INWG 72, NIC 31505, December 1974 Revision.

People:

Cerf at SU-DSL

Tomlinson at BBN

Kirstein at London

Postel at SRI-ARC

Schedule:

Some experinents now running.
Implementation of full protocol to begin by 1-Jan-75.

Comments:

Specification completed August 4th, but some work still in progress on handling of single message conversations, A new sequencing scheme (proposed by Tomlinson) may be utilized. The addressing field is now used as 4 bit format, 4 bit network, 16 bit TCP, and 24 bit process&port.

Crocker has suggested a 64 bit path address to be parsed and reformatted by the gateways along the route, There is reluctance to experiment with too many things at once though.

(28-Oct-74) A file indicating some of the changes in the specifications since the 4-Aug-74 document is now available as [ISI]<CERF>TCP-CHANGES. The areas of change are "Initial Sequence Number", "Socket definition", "Additional User System Calls", Packet Format", and "Discussion of opening and closing (SYN, REL)".

(23-NOV-74) Specifications for test implementation are now said to be ready on 1-DEC-74, and a implementation completed by 1-FEB--74.

Recent developments:

(31-DEC-74) New specification document available:

Cerf, V. Y. Dalal, and C. Sunshine, "Specification of Internet Transmission Control Program," RFC 675, INWG 72, NIC 31505, December 1974 Revision.

nvp - Network Voice Protocol

Contact:

Cohen, Danny. (COHEN@ISIB)

Documents:

"Specifications for the Network Voice Protocol (NVP)" NSC Note 43.

Pathname = [ISI]<VOICE>NVP.LST

People:

Schedule:

Comments:

Specification document available (10-Oct-74).

Recent developments:

(20-JAN-75) An initial version of NVP was implemented for real-time voice experiments between ISI and Lincoln Laboratory in August 1974. An expanded version has been in operation since December 1974 for real-time voice communication between Lincoln and CHI. NVP uses both type 0 and type 3 IMP-Host messages, and allows increased bandwidth and decreased delays at the cost of reliability.

packet radio

Contact:

Kahn, Robert, (KAHN@ISI)

Documents:

People:

Schedule:

Comments:

Recent developments:

Network Debugging Protocol

Contact:

Eric Mader (MADER@BBN)

Documents:

Mader, E. "Network Debugging Protocol," NIC 30873, RFC 643, July-74.

People:

Eric Mader (MADER@BBN)

Dave Retz (RETZ@ISI)

Ken Victor (VICTOR@SRI-ARC)

Schedule:

Comments:

This is a protocol for a PDP-11 cross-network debugger.

Recent Developments:

HOST-FRONTEND

Host-Front End

Contact:

Michael Padlipsky (Padlipsky@MIT-Multics)

Documents:

Padlipsky, M. "A Proposed Protocol for Connecting Host Computers to ARPA-Like Networks via Front-End Processors," RFC 647, NIC 31117, 12-Nov-74.

[Office-1]<NETINFO>RFC647.TXT

People:

padlipsky at MITRE Washington (padlipsky@MIT-Multics)

Postel at SRI-ARC (POSTEL@SRI-ARC)

McConnell at Illiac (JOHN@I4-TENEX)

Schedule:

Comments:

This is a suggested simple protocol for connecting host to front end computers which are in turn connected to the network.

Recent developments:

21-Jan-75

PROCESS-PROCESS

ICP - Initial Connection Protocol [Official]

Contact:

Postel, Jon. (POSTEL@SRI-ARC)

Documents:

Postel, J. "Official Initial Connection Protocol," NIC 7101 11-June-71.

Wolfe, S. [no title] RFC 202 NIC 7155 26-July-71.

Postel, J. "Official Telnet-Logger Initial Connection Protocol," NIC 7103 15-June-71.

People:

Postel, Jon. (POSTEL@SRI-ARC)

Schedule:

Comments:

Recent developments:

Telnet

Old Telnet

Contact:

Postel, Jon. (POSTEL@SRI-ARC)

Documents:

Postel, J. "Telnet Protocol," RFC318 3-April-72.

People:

Schedule:

Comments:

Recent developments:

New Telnet [Official]

Contact:

Postel at SRI-ARC

Documents:

NIC 18639 "TELNET Protocol Specifications" AUG 73

NIC 18640 "Telnet Option Specification" Aug 73

Telnet Options

NIC 15389 "Binary Transmission"

NIC 15390 "Echo"

NIC 15391 Reconnection"

NIC 15392 "Suppress Go Ahead Option"

NIC 15393 "Approximate Message Size Negotiation"

NIC 31154 "Status" RFC 651 25-Oct-74,

[Office-1]<NETINFO>RFC651.TXT

NIC 16238 "Timing Mark"

NIC 19859 "Remote Controlled Transmission and Echoing" 1-Nov-73,

NIC 20196 "Output Line Width" 13-Nov-73,

NIC 20197 "Output Page Size" 13-Nov-73,

NIC 31155 "Output Carriage Return Disposition" RFC 652 25-Oct-74,

[Office-1]<NETINFO>RFC652.TXT

NIC 31156 "Output Horizontal Tab Stops" RFC 653 25-Oct-74,

[Office-1]<NETINFO>RFC653.TXT

NIC 31157 "Output Horizontal Tab Disposition" RFC 654 25-Oct-74,

[Office-1]<NETINFO>RFC654.TXT

NIC 31158 "Output Form Feed Disposition" RFC 655 25-Oct-74,

[Office-1]<NETINFO>RFC655.TXT

NIC 31159 "Output Vertical Tab Stops" RFC 656 25-Oct-74.

[Office-1]<NETINFO>RFC656.TXT

NIC 31160 "Output Vertical Tab Disposition" RFC 657 25-Oct-74

[Office-1]<NETINFO>RFC657.TXT

NIC 31161 "Output Line Feed Disposition" RFC 658 25-Oct-74.

[Office-1]<NETINFO>RFC658.TXT

NIC 16239 "Extended Options List"

People:

Jon Postel at Sri-Arc (POSTEL@SRI-ARC)

Alex McKenzie at BBN (MCKENZIE@BBN)

Doug Dodds at BBN (DODDS@BBN)

Dave Crocker at UCLA-NMC (DCROCKER@ISI)

Schedule:

All Hosts were to have been running the new Telnet (both user and server) by 1 January 1974.

Comments:

Note: the server program is to be available on socket 23 decimal (27 octal).

A significant number of server systems now have new telnet implementations. (See RFC 702).

[Office-1]<NETINFO>RFC702.TXT

The Status Option has been revised to take advantage of the Subcommand feature and to reduce the amount of data transmitted to report the option status.

Seven new options have been defined to allow control of the format effectors Carriage Return, Line Feed, Form Feed, Horizontal Tab, and Vertical Tab.

Recent developments:

(31-DEC-74) The latest survey by Doug Dodds is:

Dodds, D. "November, 1974, Survey of New-Protocol Telnet Servers," RFC 669, NIC 31435, 4-Dec-74.

[Office-1]<NETINFO>RFC669.TXT

(31-DEC-74) Rick Schantz has made some suggestions regarding the Reconnection Option in:

Schantz, R. "A Note on Reconnection Protocol," RFC 671, NIC 31439, 6-Dec-74.

[Office-1]<NETINFO>RFC671.TXT

FTP

Old File Transfer

Contact:

Jon Postel at SRI-ARC (POSTEL@SRI-ARC)

Documents:

McKenzie, A, "File Transfer Protocol," NIC 14333, RFC 454, 16-Feb-73.

People:

Schedule:

Comments:

Recent developments:

(31-DEC-74) Kanodia has published an RFC on performance measurements of FTP at Multics which shows the important effect of Host buffering in constraining thruput.

Kanodia, R. "Performance Improvement in ARPANET File Transfers From Multics," RFC662, NIC 31386, 26-Nov-74.

[Office-1]<NETINFO>RFC662.TXT

New File Transfer

Contact:

Jon Postel at SRI-ARC (POSTEL@SRI-ARC)

Documents:

Neigus, N. "File Transfer Protocol," NIC 17759 RFC 542 12-July-73.

Postel, J. "Revised FTP Reply Codes," NIC 30843 RFC 640 5-June-74.

People:

Jon Postel at SRI-ARC (POSTEL@SRI-ARC)

Nancy Neigus at BBN (NEIGUS@BBN)

Ken Pogran at MIT-Multics (Pogran,CompNet@MIT-Multics)

Wayne Hathaway at NASA AMES (Hathaway@AMES-67)

Mark Krilanovich at UCSB (Krilanovich@UCSB-MOD75)

Schedule:

Comments:

Recent developments:

Pathnames

Contact:

Jon Postel at SRI-ARC (POSTEL@SRI-ARC)

Documents:

Crocker, D. "Network Standard Data Specification Syntax," RFC 645, NIC 30899, Jul-74.

People:

Dave Croocker at UCLA-NMC (DCROCKER@ISI)

Schedule:

Comments:

Recent developments:

File Access Protocol

Contact:

John Day (Day,CAC@MIT-Multics)

Documents:

Day, J. "Memo to FTP Group: File Access Protocol," RFC 520, NIC 16819, 25-Jun-73

People:

Ken Pogran (Pogran.CompNet@MIT-Multics) -

Schedule:

Comments:

Recent developments:

File Formats

Contact:

Jon Postel at SRI-ARC (POSTEL@SRI-ARC)

Documents:

Postel, J. "Standard File Formats," RFC678, NIC 31524, 19-Dec-74.

[Office-1]<NETINFO>RFC678.TXT

People:

Jon Postel at SRI-ARC (POSTEL@SRI-ARC)

Schedule:

Comments:

Recent developments:

(31-DEC-74) This new format standard for document file was published:

Postel, J. "Standard File Formats," RFC678, NIC 31524, 19-Dec-74.

[Office-1]<NETINFO>RFC678.TXT

Mail

Current Mail

Contact:

Jon Postel at SRI-ARC (POSTEL@SRI-ARC)

Documents:

page 26 of RFC 454 (see old file transfer).

Bhushan, A. "Standardizing Network Mail Headers," NIC 18516, RFC 561, 5-Sep-73

Sussman, J. "FTP Error Code Usage for More Reliable Mail Service," RFC 630, NIC 30237, 10-Apr-74.

Thomas, B. "On the Problem of Signature Authentication for Network Mail," NIC 30874, RFC 644, 22-July-74.

People:

Julie Sussman at BBN (SUSSMAN@BBN)

Bob Thomas at BBN (BTHOMAS@BBN)

Jon Postel at SRI-ARC (POSTEL@SRI-ARC)

Schedule:

Comments:

Concern over the authentication of the author of network messages has led to the concept of an authorized mail sending process (see RFC 644).

Recent developments:

Proposed Mail

Contact:

Postel at SRI-ARC (POSTEL@SRI-ARC)

Documents:

White, J. "A Proposed Mail Protocol," NIC 17140, RFC 524, 13-Jun-73.

Crocker, D. "Thoughts on the Mail Protocol Proposed in RFC 524," NIC 17644, RFC 539, 7-JULY-733.

White, J, "Response to Critiques of the Proposed Mail Protocol," NIC 17993, RFC 555, 27-July-73.

People:

Jim White at SRI-ARC (WHITE@SRI-ARC)

Postel at SRI-ARC (POSTEL@SRI-ARC)

Dave Crocker at UCLA-NMC (DCROCKER@ISI)

Schedule:

Comments:

Recent developments:

RJE - Remote Job Entry

Contact:

Jon Postel at SRI-ARC (POSTEL@SRI-ARC)

Documents:

Bressler, B, "Remote Job Entry Protocol," RFC 407, NIC 12112, 16-Oct-72

Krilanovich, M, "Annoncement of RJS at UCSB," RFC 436, NIC 13700, 10-Jan-73.

People:

Schedule:

Comments:

Recent developments:

RJS - CCNs Remote Job Service

Contact:

Robert Braden at UCLA-CCN (BRADEN@UCLA-CCN)

Documents:

Braden, R, "Interim NETRJS Specification," RFC 189, NIC 7133, 15-July-71.

Braden, R, "Update on NETRJS," RFC 599, NIC 20854, 13-Dec-73.

People:

Robert Braden (BRADEN@UCLA-CCN)

Steve Wolfe (WOLFE@UCLA-CCN)

Schedule:

Comments:

Recent developments:

Graphics

Contact:

Robert Sproull (SPROULL@PARC-MAXC)

Documents:

Sproull, R, and E, Thomas, "A Networks Graphics Protocol," NIC 24308, 16-Aug-74.

People:

Robert Sproull (SPROULL@PARC-MAXC)

Elaine Thomas (Thomas@MIT-Multics)

James Michener at MIT-DMS (JCM@MIT-DMS)

Schedule:

Comments:

Document available from Robert Sproull.

Recent developments:

Data Reconfiguration Service

Contact:

Jon Postel at SRI-ARC (POSTEL@SRI-ARC)

Documents:

Anderson, B. "Status Report on Proposed Data Reconfiguration Service," NIC 6715, RFC 138, 28-April-71.

Feah, "Data Reconfiguration Service at UCSB," RFC 437, NIC 13701, 30-June-74.

People:

Schedule:

Comments:

Recent developments:

RSEXEC

Contact:

Thomas, Bob, (BTHOMAS@BBN)

Documents:

People:

Schedule:

Comments:

Recent developments:

The TIPs and some RSEXEC servers now are cooperating to perform TIP user authentication and accounting functions.

Line Processor Protocol

Contact:

Don Andrews at SRI-ARC (ANDREWS@SRI-ARC)

Documents:

[SRI-ARC]<HARDY>LPPROT.NLS

[SRI-ARC]<HARDY>PROT.TXT

People:

Martin Hardy at SRI-ARC (HARDY@SRI-ARC)

Don Andrews at SRI-ARC (ANDREWS@SRI-ARC)

Schedule:

Comments:

Recent developments:

PROGRAMS

Neted - Network Standard Editor [Official]

Contact:

Michael Padlipsky (Padlipsky@MIT-Multics)

Documents:

Padlipsky, M. "NETED: A Common Editor for The ARPA Network," RFC 569, NIC 18972, 15-Oct-73.

People:

Padlipsky at MITRE (Padlipsky@MIT-Multics)

Postel at SRI-ARC (POSTEL@SRI-ARC)

Hathway at AMES (HATHAWAY@AMES-67)

Schedule:

Comments:

Recent developments:

UULP - Unified User-Level Protocol

Contact:

Michael Padlipsky (Padlipsky@MIT-Multics)

Documents:

Padlipsky, M. "Specification of a Unified User-Level Protocol," RFC 666, NIC 31396, 26-Nov-73.

[office-1]<NETINFO>RFC666.TXT

People:

Padlipsky at MITRE (Padlipsky@MIT-Multics)

Postel at SRI-ARC (POSTEL@SRI-ARC)

Schedule:

Comments:

Also known as Common Command Language (CCL).

Recent developments:

NATIONAL SOFTWARE WORKS

The National Software Works (NSW) is developing a set of protocols for its use of the ARPA Network, other uses of these protocols is encouraged.

The Procedure Call Protocol (PCP) is intended to facilitate the sharing of resources in the network at the subroutine level. The Procedure Call Protocol will be used to split NLS into a front end and back end components. Procedure Call Protocol is also to be used in the NSW as the basis for communication between the Works Manager, the Tool Bearing Hosts, and Front Desk procedure packages.

The documents cited below give a view of the Procdure Call Protocol and its use.

Contact:

Jim White (WHITE@SRI-ARC)

Jon Postel (POSTEL@SRI-ARC)

Documents:

Each is available on-line in two forms: as an NLS file and as a formatted text file. The Journal number (e.g. 24459) refers to the former, of course, and the pathname (e.g. [SRI-ARC]<NLS>PCP.TXT) to the latter, accessible via FTP using USER=ANONYMOUS and PASSWORD=GUEST (no account required).

PCP (24459,) "The Procedure Call Protocol"

This document describes the virtual programming environment provided by PCP, and the inter-process exchanges that implement it.

Pathname: [SRI-ARC]<NLS>PCP.TXT

PIP (24460,) "The Procedure Interface Package"

This document describes a package that runs in the setting provided by PCP and that serves as a procedure-call-level interface to PCP proper. It includes procedures for calling, resuming, interrupting, and aborting remote procedures.

Pathname: [SRI-ARC]<NLS>PIP.TXT

PSP (24461,) "The PCP Support Package"

This document describes a package that runs in the setting provided by PCP and that augments PCP proper, largely in the area of data store manipulation. It includes procedures for obtaining access to groups of remote procedures and data stores, manipulating remote data stores, and creating temporary ones.

Pathname: [SRI-ARC]<NLS>PSP.TXT

PMP (24462,) "The Process Management Package"

This document describes a package that runs in the setting provided by PCP and that provides the necessary tools for interconnecting two or more processes to form a multi-process system (e.g. NSW). It includes procedures for creating, deleting, logically and physically interconnecting processes, and for allocating and releasing processors.

Pathname: [SRI-ARC]<NLS>PMP.TXT

PCpFMT (24576,) "PCp Data Structure Formats"

This document defines formats for PCP data structures, each of which is appropriate for one or more physical channel types.

Pathname: [SRI-ARC]<NLS>PCPFMT.TXT

PCPHST (24577,) "PCP ARPANET Inter-Host IPC Implementation"

This document defines an implementation, appropriate for mediating communication between Tenex forks, of the IPC primitives required by PCP.

Pathname: [SRI-ARC]<NLS>PCPHST.TXT

PCPFRK (24578,) "PCP Tenex Inter-Fork IPC Implementation"

This document defines an implementation, appropriate for mediating communication between processes on different hosts within the ARPANET, of the IPC primitives required by PCP.

Pathname: [SRI-ARC]<NLS>PCPFRK.TXT

PCPTNXINT (24792,) "Tenex PCP process Internal Structure"

This document defines the internal structure of a PCP

process implemented to run on Tenex, and as such serves as a process implementer's guide. It describes the process' fork structure, the role and composition of each fork, and the manner in which the various forks interact with one another; indicates which components are supplied with PCP and which are the responsibility of the process implementer; and describes the manner in which the components are assembled at load time.

Pathname: [SRI-ARC]<NLS>PCPTNXINT.TXT

HOST (24581,) "NSW Host Protocol"

This document describes the host level protocol used in the NSW. The protocol is a slightly constrained version of the standard ARPANET host to host protocol. The constraints affect the allocation, RFNM wait, and retransmission policies.

Pathname: [SRI-ARC]<NLS>HOST.TXT

EXEC (24580,) "The Executive Package"

This document describes a package that runs in the setting provided by PCP. It includes procedures and data stores for user identification, accounting, and usage information.

Pathname: [SRI-ARC]<NLS>EXEC.TXT

FILE (24582,) "The File Package"

This document describes a package that runs in the setting provided by PCP. It includes procedures and data stores for opening, closing, and listing directories, for creating, deleting, and renaming files, and for transfering files and file elements between processes.

Pathname: [SRI-ARC]<NLS>FILE.TXT

FILE-App (24813,) "The File Package Appendix"

This appendix contains some comments on implementation strategy. The thrust is to argue that the file package as specified is near minimal and that the conversion between the PCP format and the internal storage format can be encapsulated into a few subroutines.

Pathname: [SRI-ARC]<NLS>FILE-APP.TXT

BATCH (24583,) "The Batch Job Package"

This document describes a package that runs in the setting provided by PCP. It includes procedures for creating and deleting batch jobs, obtaining the status of a batch job, and communicating with the operator of a batch processing host. This package is implemented at the host that provides the batch processing facility.

Pathname: [SRI-ARC]<NLS>BATCH.TXT

LLDBUG (24579,) "The Low-Level Debug Package"

This document describes a package that runs in the setting provided by PCP. It includes procedures for a remote process to debug at the assembly-language level, any process known to the local process. The package contains procedures for manipulating and searching the process' address space, for manipulating and searching its symbol tables, and for setting and removing breakpoints from its address space. Its data stores hold process characteristics and state information, and the contents of program symbol tables.

Pathname: [SRI-ARC]<NLS>LLDBUG.TXT

RJE-MODEL (24655,) "The NSW Remote Job Entry Model"

This document discusses the process of utilizing a batch processing facility to complete a programming task in the NSW environment. This same activity in another environment might utilize a remote job entry system.

Pathname: [SRI-ARC]<NLS>RJE-MODEL.TXT

TBH (24656,) "NSW Requirments on Tool Bearing Hosts"

This document discusses the environment needed in the tool bearing host and the interfaces to the operating system components by various PCP packages.

Pathname: [SRI-ARC]<NLS>TBH.TXT

NVTP (24827,) "The Network Virtual Terminal Package"

The Network Virtual Terminal Package (package name = NVTP) contains the procedures interfacing PCP

procedure calls to terminal oriented input and output character streams as defined by the ARPANET Telnet protocol.

Pathname: [SRI-ARC]<NLS>NVTP.TXT

NTP (25008,) "The NSW Tool package"

This document describes the procedures and data stores required of a process for use as a tool within the NSW.

Pathname: [SRI-ARC]<NLS>NTP.TXT

NSWSTRUC (25009,) "NSW Process Structure"

This document describes the structure of the PCP process tree used in the NSW.

Pathname: [SRI-ARC]<NLS>NSWSTRUC.TXT

PCPV2CHANGES (25062,) "PCP Inter-Version (2-3) Documentation"

This document describes the divergence from the Version 2 documentation in the implementation and currrent thinking.

Pathname: [SRI-ARC]<NLS>PCPV2CHANGES.TXT

People:

Jim White (WHITE@SRI-ARC)

Jon Postel (POSTEL@SRI-ARC)

Steve Warshall (WARSHALL@SRI-ARC)

Robert Millstein (MILLSTEIN@SRI-ARC)

Dick Mandell (MANDELL@ISIB)

Elizabeth Michael (MICHAEL@SRI-ARC)

Dave Manyard (MANYARD@SRI-ARC)

Charles Irby (IRBY@SRI-ARC)

Ken Victor (VICTOR@SRI-ARC)

Schedule:

A demonstration of the National Software Works concept is to be performed in July 1975.

Comments:

(31-DEC-74) The following are the latest documents:

PCPFRK (24578,) "PCP Tenex Inter-Fork IPC Implementation"

FILE-APP (24813,) "The File Package Appendix"

RJE-MODEL (24655,) "The NSW Remote Job Entry Model"

TBH (24656,) "NSW Requirments on Tool Bearing Hosts"

NVTP (24827,) "The Network Virtual Terminal Package"

Recent developments:

(21-JAN-75) The following are the latest documents:

NTP (25008,) "The NSW Tool Package"

NSWSTRUC (25009,) "NSW Process Structure"

PCPV2CHANGES (25062,) "PCP Inter-Version (2-3) Documentation"

ADDRESS ASSIGNMENTS

Assigned Links

Contact:

Jon Postel (POSTEL@SRI-ARC)

Documents:

Link Assignments:

Decimal	Octal	Use
0	0	Control Messages
1	1	Reserved
2-71	2-107	Regular Messages
72-152	110-230	Reserved
153	231	TIP Status Reporting
154	232	TIP Accounting
155-158	233-236	Internet Protocol
159-191	237-277	Measurements
192-195	300-303	Message Switching Protocol
196-255	304-255	Experimental Protocols

People:

Jon postel (POSTEL@SRI-ARC)

Schedule:

Comments:

Recent developments:

21-Jan-75

Assigned Sockets

Contact:

Jon Postel (POSTEL@SRI-ARC)

Documents:

Socket Assignments:

General Assignments:

Decimal	Octal	Use
0-63	0-77	Network Wide Standard Function
64-127	100-177	Hosts Specific Functions
128-223	200-337	Reserved for Future Use
224-255	340-377	Any Experimental Function

Specific Assignments:

Decimal	Octal	Use
1	1	Old-Telnet
3	3	Old File Transfer
5	5	Remote Job Entry
7	7	Echo
9	11	Discard
11	13	Who is on or SYSTAT
13	15	Date and Time
15	17	Who is up or NETSTAT
19	23	Character generator or TTYTST
21	25	New File Transfer
23	27	New Telnet
25	31	Procedure Call Protocol
65	101	Speech Data Base at LL-TX-2
67	103	Datacomputer at CCA
69	105	CPYNET
71	107	NETRJS (EBCDIC) at UCLA-CCN
73	111	NETRJS (ASCII) at UCLA-CCN
75	113	NETRJS (TTY) at UCLA-CCN
77	115	any private RJE server
232-237	350-355	Authorized Mailer at BBN
239	357	Graphics
241	361	NCP Measurement
243	363	Survey Measurement
245	365	LINK
247	367	TIPSRV
249-255	371-377	RSEXEC

People:

Jon Postel at SRI-ARC (POSTEL@SRI-ARC)

21-Jan-75

JBP 25-FEB-75 17:22 25474
Protocol Information [31]
Address Assignments

Nancy Neigus at BBN-NET (NEIGUS@BBN)

Schedule:

Comments:

Recent developments:

(31-DEC-74) Socket 25 (31 octal) assigned to Procedure Call Protocol.

JBP 25-FEB-75 17:22 25474

protocol-information

(J25474) 25-FEB-75 17:22;;;; Title: Author(s): Jonathan B.
Postel/JBP; Distribution: /JBP([INFO-ONLY]) ; Sub-Collections:
SRI-ARC; Clerk: JBP; Origin: < POSTEL,
PROTOCOL-INFORMATION,NLS;37, >, 22-JAN-75 11:46 JBP ;;;;####;

JDH 25-FEB-75 20:51 25475

Journal Cut-off

The cut-off for journal submission in the machine changeover is Friday morning at 10:30. Items sent after that time on the SRI-ARC machine will likely be lost. Items sent from Office-1 after about 9:30 AM Friday to people on this machine will not be delivered until after we are up at BBN.

1

JDH 25-FEB-75 20:51 25475

Journal Cut-off

(J25475) 25-FEB-75 20:51;;;; Title: Author(s): J. D. Hopper/JDH;
Distribution: /SRI-ARC([ACTION]) JDH([INFO-ONLY]) ;
Sub-Collections: SRI-ARC; Clerk: JDH;