ARPA Book
Protocols Chapter

Introduction 1

ARPANET Overview 1a

The ARPANET is an advanced computer communications system connecting together a set of computer centers in the United States and Europe. The following description of the network touches on several aspects: the physical implementation, the scope and size, and the functional goals. 1a1

The ARPANET is implemented using packet transmission technology. At each network site there is an Interface Message Processor (IMP) which is a store and forward packet routing computer. Each IMP is connected to between 1 and 5 other IMP's via common carrier circuits. These circuits are normally 50 kilobit per second channels. The IMP's are Honeywell 316 or 516 computers modified and programed by Bolt, Beranek, and Newman (BBN) <Heart>. Also connected to an IMP may be between 0 and 4 hosts. A host is a computing sysyem which currently ranges in size from a DEC PDP11 to a IBM 370/195. A Terminal Interface Processor (TIP) is an IMP and a minihost combined in one processor <Ornstein>. 1a1a

The ARPANET has grown almost continuously from the time it began with the installation of the first IMP in September 1969. As of this writing the network consists of 48 IMPs of which 21 are TIps, and 54 hosts. The network extends from Hawaii in the west to London and Norway in the east. One communication channel has been upgraded to 230.4 kilobits per second, and the communications between California and Hawaii, and between the United States and Europe are via satellite channels. The satellite channel to Europe is 7.2 kilobits per second, while the satellite channel to Hawaii is the normal 50 kilobits per second. 1a1b

The goal of the ARPA computer network is for each computer to make every local resource available to any computer in the network in such a way that any local program available to local users can be used remotely without degradation. That is, any program should be able to call on the resources of other computers much as it would call a

subroutine. The resources which can be shared in this way include software and data, as well as hardware <Roberts>. 1a1c

The process of sucessful communication requires the use of some rules of behavior in order to permit the communicating entities to properly interpret the conversation. These rules of behavior may include both constraints on the sequencing of the units of conversation, as well as the structure and content of the communication (e.g. the grammar and the meaning). In the ARPANET these rules of communication behavior are called protocols. 1a2

Communications in the ARPANET are of two types; those associated with two directly connected entities (e.g. IMP to IMP, IMP-host, system-process) and those between more widely separated entities (e.g. system to system, process to process). This second type of communication is sometimes said to be supported by a virtual communications channel. For example the virtual process to process communication channel is really a process-system, host-IMP, IMP to IMP, IMP-host, system-process channel. 1a2a

The protocols in the ARPANET build up the capabilities of the network in a series of levels or layers. The lowest of these is the IMP to IMP protocol which provides for reliable communication among the IMPs. This protocol handles transmission error detection and correction, flow control to avoid congestion, and routing. 1a2b

The next level is the IMP-host protocol which provides for the passage of messages between hosts and IMPs in such a way as to create virtual communication paths between the hosts. With the IMP-host protocol, a host has operating rules which permit it to send messages to specified hosts on the network and to be informed of the dispensation of those messages. In particular, the IMP-host protocol constrains the hosts in their transmissions in order to make make good use of available communications capacity without denying such availability to other hosts. 1a2c

The next higher level is the host to host protocol, implemented by the network control program. The host to host protocol is the set of rules whereby hosts construct and maintain communications between user processes running on separated computer systems. One process requiring communications with another on some remote computer system

makes requests on its local operating system to act on its behalf in establishing and maintaining those communications using the host to host protocol <Crocker>. 1a2d

If this brief introduction to the ARPANET is not sufficient, the reader is urged to turn to the references <Heart>, <Roberts>, <Crocker>, and <Ornstein>, before reading the body of this report. 1a2e

Protocols are those conventions or rules of behavior that enable entities to interact in an effective manner. In computer networks protocols are the rules of communication between the machines or processes. These rules may be both passive and active. Passive protocols specify the format of the communication -- the interpretation of the bit pattern. Active protocols specify the allowed sequence of communication -- which party is allowed to say what kind of things when. 1b

History 2

The histroy of protocols in the ARPA Computer Network differs in several respects from the history of other aspects of the network project. Most other aspects of the project were identified as tasks and contracted to specific organizations for solution, protocols on the other hand were not contracted to any organization at all, rather it was left up to the groups connected to the network to determine how to use it. The upshot was that the first sites on the network held meetings and formed a "network working group" (NWG) to formulate a protocol to regulate the communication between the hosts. 2a

This initially small group went about specifying a protocol for the use of the network as they percieved it, and accepted as given the IMP-host interface specified by the subnet contractors (BBN). This is not to say that there was little cooperation between BBN and the host protocol designers, in fact there was substantial communication and cooperation. 2b

The initial design for the host level protocol was presented at a meeting in Utah in December of 1969, and was determined to be unacceptable in that there was no mechanism by which programs which were written before the network existed could be accessed via the network using this protocol. 2c

The NWG went back to the drawing board and came up with essentially the current protocol by the Spring of 1970. This

protocol also included features for dynamic reconnection of the ongoing communications between processes, and met the constraints that the earlier proposed protocol failed to meet. 2d

At a meeting held at UCLA, in Spring 1970, it was decided to accept this protocol without the dynamic reconnection features. This protocol provided for logical connections (associated with the IMP provided logical links) between processes, each connection treated as a bit stream, with no significance associated with message boundaries. 2e

Implementation of this protocol was then intiaited by several sites (by this time there were 6 or 7 installed IMPs). By the fall of 1970 there was some discussion of possible modifications to the protocol. The main points to be considered were flow control and a nominal byte size. 2f

The point of most contention and debate was the flow control mechanism. The first mechanism was to count the bits data transmitted and add a constant to account for the per message overhead and use this quantity to indicate and control allocated buffers in the receiving host. An alternative mechanism was proposed that would have allowed the receiving host to quench the flow of data by issuing a cease indication, and modifications were made to the IMP-host protocol to facilitate this mechanism. Finally the current mechanism, a slight modification of the first, with exact counts of the data bits allocated and messages allowed was adopted. It was adopted that a Byte Size would be associated with each connection. 2g

As the controversy over the host to host protocol was resolved the discussion of the Initial Connection and Telnet protocols heated up. The Initial Connection protocol was aimed at providing a means for allowing one process to listen on one socket for all callers interested in a particular service. The Telnet protocol was aimed at establishing conventions for providing and utilizing the service of the interactive executive. 2h

Once Telnet useage was demonstrated attention was focused on File Transfer protocols, but it has taken a long time to reach agreement on the file transfer conventions. 2i

There was some early interest in remote job entry facilities but since many of the initial hosts were interactive timesharing systems this interest was not sufficiently general to reach an agreement until much later. 2j

Interest in a Graphics protocol has also been present from the earliest days, but here again a critical mass has been hard to achieve and the problems are much harder since graphics systems tend to be one of a kind. 2k

Philosophy 3

The philosophy behind the protocol development is one of mutual cooperation with the understanding that the protocols must be agreeable to representatives from a diverse set of system organizations. The protocols must be a standard so that each system can change a little to allow one common communication language rather than having a separate communication protocol for each pair of systems. This has been called reducing the N squared problem to a N problem. 3a

Discussion 4

Motivation 4a

Two functional capabilities are desirable in a computer network: to be able to use interactive terminals with programs on remote computers "as if you were there", and to transfer between computers large collections of data or files (which may be programs or data). The first capability is provided by the Telnet protocol and the second by the File Transfer Protocol (FTP) <NIC7104>. 4a1

Goals 4b

No Rewrite 4b1

The existing programs in the computers attached to the network were to be accessible via the network without change. 4b1a

Terminal Access 4b2

The first goal of the network users was to access a distant interactive timesharing system as if they were a local user of that distant system. 4b2a

Data Access 4b3

A second goal was access to data bases and data files. 4b3a

Principles 4c

Commonatity (Virtualization) 4c1

That each system should give a little and learn to speak a common language is a principle illustrated by the network virtual terminal concept used in the Telnet protocol. 4c1a

Layering 4c2

The protocols are layered in a series of levels, where each protocol takes as given the capability provided by the lower level protocols and uses those facilities to provide augmented capabilities to the higher level protocols. 4c2a

The layering of the protocols is illustrated by the IMP-IMP, IMP-host, host-host separation. The advantage of layering is that each level may be redesigned and evolved into a more effective implementation without significant effect on the other levels. 4c2b

Stream 4c3

The IMP to host protocol provides for the transmission of messages of up to 8095 bits. The host to host protocol uses this facility to provide for the transmission by processes of indefinite bit streams. The principal is that the arbitrary size limits imposed by the subnetwork should not propagate into higher level protocols and be embeded in applications programs (how many times has a string been limited to 80 characters in an application program ?). 4c3a

Negotiated Options 4c4

The principle of negotated options emerged slowly from the development of the file transfer and remote job entry protocols, but is now most clearly demonstrated by the Telnet protocol. 4c4a

TimeOuts 4c5

The host to host protocol did not provide for timeouts for the completion of sequences of commands or for the response to a command, although the notion that such things should be completed promptly was included. The implementations of the host to host protocol (and other protocols) have

included timeouts and it is now recognized that timeouts are essential to the continued correct functioning of such protocol implementations. 4c5a

Address Space Expansion 4c6

At every level in the addressing schemes (links, sockets, etc.) only part of the address space has been assigned for use, and a portion of the addresses have been reserved for future needs. 4c6a

Address Space Structuring 4c7

Addresses are structured into fields for ease in allocation to various purposes. For example sockets are 40 bit numbers: 8 for host, 24 for process, 7 for AEN or tag, and 1 for direction. 4c7a

Types 4d

IMP-IMP 4d1

Purpose 4d1a

The IMP-IMP protocol regulates the flow of information between the IMPS. This is the protocol that defines the packet mode of transmission, the packet formats, and the control messages exchaned by the IMPS. The purpose of this protocol is to provide to higher level protocols and programs effective communication capability with both low delay and high throughput characteristics.

Design 4d1b

See Waldens Chapter

Implementation 4d1c

Experience 4d1d

IMP-HOST 4d2

Purpose 4d2a

The IMP-HOST protocol interfaces the subnet to the attached computer systems of the ARPANET. This protocol

specifies both the hardware interface and the software control and data messages that cross the interface. The format of messages is specified.

Design 4d2b

Implementation 4d2c

Experience 4d2d

HOST to HOST 4d3

Introduction 4d3a

The Network Control Program (NCP) is the operating system module that interfaces user programs to the communications network by providing system calls to invoke communications functions specified by the network wide host to host protocol.

The intention of this section is to describe the host to host protocol by discussing an implementation of it in a network control program.

Purpose 4d3b

The purpose of this protocol is to have the diverse operating systems of the network cooperate to provide to the processes they serve a coherent interprocess communication facility. The host to host protocol specifies the format of messages and the control message interpretations used between the operating systems of the host computers in the network.

Design 4d3c

Assumptions

error free

It was assumed that the communication path provided by the subnet would be error free from the point of view of the hosts. It was further assumed that the communication between the host and the IMP through the host-IMP interface and connecting cables would be error free.

sequencing

It was assumed that messages sent on a link would be delivered in the order sent.

RFNM limited per link

It was assumed that only one message could be in progress at a time on a link, That is, once a message was sent on a link, the same link could not be used until a RFNM (Ready for Next Message) messages was returned.

no acknowledgement

It was assumed that although the RFNM was returned by the subnet no acknowledgement by the destination host would be necessary.

non breaking host

It was assumed that if a host broke (crashed) that all communication was lost. That is there was no provision for recovery from partial failure of a host such as a service interruption where state information is preserved.

concepts

connections

Connections are the pathways for interprocess communication. The host to host protocol creates connections between processes and supervises the flow of data along those connections. The end points of connections are sockets, and a connection is named by the sockets it connects.

A connection couples two processes so that output by one process is input to the other process. Connections are simplex (i.e. unidirectional) so that two connections are necessary if a pair of processes are to communicate in both directions.

sockets

Sockets are names for the ends of process to process communication paths called connections. Sockets names are 40 bit numbers, 8 bits for host name 24 bits for process name, 7 bits for AEN or tag, and 1 bit for direction. Sockets are necessary to provide a common network wide name space for the input and output ports of processes, process input and output ports are usually named in a variety of ways in each system for example as Fortran logical unit numbers, as data control block addresses, as job file numbers.

commands

connection establishment

RTS

The receiver to sender command communicates two socket numbers and a link number. The pair of socket numbers identify a connection to be established if a matching STR command has been or will be sent by the other host. The link number specifies the link to be associated with this connection, the link number is used in other commands and in the data messages as a shorthand index for naming this open connection.

Note that either host can begin opening or establishment of a connection at any time, and for a connection to be fully open an RTS and an STR command will have been exchanged.

STR

The sender to receiver command communicates two socket numbers and a byte size. The pair of socket numbers identify a connection to be established if a matching RTS command has been or will be sent by the other host. The byte size specifies the size of data bytes for this connection.

flow control

ALL

The allocate command communicates to the sender the amount of buffer capacity available in the receiving host for data messages on this link. The buffer capacity is measured with two independent counts, one for messages and another for data bits.

The buffer capacity is thought of as being consumed by the transmission of data, and created by the processing of data by the receiving process. This requires that the data receiving host send to the data sending host allocate commands at appropriate times to refresh the counts of available buffer capacity.

The data sending host is not allowed to send a message that would decrement either count below zero.

GVB

The give back command communicates to the data sending host a request by the data receiving host to return in a RET command a portion of the allocated buffer capacity on this link. The amount of capacity to return is communicated as two fractions, one for the message count and the other for the bit count.

RET

The return command is send from the data sending host to the data receiving host only in response to a GVB command and communicates the amount of buffer capacity returned for this link as two counts, the message count and the bit count.

close a connection

CLS

A pair of close commands must be exchanged by

the hosts to close a connection. Either host may initiate the closing of a connection at any time, even before a connection is fully opened. The close command communicates the pair of socket numbers that name the connection to be closed.

interrupt mechanism

INR

The interrupt by receiver is sent from the data receiving host to the data sending host when the receiving process wants to interrupt the sending process for the connection associated with this link.

INS

The interrupt by sender is sent from the data sending host to the data receiving host when the sending process wants to interrupt the receiving process for the connection associated with this link.

restart

RST

The reset command is send from one host to another host whe the first host wishes to inform the second host that all information regarding any connections between the two host has been forgotten by the first host and information about such connections shoud be forgotten by the second host. The first host expects the second host to respond with a RRP command before any other communication takes place between the two hosts.

RRP

The reset reply command is send only in response to a RST command.

miscellanous

ERR

The error command is used to communicate to another host that a message received for it is in error in some way. The error command communicates an error code and a portion of the erronous message.

ECO

The echo command may be used to test the communication path to and state of another host. The data byte sent in the echo command is expected to be returned in an ERP command.

ERP

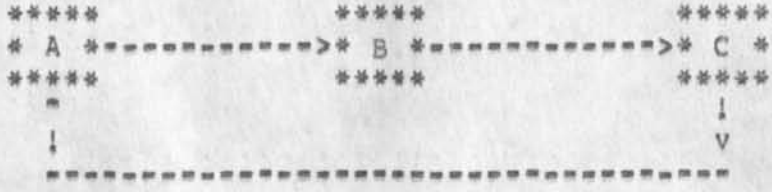
The echo reply command is sent only in response to an echo command and communicates the data byte received in the echo command back to the host that originated the echo command.

NOP

The no operation command may be sent at any time and is discarded by the receiving host.

why simplex connection ?

Connections were specified to be simplex because it was thought that it would be useful to allow processes to be connected together in arrangements such as the following example:



Implementation 4d3d

The Network Control Program (NCP) Environment

This section discusses the purpose of the NCP and how

it relates to the operating system and other protocols.

Purpose of a Network Control Program

The function of network control program (NCP) is to implement the host to host protocol. That is the NCP is to provide a common interface across the various operating systems to the user level processes, and to provide to the operating systems the means to communicate among themselves the control information necessary to establish, regulate, and terminate the communication between user processes.

The development of the network in the computer science research environment provided an ample collection of well developed interactive timesharing systems for the initial set of systems to become part of the network. These early interactive systems generally possessed a process structure and interprocess communications mechanism. It seemed that the network should naturally extend these interprocess communications mechanisms to allow communication between processes in different systems. There were some difficulties, however, for the various systems did not all have a uniform scheme for interprocess communication or even a common way of naming the destination of a communique. Several of the systems that were later added to network did not allow communication between processes, indeed, a few systems did not support the concept of a process (or so their programmers claimed).

A standard interprocess communication mechanism and a standard naming scheme were needed. Further there was a need for a common language such that the operating systems of the various hosts could talk to each other about the interprocess communications they support.

These needs are filled by the host to host protocol as implemented by the network control programs of the various hosts. The host to host protocol specifies a language of commands with

parameters which are exchanged between NCPs to arrange, manage, and terminate process to process communication. The host to host protocol also specifies a common name space called sockets for indicating the source and destination of interprocess communications. The host to host protocol provides an interprocess communication mechanism called connections.

Description of an Operating System

An operating system consists of program modules which augument the hardware and provide an environment for processes. Among the operating system modules of interest are a terminal control program (TCP), a file control program (FCP), and of course, a network control program (NCP). The interfaces between these operating system modules and user processes take the form of system calls and returns, and sometimes pseudo interrupts. System calls are implemented in a variety of ways, but often it is a special hardware instruction that invokes a system call (e.g. SVC, UUO, JSYS, MME). In higher level programming languages a system call is often indistinguishable from a subroutine call. In some cases the form of the system call is quite different for each different module of the system.

A process is a program in execution with its associated address space, a location counter, some general registers, and usually some open files (or devices) . Processes may be created by users, though there are often processes which have been programmed by systems programmers for particular functions, and some of these may be initiated by the system when it begins running. Some processes may have access to greater (or lesser) capabilities than those created by normal users. In general there may be elaborate regulations provided by the system to control passing of the capability or permission to access particular resources between processes.

One important aspect of an Operating system that has a great impact on the implementation of

network functional capabilities is the provision for interprocess communication. Generally processes are viewed as independent computational units that need interact only with the operating system in a few very constrained ways (i.e. via system calls), however often it would be useful to build a new capability based on a combination of existing programs. One way of extending the usefulness of the process structure is to allow processes to communicate between themselves such that several processes may cooperate to accomplish a computational goal. The form of communication supported by an operating system very much influences the extent to which processes actually cooperate and, therefore, the extent to which use of the ARPANET is a natural extension of the programming enviroment. The network host to host protocol seeks to make available to processes a particular form of interprocess communication called connections.

There are many other features and essential functions of operating systems which will be ignored in this discussion because they are not relevant to the implementation of an NCP. Any multiprogramming or multiple process system must have a scheduler, some form of memory management, and provide for accounting, security, protection, and privacy.

Description of a Network Control Program

This section begins with a general overview of the operation of a network control program and gradually refines the definition. The functional components of an NCP are described first in a general way followed by a description of a typical set of system calls for the user-NCP interface and a description of the operation of the NCP and finally a detailed description of the functions of each NCP component.

NCP Functions:

The NCP must provide several functions to interface between the user process on one side and the IMP on the other side. Among these functions

are device handling, formatting, error control, flow control, multiplexing, and synchronization.

The IMP is connected to the host computer much as any input or output device (since the IMP is a full duplex device it might be interfaced as two simplex devices). This implies that there must be in the lowest levels of the system a program module to control the IMP interface on the input output instruction and interrupt level.

The IMP-host protocol requires that a standard format be used for messages exchanged between the host and the IMP. The standard format has a 32 bit leader at the beginning of each message that contains control information indicating such things as the message type, source or destination host and logical link number. In addition to the leader the host to host protocol requires an additional 40 bits of prefix information for each message. This additional prefix indicates the byte size and number of bytes in the text of the message.

As data becomes available to send to the IMP, it is formatted into messages and queued for transmission to the IMP, and as messages are received from the IMP, they are queued for processing.

The messages received from the IMP are of various types. The two most frequently received are REGULAR and RFNM. A REGULAR message is used to transfer data. A RFNM (request for next message) is used to indicate that the previously sent message on this logical link to this host was sucessfully received by the destination IMP. There are several other message types to indicate error conditions.

The REGULAR messages are of two catagories: user data or NCP to NCP control information. These are distinguished by the logical link number in the leader. All NCP to NCP control messages are transmitted on logical link zero. All user data

messages are transmitted on a logical link number in the range 2 through 71.

The NCP control messages have several functions: to establish connections between pairs of processes in the network, to regulate the flow of data over these connections, to terminate connections, and to convey some special signals between the NCPs.

The leader of a data message must be examined to determine to which user process buffer the text of the message should be appended.

The user process interacts with the network by issuing system calls to the NCP to establish, use and terminate connections. When the user process issues calls which cause the NCP to send data to a distant process the NCP must include information in the leader that will enable the receiving NCP to determine for which process the data is intended.

The sending and receiving processes and hosts might not operate on the same sized quanta of information and they might operate at differing speeds. In such a situation it is natural to use buffers to smooth the flow of information and to allow each entity to operate using its prefered quantum size. It is the responsibility of the NCPs to manage these buffers and to regulate the flow from sending to receiving host such that the receiving host is able to buffer all the data sent with out undue difficulty.

Many of the NCP control messages received and many of the system calls will require the NCP to send NCP control messages to the foreign host.

The NCP must maintain information about each active connection in a connection table. The elements of each entry in this table include information about the user process using the connection, the foreign host, the buffer location and fullness, and the state of the connection.

If any errors are detected the NCP must act to protect itself from harmful consequences, but it must also act to provide reliable service to all the user processes. In any case the NCP should record the relevant information about the error and the circumstances (e.g. time and day). The NCP must also report abnormal events to the the computer operator and be able to receive instructions from the computer operator.

The NCP should make available to users and the computer operator the status of hosts and connections.

The NCP should gather statistics on the usage of various elements of the protocol and resources allocated to it (e.g. buffers).

System Calls

The following discussion of the NCP and system calls is at a level comparable to that in the basic specifications of the IMP-host protocol <BBN1822> and the host to host protocol <McKenzie>. Note that the following sections are modeled closely on Network Working Group Request for Comments note number 55 <NewKirK>.

The system calls assumed to be available to user written processes are described.

LISTEN(PORT,AEN,CODE)

The local socket of this process with this AEN is associated with this process PORT. A return value is given in CODE. If there is a pending call the connection may be opened immediately and the process notified, if there is no matching pending call the NCP will notify the process when a matching RFC arrives.

CONNECT(PORT,AEN,FS,CODE)

The local socket of this process with this AEN is associated with this PORT, and the

specified foreign socket (FS) is also associated with this local socket, defining a connection. If there is a pending call matching these parameters the connection is opened and the process so notified. A return value is given in CODE. If there is no matching pending call the NCP communicates this request to the foreign host and notifies the local process when a matching request is received and the connection is opened.

SEND(PORT,BUFFER,LENGTH,CODE)

The data starting at BUFFER and extending LEGNTH bits is transmitted on the connection associated with this PORT in accordance with the allocation values. CODE is set with a return value.

RECEIVE(PORT,BUFFER,LENGTH,CODE)

Data received on the connection associated with this PORT is stored into the processes address space starting at BUFFER an extending for LEGNTH bits. A return value is set in CODE.

CLOSE(PORT,CODE)

Activity on the connection associated with this PORT is stopped. A return value is set in CODE.

INTERRUPT(PORT,CODE)

A special interrupt signal refering to the connection associated with this PORT is sent on a logically parallel data path. A return value is set in CODE.

STATUS(PORT,INFO,CODE)

The relevant status information from the connection table entry associated with the PORT is returned in INFO. A return value is

set in CODE. This allows a user program to monitor the state of a connection, of special interest are the allocation values and the NCP buffer used and free values.

NCP Operations

Presented here are discriptions of the operations conducted during the three major phases of network usage: opening, communicating, and closing.

Opening

In order to establish a connection for data transmission, a pair of RFC's must be exchanged. An RTS must go from the receive side to the send side, and an STR must be issued by the send side to the receive side. In addition, the receive side in its RTS must specify a link number, and the send side in its STR must specify a byte size. These RFC's (RFC is a generic term encompassing RTS and STR) may be issued in either order.

A provision must also be made for queuing pending calls (i.e. RFC's which have not been dealt with by the user program). Thus, when a user is finished with a connection, he may choose to examine the next pending call from another process and decide to either accept or refuse the request for connection. A problem develops because the user may choose to not examine his pending calls; thus they will merely serve to occupy queue space in the NCP. several alternative solutions to this problem are discussed later.

Utilizing the framework of the typical system calls described above, at least four temporal sequences can be envisioned for obtaining a successfully opened connection:

The user process may issue a LISTEN indicating that it is willing to connect

to any process which sends an RFC specifying this local socket. When an RFC of interest arrives the NCP responds with a matching RFC and notifies the user processs of the now open connection. The user can, of course, inspect the parameters of the connection (using the STATUS system call, for example) to determine if it really wants the connection, and if not the user can CLOSE the connection.

If upon processing a user request for a LISTEN, the NCP discovers that a pending call exists for this local socket, the NCP immediately sends the matching RFC and notifies the user of the open connection.

The user may issue a CONNECT, specifing a particular foreign socket that he would like to connect to. An RFC is issued. If the other NCP accepts the request, it answers by returning an RFC. When this acknowledging RFC is received the connection is opened.

When processing the CONNECT, the NCP may discover that a pending call exists from the specified foreign socket to the local socket in question. An acknowledging RFC is issued and the connection is opened.

In all the above cases the user is notified when the connection is opened, but data flow cannot begin until buffer space is allocated and an ALL command is transmitted.

Any of these connection scenarios will be interrupted if either the other NCP sends a CLS command when an RFC is expected or the user issues a CLOSE system call before the connection is opened, as discussed under Closing.

Communicating

Data can only flow when a connection is fully opened (i.e. when two RFC's have been exchanged). It is assumed that the NCP's have buffers for receiving incoming data and that there is some meaningful quantity which they can advertise on a per connection basis in ALL commands indicating the amount of data they can handle. It is noted that the sending side regulates its transmission according to that amount.

When a connection is opened, a connection table entry field called their-allocation-values is set to zero. The receive side will decide how much space it can allocate and send an ALL message specifying that space. The send side will increment their-allocation-values by the allocated space and will then be able to send messages of length less than or equal to their-allocation-values. When messages are transmitted, the length of the message is subtracted from their-allocation-values. When the receive side allocates more buffer space (e.g. when a message is taken by the user, thus freeing some system buffer space), the number of bits newly available is sent to the send side via an ALL message.

Thus, their-allocation-values is never allowed to become negative and no transmission can take place if their-allocation-values equals zero.

Notice that the lengths specified in ALL messages are increments not the absolute size of the receiving buffer. This is necessitated by the asychronous nature of the flow control protocol. The values in the ALL command can be quite large, thus providing the facility for an essentially infinite bit sink, if that may ever be desired.

Closing

Just as two RFC's are required to open a connection, two CLS's are required to close a connection. Closing occurs under various circumstances and serves several purposes. To simplify the analysis of race conditions, four cases are distingusished: aborting, refusing, termination by receiver, and termination by sender

A user aborts a connection when he issues a CONNECT and then a CLOSE before the connection was opened. Typically a user will abort following an extended wait for the acknowledgement; the NCP may also abort for him if he blows up.

A connection is refused when the NCP sends a CLS as a response to an arriving RFC. This may occur if a user has issued a connect and an RFC arrives from some other foreign socket.

After a connection is established, either side may terminate. The required sequence of events suggests that attempts to CLOSE by the receive side should be viewed as requests which are always honored as soon as possible by the send side. Any data which has not yet been passed to the user, or which continues over the network, is discarded. Requests to CLOSE by the send side are honored as soon as all data transmission is complete.

Aborting

Three cases are distinguished:

In the simplest case an RFC is sent followed later by a CLS. The other side responds with a CLS and the attempt to connect ends.

The foreign process may accept the connection concurrently with the local process aborting it. In this

case, the foreign process will believe the local process is terminating an open connection.

The foreign process may refuse the connection concurrently with the local process aborting it. In this case, the foreign process will believe the local process is acknowledging its refusal.

Refusing

After an RFC is received, the local host may respond with an RFC or a CLS, or it may fail to respond. (The local host may have already sent its own RFC). If the local host sends a CLS, the local host is said to be refusing the request for connection.

CLS commands must be exchanged to close a connection, so it is necessary for the local host to maintain the connection table entry until an acknowledging CLS is returned.

Termination by the Receiver

When the user on the receive side issues a CLOSE system call, his NCP accepts and sends a CLS command immediately. Data may still arrive, however, and this data should be discarded. The send side, upon receiving the CLS, should immediately terminate the data flow.

Termination by the Sender

When the user on the send side issues a CLOSE system call, his NCP must accept it immediately, but may not send out a CLS command until all the data in the local buffers has been passed to the the foreign host. It is

thus necessary to test for both buffer empty and RFNM received before sending the CLS command. The CLS must be acknowledged before the connection table entry can be deleted.

In this presentation several topics have been mentioned which should be further explained, among these are pending call queues, and connection states.

Pending Call Queues

It is essential that some form of queuing for pending RFC's be implemented. A simple way to see this is to examine a typical connection establishment sequence. One side issues a LISTEN, the other a CONNECT. If the LISTEN is issued before the RFC coming from the remote CONNECT arrives, all is fine. However, due to the asynchronous nature of the network, events may not occur in this sequence. If calls are not queued, and the RFC comes before the LISTEN is issued, it will be refused; if it arrives later it will be accepted.

Unless one has infinite queue space, it is desireable to have some mechanism for purging the queues of old RFC's which the user never bothered to examine. An obvious but informal method is to note the time of arrival of each RFC, and then to periodically refuse all RFC's which have been queued longer than some arbitrary limit. Another action which should be included in any purging scheme is for the NCP to send a CLS on any pending connection when a user logs out or blows up.

The following scheme may be used to reduce the number of queued requests. When a CONNECT is issued, the NCP assumes that this local socket wants to talk to

the specified foreign socket and to that socket only. It therefore purges from the pending call queue all non-matching RFC's by sending CLS's. Similarly, when the connection is in the RFC SENT state (a CONNECT has been issued and an RFC sent) all non-matching RFC are refused. If a LISTEN is issued and results in an open connection, the remainder of the pending calls are not removed from the queue, in the expectation that the user may wish to accept these requests in the future.

Connection states

Since the sequence of use of a connection involves many events and the legality and interpretation of many of these events is dependent on the preceeding activity, the NCP must remember, for each connection, where it is in the sequence. To keep this knowledge concisely the notion of a state is used. It has often been attempted to construct a state transition diagram to illustrate the possible state sequences of a connection, but to accurately take into account the many possibilities the diagram would be overly complex, thus often a simpler diagram is used that shows only the main lines of the primary sequences.

The states that are typically present are:

NOT ACTIVE

This is not really a state, but the fact that a connection is not in the connection table at all.

LISTENING

The local socket is associated with a process port, and the NCP is waiting for an RFC to this local

socket from any foreign socket in any host. When an RFC does arrive for this local socket a matching RFC is sent and the connection is set to the OPEN state.

RFC SENT

This state indicates that the local socket is associated with a process port, an RFC has been sent to a specific foreign socket in a specific foreign host, and no matching RFC has yet been received. This state would be entered if the user process issued a CONNECT call and there was no matching RFC in the pending call queue. When a matching RFC does arrive, the NCP completes the initialization and marks this connection in the OPEN state.

RFC RECEIVED

An RFC has been received for which there was no matching entry in the connection table. This is a pending call. If a user process issues a matching CONNECT or LISTEN it will be satisfied at once. The local NCP will send an RFC and the connection will be marked in the OPEN state.

OPEN

RFC's have been exchanged and the connection is open. Transmission may begin subject to the constraints of the buffer allocation quantities.

ALLOCATION WAIT

To transmit data on a send connection there must be some

positive allocation values (i.e, buffer space in the receiving host), if the allocation value (either bits or messages) has fallen to zero then the sender must wait until an ALL command arrives to increment the allocation values.

RFNM WAIT

After sending data on a connection the sender is not permitted to send additional data until the corresponding (IMP to host) RFNM command is received. When a RFNM is received the state changes to either OPEN or ALLOCATION WAIT depending on the allocation values.

CLS SENT

The user program has issued a CLOSE system call and the NCP has sent a CLS command to the foreign host. This cannot be done on a send connection until all the data is sent that the user process has previously output, and until a RFNM has been received for the last message of that data.

CLS RECEIVED

A CLS command has been received from the foreign host. If this is a send connection the NCP notifies the user process at once and answers with a CLS command, moving the connection to the CLOSED state possibly discarding data sent by the user but not yet transmitted by the NCP. If this is a receive connection, the NCP must wait until the user process has read all the received data. The NCP then sends a

CLS to the foreign host, and notifies the user process.

CLOSED

The connection has been closed by an exchange of CLS commands. This is a transitory state and the connection should be deleted from the connection table shortly.

Functions of NCP Components

The following are the NCP functional components (program modules) and the tasks they carry out.

IMP Input Routine

Read messages from the IMP, and turn them over to the Network Interpreter Routine.

IMP Output Routine

Write messages to the IMP having received them from the Output Scheduler Routine.

Network Interpreter Routine

Analyze and act on messsages from the network, including maintaining connection table entries, composing replying messages, and exchanging information with the System Call Interpreter Routine, the Error and Statistics Routine, and the Output Scheduler Routine.

Output Scheduler Routine

Queue messages for delivery to the IMP Output Routine and to maintain a sent messages queue in case retransmisssion is called for.

System Call Interpreter Routine

Analyze and act on system calls from the

user processes, including maintaining connection table entries, composing messages to foreign hosts, and passing messages to the OutPut Scheduler Routine.

Error and Statistics Routine

Record and report on detected errors in the program or protocol and the use thereof. Gather and record statistics of interest.

In the following paragraphs each of the functional components is explained. While there are likely to be a number of unusual events not explicitly discussed, the majority of frequent events are described. One comment that is important at this point is that the NCP should be constructed to be resilient in the face of errors. That is to say that when an error is detected the NCP should act to protect itself from any harmful effects, but should also act in a manner consistent with achieving for the user process the most reliable and consistent communications possible.

IMP Input Routine

There must be someplace in the system to handle at the machine instruction level and interrupt level each device attached to the central processing unit. This is true for line printers, disks, terminals, and multiplexor channels as well as for the IMP or rather the IMP-host Special Interface.

The IMP-host communication is a full duplex channel (i.e. simultaneous transmission in both directions) and it is often easier to interface the IMP to the computer as two independent devices.

On input the routine has a buffer available for the longest message that can be received and has a pending instruction to read from the IMP. When an end of input interrupt occurs the routine checks the length and signals the Network Interpreter Routine that

a message is ready. The routine then gets a new buffer and starts a new read operation. The amount of buffering depends on the rate and frenquency at which the IMP Input Routine and the Network Interpreter Routine operate. Two buffers are recommended. The manner in which the routine signals the Network Interpreter Routine varies in various systems, it may be anything from raising a flag to a pseudo-interrupt.

IMP Output Routine

For output from the host to the IMP this routine is supplied by the Output Scheduler Routine with the starting address and the length of a data buffer to move to the IMP. When the transfer completes the routine frees the buffer and signals the Output Scheduler Routine.

Network Interpreter Routine

As a message from the network is processed the leader should be examined to check the link number field. If the value is zero then the message is a host to host control message. If the link number is (curently) 2 through 71 the message is a data message associated with an open connection. If the link number is other that these two catagories the message is either part of another protocol (e.g. Message Switching Protocol <Bressler>) or an error.

If the NCP is aware that another protocol is being used in parallel with the host to host protocol it can turn over any message belonging to that protocol to the appropriate program on the basis of this link number inspection.

A message from the network is processed by examining the type field. The action taken for each type is indicated. The two types

expected most frequently are REGULAR and RFNM.

REGULAR

This is a regular message, it is passed to the next phase in the input message analysis.

ERROR IN LEADER

This message indicates that there has been an error in a previous host to IMP message such that the IMP could not decipher the leader. This is the only response that will be received to one of the unanswered messages on the sent messages queue, it will take careful detective work to determine which message. If the message was related to this response can be determined, the message and leader should be checked for correctness and retransmitted.

IMP GOING DOWN

The IMP is warning of of an impending service outage, parameters in the message leader tell something about how soon and how long, so the user processes can be notified.

NOP

This no operation message is discarded.

RFNM

Ready for next message on this link. This message is used to confirm the transmission of messages from the host to the destination IMP. There should be an associated message on the sent

message queue which can now be discarded.

The link number should be used to locate a connection table entry. The state field of that table entry should indicate RFNM WAIT. This state should be changed to either OPEN or ALLOCATION WAIT depending on the amount of data ready to send and the allocation values. If there is data to send and the allocation values are positive the data send subroutine should be called.

DEAD

This is an indication that the destination host or IMP is dead. Normally the corresponding message on the sent message queue is discarded, and this host is marked dead in the host status table.

Note that some very recent work has been done on making the process to process communication more reliable in the face of network and operating system errors. Among the techniques is to treat a DEAD response as a temporary service interruption that will be quickly repaired (e.g. in a few minutes) and thus to retransmit the message associated with the DEAD response.

If the destination host (or IMP) is really dead then the NCP must close all of the connections to that host and notify any processes effected. The connection table must be updated.

ERROR IN DATA

There has been an error in the transmission of a previous host to IMP

message, but the leader was preserved, so the link field can be used to attempt to associate this message with a message on the sent message queue. Once the associated message is determined, it is retransmitted.

INCOMPLETE

In this case the destination may be alive but the message was not delivered, the message is retransmitted.

RESET

The IMP has dropped and raised its ready line. If at the time of this occurance the IMP held a message to be transmitted to the host, or if a message transmission was in progress, data has been discarded. Similarly if a message was being transmitted to the IMP at the time of this occurance, it was discarded. The host and the IMP should at this point send each other several NOP messages to clear the line and reestablish the flow of messages. Some of the messages on the sent messages queue may need to be retransmitted.

UNASSIGNED

There are several messages types that are not assigned any meaning currently, these should be treated as NOPs, that is ignored.

The next phase in the analysis of a message from the network is to determine whether this is a host to host command or a data message associated with an open connection.

Suppose the current message has a link number in the range 2 through 71

identifying it as a data message associated with an open connection.

The link number is used to find a connection table entry and find the buffer associated with this connection, then checking the allocation and buffer space available the data is copied from the message into the processs buffer. Of course the proper checking is done to see that the connection is open, etc. and the allocation values are updated as appropriate possibly sending an ALL command. If the process has requested some notification when data arrives then the appropriate notice is given.

If the link number is zero then this is a host to host command, and contains one or more commands. Some of the commands are trivial while others are quite complex and require the mantenance of state information in the connection table.

NOP

This command is discarded.

RTS

This is a receiver to sender request for connection. The connection table is searched for a matching entry (due to a CONNECT or LISTEN system call). If a match is found the connection is opened (sending an STR if it has not been done earlier). If the connection state was LISTENING the matching STR is sent, otherwise the connection state should be RFC SENT. In either case the connection state is set to OPEN.

If no match was found then the

information is added to the table, creating a new entry. This is the case of a pending call. The connection state is set to RFC RECEIVED.

STR

This is a sender to receiver request for connection. The connection table is searched for a matching entry. If a matching entry is found the connection is opened (sending an RTS if it has not been done earlier). If the connection state is LISTENING the matching RTS is sent, otherwise the state should be RFC SENT. In either case the state is set to OPEN.

If no match was found then the information is added to the table, creating a new entry. This is the case of the pending call. The connection state is set to RFC RECEIVED.

CLS

This is a command to close the connection. If the connection is in the state CLS SENT, the matching CLS has been sent and the connection state set to CLOSED. Otherwise the state is set to CLS RECEIVED.

If this is a send connection the associated process is informed and any unsent data is discarded. The matching CLS is then sent and the connection state set to CLOSED.

If this is a receive connection there may be data received and buffered which has not yet been

read by the associated process. Thus the information that the connection is now closed must be flagged so that the process can be informed as it finishes reading the accumulated data. The matching CLS can be sent as soon as the NCP has flagged the connection entry. The connection state is also set to CLOSED.

At this point the state should be CLOSED, the data buffers should be empty, and the process aware that the connection is closed, thus the connection table entry can be deleted.

ALL

This is an allocation of buffer space for messages and bits that may be sent on the associated connection. The connection table entry fields for their-allocation-values is updated by adding the just received quantities to the values in the table entry. If the connection state was ALLOCATION WAIT it is changed to OPEN. If there is data waiting to be sent the data send subroutine is called.

GVB

This is the give back command, it requires the return (in a RET command) of a portion of the current allocation for the associated connection. This is done by building a RET command and asking the Output Scheduler Routine to send it. The connection state should change to ALLOCATION WAIT if

the allocation values have been reduced to zero.

RET

This is the return command, in answer to a give back command associated with this connection. The allocation values are now decremented by the amounts indicated in the return command.

INR

This is a command to interrupt the process associated with the receive connection indicated by this link number.

INS

This is a command to interrupt the process associated with the send connection indicated by this link number.

ECO

This command requires that an echo reply command be sent. The ERP command containing the received parameter is constructed and turned over to the Output Scheduler Routine.

ERP

This is a response to an echo command and the data received should be exactly that which was sent.

ERR

This command indicates that the sender of this command has detected

an error. This command and the date and time are turned over to the Error and Statistics Routine for recording. The data portion of the command indicates which of the messages and connections are involved since these connections may have to be resynchronized.

RST

This is a host to host reset command. This indicates that the sending host has cleared all of its tables of information, i.e. all connection are dissolved. Thus, all the tables of information relating to the sending host are cleared, and a RRP command. The RRP is composed and turned over to the Output Scheduler Routine to be sent. Also any user process that may be effected are notified.

RRP

This is a response to a reset command previously sent.

Data Send Subroutine

This subroutine checks to see if there is buffered data and allocation available, and the state is OPEN. If so the subroutine forms a message whose length is the minimum of the data available, the allocation available and the maximum allowed message size. This message is turned over to the Output Scheduler Routine. The allocation values are updated, and the state is set to RFNM WAIT.

Output Scheduler Routine

As messages ready for transmission to the

various remote hosts are turned over to the Output Scheduler Routine, they are queued and delivered one at a time to the IMP Output Routine. It may be appropriate to order the queue according to some priority (e.g. host to host commands first), but this is optional. As the messages are sent by the IMP Output Routine they should be placed on a sent messages queue. As RFNMs are received the corresponding messages can be deleted from the sent messages queue. Other responses (e.g. INCOMPLETE) will cause a message on the sent messages queue to be indicated for retransmission.

System Call Interpreter Routine

As a user process issues system calls the NCP (eventually) must be invoked to service these requests. Some calls will be control requests (CONNECT, LISTEN, CLOSE, ...) while others will be data requests (SEND, RECEIVE).

For the control requests the NCP must check the status of table entries referenced in the call or create new entries. Some calls may require composition and sending of NCP commands to other hosts.

For the data flow requests the NCP must check tables and buffers and move data from system buffers to user process buffers or vice versa as the buffer space or data availability permits. This may result in the NCP sending to the other host either a data message or an allocate command depending on the direction of data flow.

The actions taken by the NCP to satisfy each of the system calls is now indicated.

LISTEN

The NCP searches the connection table for a pending call which matches this

request. If a match is found the table entry is completed with the information supplied by this call; namely, the process identification and the port identification. A buffer should be assigned and initialized. The state should be RFC RECEIVED, a matching RFC should be sent and the connection moved to the OPEN state. The user process should be notified of the now open connection.

If there is no matching pending call a new table entry is created, filling in the values for local socket, process, and port identification. The state should be set to LISTENING.

CONNECT

The connection table is searched for a pending call. If a pending call is found the state should indicate RFC RECEIVED. A matching RFC is sent and the state updated to OPEN. A buffer should be assigned and initialized, and the remaining table entries filled in. The user process should be notified of the now open connection.

If no matching pending call was found a new table entry is created and filled in with the supplied information. The NCP sends an RFC and sets the table entry state to RFC SENT.

SEND

The indicated data is copied from the users buffer to the NCP buffer (being concatenated to any data already there) associated with this port. The buffer can be found from the the connection table entry associated with this port. The state is checked and if

it is OPEN the allocation values are checked if either is zero the state is set to ALLOCATION WAIT. If there is space allocated the data send subroutine is called.

RECEIVE

The NCP moves data from the NCP buffer indicated in the connection table entry associated with this port to the users buffer up to the limit of either the amount specified or the amount available. The amount of data actually moved is indicated to the process. The NCP also checks to see if this frees a sufficient amount of buffer space to send an allocate command. If so an ALL is formatted and turned over to the Output Scheduler Routine.

CLOSE

The NCP will try to close this connection as soon as it can be sure the data flow has stopped. If this is a send connection, the NCP will wait until all the data issued by the user in SEND system calls has been transmitted to the remote host and a RFNM returned from the last message. This condition can be checked by ascertaining that the NCP buffer for this connection is empty and the state is OPEN (or even ALLOCATION WAIT). Once this all-data-transmitted condition has been met the NCP can begin to close the connection. The System Call Interpreter Routine forms a CLS command and turns it over to the Output Scheduler Routine. The connection state is set to CLS SENT.

If this is a receive connection the user process clearly does not want any more data even if there is some it has

not read, so any buffered data or any that arrives following the CLOSE call is discarded, and no new allocates are sent. The NCP sends a CLS at once to notify the sending NCP and process to stop their transmission and to close the connection. The connection state is set to CLS SENT.

INTERRUPT

For a send connection the NCP forms a INS command, and for a receive connection the NCP forms a INR command; the command is forwarded to the Output Scheduler Routine.

STATUS

The NCP returns, in the INFO argument, data from the connection table entry associated with this port. This system call has no effect on the state of connections or buffers, and no information is transmitted to the network because of it.

Error and Statistics Routine

In case of any error condition detected a record should be added to a log file indicating the date, time, leader, and other circumstances of the error (e.g. NCP control message, portion of the content of the message).

Errors in use of the host to host protocol should also be reported back to the offending host using the ERR command. Any ERR commands received should be logged.

Certain kinds of errors and errors that occur with high frequency should be reported to a system operator via an on-line console.

The Connection Table

The entries of the connection table should contain the following fields:

link number

local socket

foreign socket

foreign host

process identification

port identification

buffer address

state of connection

byte size

allocation values

date and time

In summary, the functions of the NCP are restated: to provide to the user processes a form of interprocess communication called connections. In carrying out this function the NCP must implement mechanisms for error control, flow control (allocates), multiplexing (sockets and links), and synchronization (interrupts).

The Model System Analyzed

This section describes the model NCP discussed in the previous section as if were an actual implementation.

Model system

System

The operating system is a timesharing system which provides for user process, a file system,

and interprocess communication. Each user process has an independent (virtual) address space, a set of general registers, a location counter, and a set of open files. The system provides system calls to open, read or write, and close files, terminals or connections. Interprocess communications are supported by a mechanics similar to the network connections. There is also a pseudo interrupt facility such that the system can cause the location counter of a process to be set to the processes interrupt address.

NCP

The network control program is implemented as part of the operating system, though it is programmed in an way that would allow it to be run as a user program (except for the privileged interaction with the IMP input and output handler). The communication between the NCP and the user processes uses the existing interprocess communication system calls.

Points of comparison

System Calls

The system calls Listen, Connect, Send, Receive, Close, Interrupt, and Status are available to users. These call are similar to other input and output service call.

Return Characteristics

These system calls are nonblocking, with the option of blocking until completion.

Programming Languages

The network system calls are available to programmers in every programming language on the system.

RFC Queueing Policy

Requests for connection are queued until either the local process issues a Connect system call or a timeout period elapses. When a Connect system call is issued on a local socket all requests queued on that socket are refused execept the matching request. Requests queued on a local socket opened via a local Listen system call are retained in the queue.

Timeout Policy

Queued RFCs are timed out after ten minutes, a missing CLS is timed out after two minutes.

Connection States

The following states are used: Not Active, Listening, RFC Sent, RFC Received, Open, Allocation Wait, RFNM Wait, CLS Sent, CLS Received, Closed.

Allocation Policy

The allocation policy is to carefully control the flow of data using the bit count of the allocation to allow exactly the buffer space reserved on a per connection basis. In particular the initial allocation is a large number of messages (100) and as many bits as available in the connection buffer. As the data flows, the allocation values are adjusted whenever the values fall to a lower bound expressed as a fraction of the initial allocation (e.g. two-thirds). When the allocation is adjusted it is set to the maximum values then available.

Interrupt Treatment

The network interrupt signals INS and INR cause the user program associated with

the connection to begin executing at its interrupt address.

Retransmission Policy

The incomplete transmission reply from the IMP will cause the indicated message to be retransmitted.

Error Treatment

A log file is kept of all unusual occurances, among the things entered into this log are all ERR messages received, all ERR messages sent, and any information about internal errors detected.

Measurement and Status Information

The NCP keeps running totals on the number of times each host to host command is sent or received, on the number of messages sent and received of the number of bits sent and received, and the number of each type of IMP to host and host to IMP message received or sent. The NCP keeps an accounting log in which is recorded the information about each connection when the connection is closed. The data recorded is the user name and account number, the foreign host, the number of messages and bits sent and received, the elapsed time and the time and day when the connection was closed.

The NCP connection table is accessed by a status display program which displays the foreign host, the socket numbers, the link number, the allocation values, and connection state, for each connection.

Operator Interaction

The operator can close any connection or send a reset to any host, can stop,

continue, or reinitialize the NCP. The operator is informed of errors by the NCP.

Experimental Protocols

There is a provision to pass messages which arrive on designated links to other programs, to provide for testing of experimental protocols.

Experience 4d3e

First note that the ARPANET works. The NCPs in the host dc communicate among themselves, and user level programs in the various hosts do communicate with other user level programs in other hosts.

This has been accomplished by a uncoordinated group of systems programmers working for diverse organizations geographically distributed. These programmers established a working group and used a series of technical memos (called Request for Comments) to exchange information and viewpoints on the developing protocols. Several meetings were held to gather concensus on protocol issues and adopt proposals for implementation. The specifications produced by this process are loose in several respects, the two most important areas being the functional specification of the user process to NCP interface (system calls) and the requirement for queueing of requests for connection.

The current host to host protocol has several flaws in addition to the weak positions on the user interface and queueing cited above. Error control is present in a very limited sense, the ERR command is useful for reporting detected protocol violations, but such violations should arise only due to program bugs, and the ERR command is not employed by many of the implementations. The hosts should have a means of ensuring that the data transmitted is received correctly and that the messages transmitted all arrive. The first problem could be attacked by an end to end checksum, and the second by a message sequence number.

Another problem is in the flow control aspect, while the

allocate mechanism is constructed to allow quite flexible buffer management, many of the implementations have chosen to use a very simple strategy, often one that requires an allocate for each message, thus insuring a host to host round trip delay between messages of the same conversation. Similarly the host to host protocol requires a host to destination IMP round trip delay between each message of the same conversation by requiring the NCP to wait for a RFNM to each message on a logical link before sending another message on the same logical link. These constraints limit the throughput achievable on any particular connection.

The performance measurements of network control programs has been very spotty and informal. There should be some consistency and regularity to performance measurements. There needs to be a standard set of experiments defined and these experments should be performed regularly.

Generally network control programs implemented as core resident modules are capable of higher throughput rates and cause smaller delays, this is not necessairly due to better coding but usually due to avoidance of the paging or swapping overhead incurred with a nonresident program. On the other hand the nonresident program may have the advantage of not tying up core memory when not in use and may be able to have only the active subroutines in core thus using a smaller portion of core even when in use.

There is no authority to designate network control programs complete or correct. There should be a mechanism for a third party to review and certify NCPs, as the situation stands each implementation is correct only on the word of its implementer.

The documentation of network control programs is spotty, often there is no documentation (other than the code) of the program, however see <BBN91>, <White1>, <Winett>, <Wong>. Further it is sometimes difficult to find documentation on the user program interface (system calls). This latter problem is serious in that it tends to prevent users from constructing inovative applications of the network facilities.

Summary 4d3f

Process-Process 4d4

Initial Connection Protocol 4d4a

Purpose

The Initial Connection Protocol is used to establish a two way communication between a pair of processes, and to allow one process to accept a series of calls on an advertized socket number. The processes are usually characterized as a user (calling) process and a server (listening) process.

Suppose that a host organization wants to offer some computing service to the network community. There must be a way in which programs can contact the service program and utilize the service. The server can publish and advertize a socket number where the service is available. This is the concept of a well known socket.

But unless the service is trivial the use of the service will take some time and the first user of the service may block other users of the service. This calls for the initial interaction between the user and the server to negotiate a new communication path that frees the well known socket.

We also note that a pair of connection will be needed between the user and the server if there is to be a two way conversation between them, even if the user is to only specify some arguments and parameters, and the server to only report some computed results.

Thus we have the Initial Connection Protocol which allows a host organization to advertize a service on a well known socket, to switch the communication from that socket to an other path at once, and to have the new path be a pair of connections for a two way conversation.

Design

A server process attaches a well known send socket L and listens. A user process initiates a connections to L from its receive socket U. The byte size for

this connection is 32 bits. The server then transmits a 32 bit even number S as data, and closes the connection. The number S and its successor S+1 are the socket numbers the server will use. The final steps are for sockets S and S+1 at the server host to be connected to sockets U+3 and U+2 respectively at the user host.

Implementation

Experience

Although this protocol is very simple in appearance, it did initally have flaws. The original protocol specified the final connections to be between U and S+1, and between U+1 and S. This caused problems due to the variations in the queueing policies implemented in the NCPs of various hosts and the flexible ordering rules in this ICP protocol. The principal problem being that the socket U could be busy when the attempt to connect it to socket S+1 was made thus aborting the whole procedure. This is the reason sockets U+2 and U+3 now are used on the user side.

Telnet 4d4b

Purpose

The purpose of the Telnet protocol is to enable a user at one host to utilize the programs and files of another host as if the user were a local user of the distant host.

The implementation of Telnet is to the NCP almost indistinguishable from any pair of communicating processes in the network. At the computer where the human user sits at his terminal there is a program called User-Telnet which talks to the terminal on one side and talks to the NCP on the other side. At the computer where the serving program is located there is a program called Server-Telnet which talks to the NCP on one side and talks to the serving program on the other side as if it (Server-Telnet) were a terminal.

This last requirement, that the serving program believes it is talking to a terminal and not the network, is a tricky one. Some systems have constructs which allow a process to act as a terminal to another process, in these systems this is a simple requirement to implement. In other systems however the implementation of this capability has been so difficult that the Server-Telnet function has been implemented in the system with the NCP. The importance of this requirement is that it permits programs constructed for use from interactive terminals with no thought of the network to be used by remote users via the network.

Design

The design of Telnet focuses on what a terminal is expected to look like to a computer -- its character encoding and its control. The encoding used to transmit characters in the network is ASCII. Seven bit ASCII in eight bit bytes, the eight (high order) bit being set to zero for ordinary characters. It is the responsibility of the sending system to convert from the native character set there to the network standard, and the responsibility of the receiver to convert from the network standard to its local character set.

The control of the terminal was a major issue of discussion in the development of Telnet. The problem resolves arround the differences between terminals which allow two way character at a time communication, and terminals which alloy only one way line at a time communication. While the first type of terminal can easily simulate the second it is not adaquate to specify that network virtual terminals will always be of this second type. The reason is that many of the systems on the network have developed powerful interactive programs that utilize the character at a time feature to great advantage and to prevent the optimal use of these tools via the network would be a severe blow to the goal of the network -- resource sharing.

Another area of great discussion was the relationship between the logical end of command or line signal and

the physical formatting that occurs at the end of a line -- carriage return and line feed.

The basic element of the Telnet protocol is the specification of the fiunctional characteristics of a fictious terminal called the Network Virtual Terminal (NVT).

The requirement on each host is to interface its service programs to the network virtual terminal, and for its users to provide a program to map its real terminals into the network virtual terminal. The point here is that each host has to learn to deal with one new terminal type but not all the terminal types on all the hosts in the network.

Telnet protocol provides for the control of certain interaction parameters such as whch host is responsible for the echoing, where the interaction is to be line at a time or character at a time, etc. The protocol has mechanism for the user and server programs to negotiate the settings for these parameters.

It should be emphasized that the principle of negotiated options is a lesson learned. Telnet did not originally allow for negotiation of these type of parameters. one side could command the other to put a particular option or parameter into effect.

The necessity of a mechanism to synchronize the user and server programs was recognized at the outset, and has been affirmed. This mechanism is used in Telnet to overcome the problem that can arise if the serving program gets stuck in a loop and the data stream gets full. There must be a way to signal the server using another path and at the same time indicate the corresponding point in the normal path.

Issues

Control of format effectors

echoing

end of line significance

two kinds of real terminals

telnet control signals escaped by IAC

keyboard and printer linked

buffers a line

end of line significant

keyboard and printer independent

each character sent when typed

end of line not interesting

Implementation

Experience

File Transfer 4d4c

Introduction

The File Transfer Protocol (FTP) is designed to fill the need for a mechanism to transfer files containing programs or data between computers. The FTP utilizes a Telnet connection (pair) to allow the exchange of control information (requests and replies) and a separate data connection for the actual transmission of the file. The NCP is not normally aware of the fact that this data connection is used for the FTP.

Purpose

The point of File Transfer protocol is exactly that -- to move files of either data or program between hosts in the network. The File Transfer protocol specifies a set of commands and replies to be exchanged between the processes to arrange the transfer and a set of formats for the actual transmission of the file contents.

Design

Implementation

Experience

Remote Job Entry 4d4d

Purpose

The Remote Job Entry protocol specifies a set of commands and replies to be utilized in arranging the transmission of files of batch job input or output between a host that supports a batch processing capability and a host where users desire access to such a facility.

Design

Implementation

Experience

Mail 4d4e

Purpose

The mail or user message exchange capability of the network is not implemented as a seperate protocol but as a part of the File Transfer protocol. Using the facilities of the File Transfer protocol mail sending and receiving processes accept messages from users and deliver them to the users requested either on the same or another host.

This mail sending capability may be one of the most used and most visible uses of the ARPANET, yet was the least planned. It is also an area that demonstrates the tremendous synergystic effect of communications between the groups that make up the network community. The interesting features of the current mail system were not originally present at any one host, but as the staff at one site saw features at another, they also incorporated the good points into their own implementations, thus each host improved its service by incorporating the good features of other systems.

Design

The mail protocol as used today can hardly be said to have been designed at all. Most of the interactive timesharing systemes in the network had a local mechanism which allowed users to send short text messages to other users. The extension of this capability to allow messages to be exchanged by user on separate hosts was explicitly encouraged by the last minute inclusion of mail oriented commands in one of the many draft versions of the file transfer protocol.

Implementation

Experience

RSEXEC 4d4f

Purpose

Design

Implementation

Experience

Graphics 4d4g

Purpose

The aim of the Graphics protocol is to allow users with various different kinds of display hardware at different hosts in the network to make use of common graphics application programs. The Graphics protocol describes a model of graphics interactions and display processing, and specifies commands and formats for communicating graphical information.

Design

Implementation

Experience

Data Reconfiguration Service 4d4h

Purpose

The intent of the Data Recinfiguration Service is to provide a mechanism for translating data from one representation to another representation. The source and destination representations would be described with statements in a description language.

Design

Implementation

Experience

The Data Reconfiguration Service was not used in any significant way and may be used as an example of a protocol that for one reason or another was unnecessary. Either the useage patterns of the network have not grown to include the type of traffic DRS was designed to assist, or in every practical case that has come into use there has been a more efficient ad hoc solution.

Design 4e

Implementation 4f

Performance 4g

Design Evolution 4h

Example Implementations 4i

Issues 4j

Priority 4j1

The question of priority traffic in a system where the normal delivery time is less than one second is still an open issue. There are some at least who suggest that it is not a problem of priority delivery by the network, but rather a problem of controling which message should be entered into the network when.. 4j1a

Future 4k

TCP 4k1

Glossary 6a

Abbreviations 6a1

AEN 6a1a
another eightbit number

ALL 6a1b
A host to host protocol command to allocate buffer space to the sending NCP in the receiving NCP.

ANTS 6a1c
ARPA Network Terminal System

ARPA 6a1d
Advanced Research Projects Agency of the Department of Defense

ARPANET 6a1e
Advanced Research Projects Agency Computer Network

ASCII 6a1f
American Standard Code for Information Interchange, The character encoding used in the network.

BBN 6a1g
Bolt, Beranek, and Newman, Inc, Cambridge, Massachusetts

BKY 6a1h
The operating system used at Lawrence Berkeley Laboratories for the CDC 6600 computer.

CCBS 6a1i
Center for Computer-based Behavorial Studies at University of California, Los Angeles.

CDC 6a1j
Control Data Corporation

CLS 6a1k
A host to host protocol command to close the connection.

DEC 6a1l
Digital Equipment Corporation

DMS 6a1m
Dynamic Modeling System, A host computer on the ARPANET at MIT.

EBCDIC 6a1n
Extended Binary Coded Decimal Interchange Code, The character encoding used primarily by IBM computer systems.

FCP 6a1o
File Control program

FTP 6a1p
File Transfer Protocol

IBM 6a1q
International Business Machines

ICP 6a1r
Initial Connection Protocol
IPC 6a1s
interprocess communication
IMP 6a1t
Interface Message Processor
LBL 6a1u
Lawrence Berkeley Laboratory
MCP 6a1v
The operating system for the Burroughs 6700,
MIT 6a1w
Massachusetts Institute of Technology
Multics 6a1x
Multiplexed Information and Computing Service, the operating system for the Honeywell 6180 computer designed and implemented at MIT's project MAC.
NCC 6a1y
Network Control Center at BBN,
NCP 6a1z
Network Control Program
NIC 6a1a@
Network Information Center at the Augumentation Research Center of Stanford Research Institute, Menlo Park, California.
OS/MVT 6a1aa
An IBM operating system for the 360 series of computers.
pDP 6a1ab
Programmed Digital Processor
RAND 6a1ac
The RAND Corporation
RFNM 6a1ad
Request For Next Message
RFC 6a1ae
request for connection
RTS 6a1af
Receiver to Sender request for connection, A host to host protocol command,
SDC 6a1ag
System Development Corporation
STR 6a1ah
Sender to Receiver request for connection, A host to host protocol command,
TCP 6a1ai
Terminal Control Program
TENEX 6a1aj

The operating system designed and implemented by BBN for the DEC PDP10 computer.

TIP 6a1ak
Terminal Interface Processor

UCLA 6a1al
University of California, Los Angeles

UCSB 6a1am
University of California, Santa Barbara

UCSD 6a1an
University of California, San Diego

UI 6a1ao
University of Illinois

VM 6a1ap
The IBM operating system for the 370 series of computers.

Terms 6a2

another eightbit number 6a2a
The user program specified portion of the socket number.

ARPA Network Terminal System 6a2b
A particular small host system designed to interface a wide variety of terminals and peripherals to the ARPA network. This system was designed and implemented by the Center for Advanced Computation at the University of Illinois. The system operates on a DEC PDP11 computer.

connection 6a2c
The form of interprocess communication provided to the user level processes by the NCPs in the host computers. A connection is a logical simplex stream of data from one port of one process to another port of another process in the network.

control message 6a2d
A message (of the regular type) that contains host to host commands.

File Control Program 6a2e
That module in the operating system that controls the access to files by the user processes.

File Transfer Protocol 6a2f
The protocol that specifies the communication interaction required to move blocks of data (files) between host computers in the network.

full duplex 6a2g
A channel in which data can flow in both directions simultaneously.

half duplex 6a2h

A channel in which data can flow in both directions, but may only flow in one direction at a time.

header 6a2i
The control information at the begining of a packet.

host 6a2j
A computer attached to an IMP. A host does not necessarily offer services to other computers in the network.

Initial Connection Protocol 6a2k
The sequence of actions taken by user level programs to establish a pair of connections between a user program and a service program.

Interface Message Processor 6a2l
The packet routing computers which are the nodes of the ARPA network. An IMP is connected to between 1 and 5 other IMPs and to between 0 and 4 hosts.

interprocess communication 6a2m
The facility for one process to communicate with another process.

leader 6a2n
The first 32 bits of a message, containing address and control information. The most important fields in the leader are: the message type, the link number, and the host address.

link number 6a2o
A parameter in the leader that selects a logical communication channel between the source and destination hosts.

message 6a2p
The unit of transmission between a host and an IMP, up to 8096 bits.

Network Control Program 6a2q
The program module added to the operating system that interfaces the user processes to the IMP and controls the communication between hosts by implementing the host to host protocol.

packet 6a2r
The unit of transmission between IMPs, up to 1008 bits.

port 6a2s
The input or output identifier associated with a particular data stream of a process. For example a Fortran logical unit number or a data set reference number, or an assembly languague data control block.

prefix 6a2t
A 40 bit block immeadiately following the leader and

containing the byte size and number of bytes of following text.

process 6a2u
A program in execution with its associated address space, registers and location counter.

protocols 6a2v
The rules of behavior, in particular, the allowed formats and sequences of communication between two processes.

regular message 6a2w
A message from the host to the IMP or from the IMP to the host that is the normal data carrying type. When following the host to host protocol a regular message may carry either a set of control messages or a users data.

request for connection 6a2x
Either of the host to host protocol commands STR or RTS.

Request For Next Message 6a2y
A message from the IMP to the host indicating that the previously sent message on the same link number as this RFNM was received by the destination IMP and has begun transmission into the destination host.

socket 6a2z
The terminus of a connection. The network wide name of an input or output port associated with a process.

Telnet 6a2a@
The protocol (or the programs that implement it) that specifies the communication interaction such that a user on one system gains access to the services of a second system as if he were a local user of the second system.

Terminal Interface Processor 6a2aa
An extension of the IMP to allow a variety of terminals to access the ARPA network. The TIP contains the NCP and User-Telnet programs as well as the terminal handling code in the same processor as the IMP. In addition there is a BBN constructed multi-line controller for up to 63 terminal.

simplex 6a2ab
A channel in which data can flow in one direction only.

Terminal Control Program 6a2ac
The program module in the operating system that controls the flow of data between the interactive terminals and the user processes.

virtual 6a2ad
Being something in effect, but not in actuallity. For example a virtual memory might be one that a user

process accesses as if it were a large linear core resident set of memory words, when in actuallity the memory is managed by the operating system using paging and maping such that only a small portion of the users set of memory words are in core at any particular time.

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book

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TNLS COURSE OUTLINE #2: INTRODUCTION TO STRUCTURE AND VIEWING

This is the outline for the second TNLS course which introduces NLS structure (hierarchical) and special tools for viewing structured information ('view specs'). It is derived from the TNLS Courses master file which contains 5 graduated course levels (by filtering on statement name keys which are then turned off for printing). This distribution is to KWAC and ARC; printed copies are available from Trainers or by request to myself or Feedback.

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TNLS COURSE OUTLINE #2: INTRODUCTION TO STRUCTURE AND VIEWING

< BAIR, COURSE.NLS;51, >, 25-FEB-75 20:56 JHB
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%Filters at (filters); 2 = < BAIR, SECONDCOURSE.NLS;1, >,%

INTRODUCTION TO TNLS

AKW = Augmented Knowledge Workshop

PURPOSE OF SYSTEM: Augmentation of Knowledge Work

GOAL: To provide computer based tools to accomplish all aspects of knowledge work with an emphasis on collaboration.

OVERVIEW of system

NLS = oN Line System

TNLS = Typewriter Version

CAPABILITIES OF SYSTEM:

Composing

Editing

Studying

Structuring

Browsing = viewing

Printing

Publishing

Communicating =

sending and receiving mail, messages, documents; teleconferencing; etc.

Storing and retrieving =

record keeping, library services, data bases, searching, etc.

Calculating

Course Organization

NLS is divided under headings for the purposes of this course. The commands under each heading can be used to perform the general operation denoted by the heading, eg. "printing" includes commands that cause the system to print in various ways.

NLS CONCEPTS:
1. GETTING TO NLS
2. STRUCTURE
3. PRINTING
4. ADDRESSING
5. EDITING
6. COMMUNICATING
7. TROUBLE SHOOTING AND HELP

NLS COURSE LEVEL:

NLS training is further divided into five courses for ease of learning. Each level corresponds to what can be covered at one time. The things introduced at each level are determined by difficulty, usefulness, complexity, and quantity (i.e. so thaT there is not an excessive amount to cover at any one time).

Each level contains the commands from the previous level for review in addition to the commands to be introduced (which are marked by an *).

BASIC TNLS
This is the first course level (basic) which covers those commands necessary to enter, edit, and "mail" typewritten information. It has a special structure and is published in the Journal (see -- Journal, 24207,).

* INTRODUCTION TO TNLS STRUCTURE AND VIEWING
This is the outline for the second course which introduces NLS structure (hierarchical) and special tools for viewing structured information ("view specs").

DEFINITIONS FOR THE COURSE OUTLINE

COMMANDS: You type some characters to tell the computer what to do. The characters you type are represented by the uppercase letters in each "command word".

< > = you type a space.

Words that are all in upper case indicate that you type in the appropriate information for that command, eg. CONTENT.

[ ] = Comments and suggestions will appear in brackets.

CONTROL MARKER (CM) = WHERE YOU ARE: Where the computer thinks you are pointing to (to some character in some file); you may move it by specifying an ADDRESS; this is where your command will be done.

CTRL = hold down the control (CTRL) key WHILE typing the specified character.

OK or CR means you type a Carriage Return.

<esc> = the ESC or escape key on your terminal (sometimes labeled "alt mode").

BASE C: = the TNLS ready signal. It means that you can type in an editing or file handling command (like home base...).

SEND C: = the Sendmail subsystem ready signal. It means that you can type in a Sendmail command.

* DESTINATION:
In TNLS: DESTINATION = ADDRESS.
When referring to Group or Text, two ADDRESSES are needed.

* SOURCE:
In TNLS: SOURCE = ADDRESS
When referring to Group or Text, two ADDRESSES are needed.

* TYPEIN and CONTENT(for this course) = a string of characters from the keyboard, ending with an CR. [TYPEIN has a special form when a FILE ADDRESS or Link or Ident is called for (You can tell from the noise words)].

*INTRODUCTION TO TNLS STRUCTURE AND VIEWING

1. GETTING TO NLS

THE TERMINAL AND USE
See the "Basic TNLS-8 Course" [you usually have to dial a telephone number and place the receiver in your terminal's cradle]

NETWORK (ARPA) [see also the "Network Login Procedure"]

Network Login [for a new connection where you dial in]

[I] Type e [to get the Network's attention]

[II] Type LOGIN CR then give your name and password when asked.

[III] Type QUIT CR [after logging in to Net]

[IV] Type @ O <> 43 CR [to open a connection to Office-1, Host 43]

You now should be connected to TENEX

TENEX "Executive"

Login procedure:

[V] type your USERNAME <> PASSWORD <> CR
[SPACE fills in your account number automatically; you're then ready to call NLS]

* Express Login, type:
EL USERNAME <> PASSWORD <> CR

Calling NLS
[VI] Type NLS CR [it's not necessary to call NLS more than once during one login session]

CTRL c [to interrupt NLS and type CONTINUE to return]

* Quit NLS CR [to leave NLS and type CONTINUE to return]

2. ORGANIZATION OF THE SYSTEM

FILES & DIRECTORIES

Information in the origin ("parent") statement of a file
[not numbered, contains filename, etc., do not edit]

File names

* Types of files [indicated by filename extensions]

* TXT = sequential file which can be copied into NLS
COPY = a temporary sequential file, usually a message

Load File:
Load File FILENAME OK [FILENAME WILL BE ECHOED]

User creation of files

<>CReate File FILENAME OK

To see a list of all your files:

<>SHow Directory (of) OK:OK OK [this defaults to your directory]

FILE STRUCTURE

STATEMENTS and statement numbers [The basic element of structure in a file]

* Relationships between statements:
Substatement & Source

* STRUCTURES made up of statements:
BRANCH: statement plus substructure
GROUP: set of branches with same source

3, PRINTING: to see specified view of stored information
[To see anything in TNLS you must print it]

Printing on a terminal:

Print STRUCTURE (at) DESTINATION VIEWSPECS

Print File OK

Print Journal (mail) OK

Print Rest OK

\ [easy print, typing a \ prints the statement where you are]

LF [line feed prints the next statement regardless of level]

VIEWSPECS: to specify what you see

w = Default, all lines & levels (show all of the text)
m/n = numbers on/off
y/z = blank lines on or off
[have instructor set these for your default]

* To clip levels and lines, use lower case viewspecs including:
a/b = show one level less/more
c/d = show all levels/show first level
e = show referenced statement level
g/h = show branch only/show all branches
q/r = show one line less/more
s/t = show all lines/show first lines only
w/x = show all lines, all levels/show one line, one level

* SIDS (Statement Identification Numbers)
I/J = SIDS on instead of statement numbers/statement numbers instead of SIDS
[can be used in place of statement numbers in NLS]

4, ADDRESSING

Control Marker concept = where you are (travels left to right)

Jump to a new address:
Jump (to) Address ADDRESS VIEWSPECS OK

* To tell where Control Marker is:

* period [.] command [shows statement and character number]

slash [/] command [shows Control Marker context]

* [Addressing can be combined with editing]

ADDRESSING WITHIN A FILE, use:

STATEMENT NUMBER:
Automatically assigned to a statement, but not included in it,

CONTENT ADDRESS: "TYPEIN" [must be surrounded by quotes]
where TYPEIN = the text to be searched for,

* ADDRESSES within one statement:

*+e skip to end (last character) of statement

*+f skip to front (first character) of statement

* ADDRESSING BY JUMPING

TO FIND A WORD OR STRING OF CHARACTERS (= CONTENT):

* Jump (to) Word Next CONTENT VIEWSPECS OK [no quotes]

* Jump (to) Word First CONTENT VIEWSPECS OK

* Jump (to) Content Next CONTENT VIEWSPECS OK

* Jump (to) Content First CONTENT VIEWSPECS OK
[type a CTRL b for CONTENT to continue search
for same thing]

* TO GO BACK TO PREVIOUS OR OTHER FILES

* Jump (to) File Return OK ANSWER OK
[type an N instead of second OK = next filename
in stack will be echoed]

* TO JUMP BY STRUCTURE:

  * Jump (to) Origin DESTINATION VIEWSPECS OK

  * Jump (to) End (of Branch) DESTINATION VIEWSPECS OK

* TO JUMP TO AN ADDRESS OR LINK:

  * Jump (to) Link CONTENT OK

ADDRESSING BETWEEN FILES AND DIRECTORIES:

* ADDRESSES in and among files [preceded by a period]:

  * .1 link [find and jump on the next link]

LINKS for addressing [may be used after any A:]
[see also Jump to Link]
(FILENAME,ADDRESS) OR
(DIRECTORY,FILENAME,ADDRESS) OR
(DIRECTORY,FILENAME,ADDRESS:VIEWSPECS)

5, EDITING -- may be combined with addressing,
Syntax: VERB NOUN A: ADDRESS (L: LEVEL) CR (OK? CR)

* STRINGS and STRUCTURE = "nouns":

* STRINGS: [part of a statement]

* Character
* Word [note that the system readjusts spaces]
* Text

* STRUCTURE: [one or more statements]

Statement [statements renumbered automatically]

* Branch

* Group

EDITING COMMANDS:

* LEVEL-ADJUST determines the level of a statement at a new location

Just a CR = same level

*u (adjust up a level from referenced statement)
d (adjust down a level from referenced statement)

INSERT

Insert STRUCTURE (to follow) DESTINATION LEVEL-ADJUST CONTENT OK

* Insert STRING (to follow) DESTINATION CONTENT OK

continue to insert: CTRL e instead of OK puts you in the Enter mode, CTRL x to get out.

DELETE

Delete File CONTENT OK

Delete STRUCTURE (at) DESTINATION OK

* Delete STRING (at) DESTINATION OK

SUBSTITUTE

Substitute STRING in STRUCTURE (at) ADDRESS CR
(New STRING) T: TYPEIN CR
(Old STRING) T: TYPEIN CR Finished? Y/N: Y [for yes]
Substitutions made: NUMBER

[will replace the old STRING with new STRING every time it finds it in the STRUCTURE.]

MOVE

Move STRUCTURE (from) SOURCE (to follow) DESTINATION
LEVEL-ADJUST OK

* Move STRING (from) SOURCE (to follow) DESTINATION OK

COPY

Copy STRUCTURE (from) SOURCE (to follow) DESTINATION
LEVEL-ADJUST OK

* Copy STRING (from) SOURCE (to follow) DESTINATION OK

* REPLACE

* Replace STRUCTURE (at) DESTINATION (by) CONTENT OK

* TRANSPOSE

* Transpose STRUCTURE (at) DESTINATION (and) DESTINATION OK

UPDATE FILE [not imperative, but good practice]

Update File OK

6, COMMUNICATING with other users

SENDMAIL and the Journal

Interrogate

Interrogate OK
(distribute for action to:) IDENT/,LASTNAME
(distribute for information-only to:) IDENT/,LASTNAME
(title:) CONTENT
(type of source:) Message or Statement or Branch or File
(at) SOURCE
(show status?) ANSWER
(distribute the mail now?) ANSWER

* Individual commands: instead of Interrogate, specify by using the following:

* Title CONTENT OK

* Distribute (for) Information (Only) (to) IDENT/,LASTNAME OK

* Distribute (for) Action (to) IDENT/,LASTNAME OK

* Comments CONTENT OK

* <>SHoW Status OK

* Send the mail now? Y/N ANSWER

* To send a message or statement: [appears in receiver's mailbox]

* Message CONTENT OK

* <>STatement (at) SOURCE OK

* To send a structure or file: [a link appears in receiver's mailbox]

* Group (at) SOURCE OK

* Branch (at) SOURCE OK

* File DESTINATION OK

* To identify a user by lastname or ident:

* Show Record (for ident) .LASTNAME OK [precede by period]

* Show Record (for ident) IDENT OK

Mailbox = (journal) branch of your initial file -- sendmail automatically inserts citation

Send Message (Tenex)

* first: Goto (subsystem) Tenex OK [You cannot log out from this Tenex, must QUIT]:

* SND CR [The system will prompt you:]
(to:) TYPEIN CR [lastnames separated by comma]
(cc:) TYPEIN CR [lastnames separated by comma]
(subject:) TYPEIN CR [subject of your message]
(message:) TYPEIN
CRTL z CR [to terminate and send the message]
OU CR

Linking (Tenex)
first: Goto (subsystem) Tenex OK [You cannot log out from this Tenex, must QUIT]:
WHE<esc>re (is) USERNAME CR [do not link when user is in SNDMSG, OUTPRC, NOUTPRC, or XLIST]
LIN<esc>k (to) USERNAME CR [precede comment with ; end with CR, repeat every 3 lines]

7. TROUBLE SHOOTING AND HELP

Type ? for commands or needed info.; available after any prompt.

* HELP:

Type CTRL q for help concerning what you are doing or type H for Help command (after Help you can type any word in NLS you wish to know about). CTRL x gets you out of Help and back to where you were.

* Help TYPEIN OK

* Help OK

Send a message or sendmail item to: FEEDBACK

call SRI/ARC, (415 326-6200, ext,3630)

link to FEEDBACK

Status commands

CTRL t [note the words RUNNING or WAIT -- WAIT means the computer is waiting for you to do something]

* <>SHow Disk (space status) OK [each user has a certain allocation of pages]

Remedies

CTRL c, reset, NLS

* dsk pages and over allocation...exPunge

Update File Compact [re-stores file more efficiently in computer]
Delete Modifications [destroys all changes since last update]

PRACTICE

Primer ("TNLS-8 Primer," Journal Accession number -- 23911,)

* Use Strategies
How to use the system to accomplish specific tasks, from daily routine tasks to creative intellectual enterprise.

OTHER AVAILABLE COURSES:

* 3. INTERMEDIATE TNLS
This is the third formal course or level of expertise, and represents significant experience with the system. The Programs and Useroptions subsystems are introduced as well as Output Processing for printer formating.

* 4. ADVANCED TNLS
This is the fourth course or level, which introduces new commands that emphasize alternatives, short cuts and special applications.

* 5. EXPERT ADVANCED TNLS
This is the fifth, most advanced level which covers any NLS command phrases or application techniques remaining in the running system.

* EXAMPLE OF STRUCTURE :

< BAIR, MENU,NLS;1, >, 28-JAN-75 17:29 JHB ;;;;

1 SOUP

1A VEGETABLE

1B CREAM OF MUSHROOM

2 ENTREE

2A FRIED CHICKEN

2B PRIME RIBS

2C SALMON

2C1 WITH CREAM SAUCE

3 DESSERT

3A PIE

3A1 APPLE

3A2 BLUEBERRY

3B ICE CREAM

3B1 VANILLA

3B2 PEPPERMINT

3B3 MAPLENUT

3B4 CHOCOLATE

4 BEVERAGE

4A TEA

4B COFFEE

JHB 25-FEB-75 21:51 25477

*THE TNLS COURSE OUTLINE
INTRODUCTION TO STRUCTURE AND VIEWING

SRI-ARC

26 FEB 75

Augmentation Research Center

STANFORD RESEARCH INSTITUTE
MENLO PARK, CALIFORNIA 94025

Comments:

This is the outline for the second TNLS course which introduces NLS structure (hierarchical) and special tools for viewing structured information ("view specs"). It is derived from the TNLS Courses master file which contains 5 graduated course levels (by filtering on statement name keys which are then turned off for printing). This distribution is to KWAC and ARC; printed copies are available from Trainers or by request to myself or Feedback.

JHB 25-FEB-75 21:51 25477

TNLS COURSE OUTLINE #2: INTRODUCTION TO STRUCTURE AND VIEWING

(J25477) 25-FEB-75 21:51;;;; Title: Author(s): James H. Bair/JHB;
Distribution: /UD([ACTION]) KWAC([INFO-ONLY]) SRI-ARC([
INFO-ONLY]) ; Sub-Collections: SRI-ARC UD KWAC; Clerk: JHB;
Origin: < BAIR, SECONDCOURSE.NLS;8, >, 25-FEB-75 21:27 JHB ;;;;####;

JHB 25-FEB-75 22:21 25478

THE BASIC TNLS-8 COURSE OUTLINE

This is a newly revised version of the first course in NLS, designed by ARC to be minimally complex and yet contain the commands necessary to enable a user to enter, edit, and 'mail' text. Course completion time ranges from 1/2 to 2 days. Printed copies are available from Trainers, Feedback, or JHB.

JHB 25-FEB-75 22:21 25478

THE BASIC TNLS-8 COURSE OUTLINE

TNLS SYLABUS

THE BASIC TNLS-8 COURSE OUTLINE

INTRODUCTION TO NLS

NLS = oN Line System

TNLS = Typewriter Version

CAPABILITIES OF SYSTEM:

- Composing
- Editing
- Studying
  - Structuring
  - Browsing - viewing
- Printing
- Publishing
- Communicating -

  sending and receiving mail, messages, documents; teleconferencing; etc.
- Storing and retrieving -

  record keeping, library services, data bases, searching, etc.
- Calculating

SOME NOTES

**This is designed for use when terminals are available for all participants to use/view easily. It is intended to be the first course a person receives on NLS. The commands are shown as they would appear with partial prompting.

COURSE ORGANIZATION

The course is organized by concepts of what a user can do with

TNLS at this level. The seven concepts [listed below] are ordered as one would need them to use the system. Under each concept are the exact commands that instruct the computer to perform the function that goes with the concept. There is a command summary at the end of the course outline that lists the same commands alphabetically for easy reference.

The commands which are included in this first course have been selected to let a user write, edit, store, and communicate typewritten information [text]. Those commands numbered with a (2) are to be covered on the second day of the course.

TNLS CONCEPTS: [Things you can do as covered in this course:]

1. FILES FOR STORAGE

2. TYPING IN INFORMATION

3. TYPING OUT INFORMATION

4. EDITING

5. COMMUNICATING

6. ADDRESSING

7. TROUBLE SHOOTING AND HELP

DEFINITIONS FOR THE COURSE OUTLINE

COMMANDS: You typing some characters to tell the computer what to do.

<> means strike the SPACE bar.

Upper case characters in a TNLS command phrase are what you type.

Words that are all in uppercase represent something appropriate that you type.

TYPEIN = a string of characters from the keyboard, ending with an OK.

WHERE YOU ARE: Where the computer thinks you are pointing to

[to some character in some file]; you tell it by specifying an address; this is where your command will be done.

CTRL = hold down the control [CTRL] key while typing the specified character.

CR = strike the carriage return key

BASE C: = the TNLS ready signal. It means that you can type in an editing or file-handling command [like home base...].

SEND C: = the Sendmail subsystem ready signal. It means that you can type in a Sendmail command.

GETTING TO NLS

THE TERMINAL AND USE [if dialing in]

If dialing in, turn on, dial TIP number, place receiver in cradle after hearing tone, and make sure terminal is online.

NETWORK [if used]

Net login [-- see "Network Login Procedure" for differences]

Brief Summary for dial in users: [Steps are numbered]

[I] Type e [to get the Network's attention]

[II] Type LOGIN CR then give your name and password when asked.

[III] Type QUIT CR [after logging in to Net]

[IV] Type @ O <> 43 CR [to open a connection to Office-1,Host 43]

You now should be connected to TENEX

TENEX Executive

Login procedure:

[V] type your USERNAME <> PASSWORD <> CR [the last SPACE fills in account number automatically; you're then ready to call NLS]

(2) Group allocation quota:
GROUPSTAT CR [to see who else is using your slot]

Calling NLS:

[VI] Type NLS CR

(2) To get back to TENEX :

type CTRL C [under most conditions you may continue in NLS by
typing CON CR]

To leave the system, logout in NLS:

BASE C: <> Logout CR

BASIC TNLS:

Abort Commands = CTRL x [kills the command before the final CR!]

OK: means you type a carriage return.

1. FILES

The origin statement [no number, contains the file name - don't edit]

The initials file -- automatically your first file, named after your initials [also your mail box]

New files

BASE C: <>CReate C: File T: FILENAME CR
(DIRECTORY, FILENAME,NLS;1,)

[any short "word", like a folder label]

(2) To see a list of all your files: Show Directory:

BASE C:<>SHow C: Directory (of) OK: CR OK: CR

(2) To work in another file:

BASE C: Load C: File T: FILENAME CR

2. TYPING IN INFORMATION

Insert statement [ADDRESS = statement number]

BASE C: Insert C: Statement (to follow) A: ADDRESS CR L: CR T: TYPEIN CR

[TYpEIN means you type in whatever you want in the file]

(2) Continue to insert = CTRL e [instead of CR for final OK:]

[puts you in the "Enter mode" -- you type CR to end each statement, when finished type a CTRL x after the L:]

backspace character = CTRL a
backspace word = CTRL w

(2)Insert Text at the end of a statement

(2)BASE C: Insert C: Text (to follow) A: +e CR T: TYPEIN CR

[+e means the end of the statement]

3, TYPING OUT INFORMATION *To stop printing type a CTRL o

[takes some time to get through!!]

Printing the file:

BASE C: Print C: File OK: CR

Print Statement:

BASE C: Print C: Statement at A: ADDRESS CR V: CR

Print the rest of the file:

BASE C: Print C: Rest OK: CR

(2) Easy Print:

BASE C: \ [slash prints the statement where you are]

4. EDITING

To change information that has been typed in:

To change information within a statement:

Substitute Text in Statement [to correct most errors]:

BASE C: Substitute C: Text (in) C: Statement (at) A:
ADDRESS CR
(New TEXT) T: TYPEIN CR
(Old TEXT) T: TYPEIN CR Finished? Y/N: Y [for yes]
Substitutions made: NUMBER

[replaces the old text with the new text every time it finds it in the statement.]

To change whole statements

Delete Statement

BASE C: Delete C: Statement at A: ADDRESS CR OK: CR

(2) Move Statement:

BASE C: Move C: Statement (from) A: ADDRESS CR (to follow) A: ADDRESS CR L: CR

(2) Copy Statement:

BASE C: Copy C: Statement (from) A: ADDRESS CR (to follow) A: ADDRESS CR L: CR

Delete File

BASE C: Delete C: File T: FILENAME CR OK: CR

[Careful, this removes the file. You can Undelete a File before Logout.]

Update: [do periodically for backup, not imperative]

BASE C: Update C: File OK/C: CR
(FILEOWNER, FILENAME.NLS;2,)

(2) formatting technique:

To type in a carriage return, type CTRL v CR

5. COMMUNICATING

(2) SENDMAIL SYSTEM:

(2) Submit message using idents [or ,lastname] and Interrogate [where the system prompts you]:

BASE C: Goto (subsystem) C: Sendmail OK: CR

SEND C: Interrogate OK: CR

(distribute for action to:) T: CHI,FEEDBACK,SGR CR

(distribute for information-only to:) T: JCN CR

(title:) T: Your Example CR

(type of source:) C: Message T: TYPEIN CR

(show status?) Y/N: Y [the status typed by the system:]

TITLE: Your Example
AUTHOR(S): JHB
DISTRIBUTE FOR ACTION TO: chi feedback sgr
DISTRIBUTE FOR INFO-ONLY TO: jcn
MESSAGE: [Typein of message will be repeated.]

(send the mail now?) Y/N: Y [for yes]

Completed

SEND C: Quit OK:/C: CR

(2) to send a statement that's already stored online, use the following instead of Message [See the Command Summary for example]

Statement

(2) to send a file use the following instead of Message [See the Command Summary for example]

File

(2) The mail box is in your initials file under a statement called "(Journal)"

(2) Print Journal

BASE C: Print C: Journal (mail) OK: CR

(2) Empty mail box: substitute (read) for (journal)...

TENEX ways: SNDMSG and LINK

To send a Message [Tenex]

BASE C: Goto (subsystem) C: Tenex OK: CR
[You cannot log out from this Tenex, must
QUIT]:

```
SND CR                  [The system will prompt you:]
(to:) TYPEIN CR         [lastnames separated by comma]
(cc:) TYPEIN CR         [lastnames separated by comma]
(subject:) TYPEIN CR [subject of your message]
(message:) TYPEIN
CRTL Z CR     [to terminate and send the message]

QUIT CR   [To go back to where you were in TNLS]
```

Linking [in Tenex] [first ask where the person is:]

```
CTRL C
WHERE <> USERNAME CR  [do not link when user is in
                       SNDMSG, OUTPRC, NOUTPRC, or XLIST]

LINK <> USERNAME CR  [precede comment with ;
                      end with CR
                      repeat every 3 lines]
CON CR  [returns you to NLS]
```

6. ADDRESSING

Where the control marker is -- type a / [see the questionmark key on some terminals]. This will show an arrow pointing to the character that you are at: ==>x

Addressing within files [to move the control marker]

Jump to new address [to change where your control marker is]

BASE C: Jump (to) C: Address A: ADDRESS CR

OR you can type in an address anytime you see the prompt A: An address can be:

statement number [NOTE: TNLs automatically renumbers statements when appropriate]

1 ,t ("tail") for the last statement in the file -- begins looking from statement number 1 [the one is necessary to avoid confusion]

(2) "TYPEIN" To find some word or text

BASE C: Jump (to) C: Address A: "TYPEIN" CR

[enclose in quotes whatever word or series of characters you want to find -- takes you to the first occurrence of it that occurs to the right and down in your file]

(2) statement number and "TYPEIN" To find some word or TYPEIN starting in a particular statement

BASE C: Jump (to) C: Address A: STATEMENT NUMBER "TYPEIN" CR

Addressing across files and directories

TO address another file:

BASE C: Jump (to) C: Address A: FILENAME,CR

TO address another person's file:

BASE C: Jump (to) C: Address A: DIRECTORY,FILENAME, CR

TO address a particular statement in another person's file:

BASE C: Jump (to) C: Address A: DIRECTORY,FILENAME,STATEMENT NUMBER CR

7. TROUBLE SHOOTING AND HELP

Immediate:

Type ? for a list of all the possible command words.

Type CTRL Q for help concerning what you are doing or type H for the Help command [after Help you can type any NLS word you wish to know about]. CTRL x gets you out of Help and back to where you were.

call SRI-ARC, [415 326-6200, ext.3630]
or Link to Bair, Roetter, Beck or Feedback at Office-1

(2) FEEDBACK mechanism: [any complaints, questions, problems, suggestions]

SNDMSG or Sendmail to FEEDBACK
response should be no later than 1 working day.

(2) Status commands

CTRL t [note words RUNNING or WAIT -- system should be either running or waiting for you]

(2) Remedies

CTRL c, reset, NLS

BASE C: Update C: File OK/C: Compact OK CR:

PRACTICE

In addition to trying each command, there is a Primer designed to be used for practice.

Note: The next course is called, "Introduction to Structure and Viewing", and explains many of the things skipped in this course.

TNLS COMMAND SUMMARY FOR THIS COURSE: [alphabetical] You type that part of the command that appears in capitals, CR = Carriage Return,

BACKSPACE CHARACTER = CTRL a ; BACKSPACE WORD = CTRL w

CARRIAGE RETURN [formatting] = CTRL v CR

CONTINUE TO INSERT = CTRL e instead of first CR [CTRL x to stop inserting]

COPY STATEMENT

Copy C: Statement (from) A: ADDRESS CR (to follow) A: ADDRESS CR L: CR

CREATE FILE

<>CReate C: File T: FILENAME CR

DELETE STATEMENT:

Delete C: Statement (at) A: ADDRESS CR OK: CR

DELETE FILE:

Delete C: File T: FILENAME CR OK: CR

INSERT STATEMENT:

Insert C: Statement (to follow) A: ADDRESS T: TYPEIN CR

INSERT TEXT at the end of a statement

Insert C: Text to follow A: +e CR T: TYPEIN CR

JUMP TO ADDRESS:

Jump (to) C: Address A: ADDRESS CR

Jump (to) C: Address A: "TYPEIN" CR

Jump (to) C: Address A: statement number "TYPEIN" CR

Jump (to) C: Address A: FILENAME, CR

Jump (to) C: Address A: DIRECTORY,FILENAME, CR

Jump (to) C: Address A: DIRECTORY,FILENAME,STATEMENT NUMBER CR

LOAD FILE:

Load C: File T: FILENAME CR

MOVE STATEMENT:

Move C: statement (from) A: ADDRESS CR (to follow) A: ADDRESS
CR L: CR

PRINT STATEMENT:

print C: Statement at A: ADDRESS CR V: CR

Easy print = \

PRINT REST:

Print C: Rest OK: CR

Stop printing = CTRL o

PRINT FILE:

Print C: File OK: CR

SHOW DIRECTORY:

<>SHow C: Directory (of) OK: CR OK CR

SUBSTITUTE TEXT IN STATEMENT:

Substitute C: Text in C: Statement at A: ADDRESS CR
(New TEXT) T: TYPEIN CR
(Old TEXT) T: TYPEIN CR Finished? Y/N: OK: CR
Substitutions made: NUMBER

TAIL = ,t for ADDRESS

[the last statement in the file -- when single level]

UPDATE A FILE:

Update C: File OK/C: CR

SENDMAIL SYSTEM:

Submit Message or Statement or File, idents [or ,lastname], and
Interrogate:

Goto (subsystem) C: Sendmail OK: CR

SEND C: Interrogate OK: CR

(distribute for action to:) T: CHI,FEED,JCN CR

(distribute for information-only to:) T: RWW CR

(title:)T: Your Example CR

(type of source:) C: Message T: TYPEIN CR

OR,,type of source:) C: STATEMENT A: ADDRESS CR

OR,,type of source:) C: File T: FILENAME, CR

(show status?) Y/N: Y

TITLE: Example

AUTHOR(S): JHB

DISTRIBUTE FOR ACTION TO: chi feed jcn

DISTRIBUTE FOR INFO-ONLY TO: rww

MESSAGE: Typein of message.

(Send the mail now?) Y/N: Y

Completed

Quit OK:/C: CR

(2) Print Journal

Print C: Journal (mail) OK: CR

(2) Empty mail box: substitute (read) for (journal)...

JHB 25-FEB-75 22:21 25478

BASIC TNLS-8 COURSE

SRI-ARC

26 FEB 75

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MENLO PARK, CALIFORNIA 94025

JHB 25-FEB-75 22:21 25478

This is a newly revised version of the first course in NLS, designed by ARC to be minimally complex and yet contain the commands necessary to enable a user to enter, edit, and "mail" text. Course completion time ranges from 1/2 to 2 days. Printed copies are available from Trainers, Feedback, or JHB.

THE BASIC TNLS-8 COURSE OUTLINE

(J25478) 25-FEB-75 22:21;;;; Title: Author(s): James H. Bair/JHB;
Distribution: /UD([ACTION]) KWAC([INFO-ONLY]) ARC-APP([
INFO-ONLY]) ; Sub-Collections: SRI-ARC UD KWAC ARC-APP; Clerk: JHB;
Origin: < BAIR, BASICCOURSE.NLS;15, >, 25-FEB-75 20:28 JHB ;;;;####;

JI 26-FEB-75 04:55 25479

.PlexNum=yxz(LEVEL);

Doug, 1

I created a test file, a copy of which is appended under statement 2; 2a represents statement 0 and 2b, branch 1. The object was to get Output Processor to produce a file with plex numbers equal to statement contents. As you can see, I failed at the 6th, 7th, and 8th level. Am I misunderstanding the directive .PlexNum= ; - it reads as though you ought to be able to give it in a contiguous descending fashion and have it work. 1a

In any case, having failed in the above, and preferring to give directives that apply to an entire file [to easily set-up standard file formats], I wondered if maybe commands like .PlexNum= ; could be extended to include another argument, LEVEL. That way, it would simplify setting up standard file formats; i. e. .PlexNum=abcd; where a,b, and c would be like they now are and d could specify which level the directive were to apply to throughout the file. 1b

In any case, thought the thought worth sharing.....Jean 1c

Test File 2

< HELP, TEST-REM.NLS;2, >, 25-FEB-75 17:18 JI ;;;; 2a

Test File for Directives

<2,1,1>: <1>: 2a1

<2,1,1,1>: <1,1>: 2a1a

2a1a1 <1,1,1>: 2a1a1

2a1a1a <1,1,1,1>: 2a1a1a

(a) (a) 2a1a1a1

2a1a1a1a (1) 2a1a1a1a

2a1a1a1a1 1: 2a1a1a1a1

2a1a1a1a1a 2: 2a1a1a1a1a

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COBOL PROGRAM

Betty Finney called and said you wanted this file journalized. She wasn't certain about the distribution so I have sent it to you and you can forward to the proper people.

COBOL PROGRAM

```
IDENTIFICATION DIVISION.                                                    1
   PROGRAM-ID. 'GALLEY'.                                                    1a
AUTHOR. D. WEEKS.                                                           2
ENVIRONMENT DIVISION.                                                       3
CONFIGURATION SECTION.                                                      4
SOURCE-COMPUTER. IBM-360-I50.                                               5
OBJECT-COMPUTER. IBM-360-I50.                                               6
INPUT-OUTPUT SECTION.                                                       7
FILE-CONTROL.                                                               8
   SELECT CHNGE ASSIGN TO UT-2400-S-SYS010.                                 8a
   SELECT MESSAGE ASSIGN TO UR-1403-S-SYS007.                               8b
   SELECT LISTING ASSIGN TO UR-1403-S-SYS006.                               8c
   SELECT MTSTP ASSIGN TO UT-2400-S-SYS009.                                 8d
DATA DIVISION.                                                              9
FILE SECTION.                                                               10
FD  CHNGE                                                                   11
   DATA RECORD IS FORMF                                                     11a
   RECORDING MODE IS F                                                      11b
   LABEL RECORDS ARE STANDARD                                               11c
   BLOCK CONTAINS 0 CHARACTERS                                              11d
   RECORD CONTAINS 0 CHARACTERS.                                            11e
01  FORMF  PICTURE X(132).                                                 12
FD  LISTING                                                                 13
   DATA RECORD IS TXTOT                                                     13a
   RECORD CONTAINS 133 CHARACTERS LABEL RECORDS ARE OMITTED.                13b
```

COBOL PROGRAM

```
01  TXTOT PICTURE X(133).                                          14
FD  MESSAGE                                                        15
    DATA RECORD IS MSG                                             15a
    RECORD CONTAINS 133 CHARACTERS                                 15b
    LABEL RECORDS ARE OMITTED.                                     15c
01  MSG PICTURE X(133).                                           16
FD  MTSTP                                                          17
    DATA RECORD IS FORMU                                           17a
    RECORDING MODE IS F                                            17b
    LABEL RECORDS ARE OMITTED                                      17c
    RECORD CONTAINS 200 CHARACTERS.                                17d
01  FORMU PICTURE X(200).                                         18
WORKING-STORAGE SECTION.                                           19
77  PGE-NUM-C PIC S9(5) COMP.                                     20
77  NUCH PIC S9(8) COMP SYNC.                                     21
77  ERR-SWITCH PICTURE 9 COMPUTATIONAL.                           22
77  ERR-SWITCH-2 PIC 9 COMP.                                      23
77  INPC PIC S9(4) COMP SYNC.                                     24
77  TRCT PIC S9(4) COMP SYNC.                                     25
77  TRCT1 PIC S9(4) COMP SYNC.                                    26
77  INDX PIC S9(4) COMP SYNC.                                     27
77  TRCS PIC S9(4) COMP SYNC.                                     28
77  NUM PIC S9(4) COMP SYNC.                                      29
77  NUM-CHAR PIC S9(4) COMP SYNC.                                 30
77  TIN PIC S9(4) COMP SYNC.                                      31
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77  LIN-NUM-C PIC S9(4) COMP SYNC.                                  32
77  VLCT PIC S9(4) COMP SYNC.                                       33
77  NIRC PIC S9(4) COMP SYNC.                                       34
77  NORC PIC S9(4) COMP SYNC.                                       35
77  NMPG PIC S9(4) COMP SYNC.                                       36
77  REFORM      PICTURE 99999.                                      37
77  REFRM2      PICTURE 9999999.                                    38
77  USEDATE  PIC 9 COMP.                                           39
77  NP  PICTURE 9 COMPUTATIONAL.                                   40
77  TRNB PICTURE 999 COMPUTATIONAL.                                41
77  TRNL REDEFINES TRNB PICTURE XX JUSTIFIED RIGHT.                 42
77  INDATE PIC X.                                                  43
77  REFCODE PIC X VALUE IS '_'.                                    44
77  BACKSPAC PIC X VALUE IS '?'.                                   45
77  CARRET PIC X VALUE IS '?'.                                     46
77  PREC-COD PIC X VALUE IS '?'.                                   47
77  TAB-CHAR PIC X VALUE IS '?'.                                   48
77  BLNK PIC X VALUE IS ' '.                                       49
77  HEX00 PIC X VALUE IS '?'.                                      50
77  SWITCH-CODE PIC X VALUE IS '?'.                                51
77  STOP-CODE PIC X VALUE IS '?'.                                  52
77  FEED-CODE PIC X VALUE IS '?'.                                  53
77  STOP-TRANS PIC X VALUE IS '?'.                                 54
01  ITXT.                                                          55
    02  INDATA OCCURS 200 TIMES PICTURE X.                         55a
```

COBOL PROGRAM

```
01  ER.                                                          56
    02  CC PICTURE X.                                           56a
    02  LYN3.                                                   56b
        03  F1 PICTURE X.                                       56b1
        03  NUMR1 PICTURE X(2).                                 56b2
        03  F2 PICTURE X(52).                                   56b3
01  ER1.                                                         57
    02  CAR      PICTURE X.                                     57a
    02  CDNO     PICTURE -ZZZZZZZ9.                             57b
    02  FILLER   PICTURE XX.                                    57c
    02  DUMP     PICTURE X(80).                                 57d
    02  EROFIL   PICTURE X(41).                                 57e
01  ER2  REDEFINES ER1.                                         58
    02  CHAR     PICTURE X.                                     58a
    02  LYNE.                                                   58b
        03  LIN  PIC X(123).                                    58b1
        03  ERR.                                                58b2
            04  EC1 PIC X.                                      58b2a
            04  EC2 PIC XX.                                     58b2b
            04  EC3 PIC X.                                      58b2c
            04  EC4 PIC XXXXX.                                  58b2d
    02  LYN1 REDEFINES LYNE.                                    58c
        03  LYN2 OCCURS 132 TIMES PICTURE X.                    58c1
01  PBCODE.                                                     59
    02  NMBR  OCCURS 2 TIMES pIC X.                             59a
```

COBOL PROGRAM

```
01  PBCDE REDEFINES PBCODE,                                          60
    02 NUMR  PIC XX,                                                 60a
01  VALID,                                                           61
    02  CDES PIC X(42) VALUE IS
    '242223272526070802200304050609302129283233',                    61a
    02  CODS  REDEFINES CDES,                                        61b
       03  COES OCCURS 21 TIMES PIC XX,                             61b1
01  OUTBUF,                                                         62
    02  BUFFER OCCURS 132 TIMES PICTURE X,                          62a
01  BUFF REDEFINES OUTBUF,                                          63
    02  TXT PICTURE X(123),                                         63a
    02  PGE-NUM PICTURE X(5),                                       63b
    02  LIN-NUM PICTURE X(4),                                       63c
01  BUFF2 REDEFINES OUTBUF,                                         64
    02  F4 PICTURE X(2),                                            64a
    02  LIN-NUM-2 PICTURE X(4),                                     64b
    02  PGE-NUM-2 PIC X(5),                                         64c
    02  LIN-NUM-3 PIC X(4),                                         64d
    02  F5 PIC X(117),                                              64e
01  NAMCHK,                                                         65
    02  CHECKER OCCURS 7 TIMES PICTURE X,                           65a
PROCEDURE DIVISION,                                                 66
    OPEN INPUT MISTP, OUTPUT LISTING, CHNGE, MESSAGE,               66a
    MOVE ALL SPACES TO ITXT,                                        66b
    MOVE ITXT TO OUTBUF, ER1, ER, NAMCHK,                           66c
```

```
    MOVE ZERO TO CAR, NP, INPC, TRCT, TRCS, TRNB, TIN,                    66d
    MOVE ZERO TO NMBR (1), NMBR (2), NIRC, NORC, NUCH, NMPG,              66e
    MOVE ZERO TO USEDATE, ERR-SWITCH, ERR-SWITCH-2, RETURN-CODE,          66f
    MOVE '*** PREPROCESSOR FOR CHARACTER CONVERSION ***' TO               66g
       DUMP WRITE TXTOT FROM ER1 AFTER POSITIONING CAR,                   66g1
       WRITE MSG FROM ER1 AFTER POSITIONING CAR,                          66g2
    MOVE SPACES TO ER1,                                                   66h
    READ MTSTP INTO ITXT  AT END GO TO KLOSER,                            66i
    ADD 1 TO NIRC,                                                        66j
    PERFORM TRNSLAT THRU TREND VARYING TRCT1 FROM 1 BY 1 UNTIL            66k
    TRCT1 IS > 200 OR TIN IS NOT EQUAL TO 0, MOVE 0 TO TRCT1,             66l
STRT,                                                                     67
    PERFORM INPOS, IF INDATA (INPC) NOT = PREC-COD GO TO STRT,            67a
    PERFORM INPOS, IF INDATA (INPC) = '2' GO TO CREATE,                   67b
    IF INDATA (INPC) = 'S' OR '?' GO TO SEXTION,                          67c
    IF INDATA (INPC) = 'N' OR '?' GO TO NEWSECT,                          67d
    MOVE '*** INVALID STARTING LINE ***' TO LYN3, PERFORM                 67e
    WRT-ERR, PERFORM FND-CAR-RET THRU CAR-RET-END, GO TO STRT,            67f
CREATE,                                                                   68
    MOVE 0 TO NP, MOVE 10 TO PGE-NUM-C,                                   68a
    MOVE PGE-NUM-C TO PGE-NUM, MOVE 10 TO LIN-NUM-C,                      68b
    MOVE LIN-NUM-C TO LIN-NUM, PERFORM WRT1, GO TO TRY-2,                 68c
TRY-AGAIN,                                                                69
    PERFORM INPOS,                                                        69a
    IF INDATA (INPC) NOT = PREC-COD PERFORM OTPOS THRU OTEND              69b
```

COBOL PROGRAM

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   GO TO TRY-AGAIN. PERFORM INPOS.                                    69c
TRY-1.                                                                70
   IF INDATA (INPC) = 'S' OR '?' GO TO SEXTION.                       70a
   IF INDATA (INPC) = 'N' OR '?' GO TO NEWSECT.                       70b
TRY-2.                                                                71
   PERFORM CHK-CODE THRU PREC-END.                                    71a
   IF (VLCT = 7 OR 5 OR 19) AND (NP = 0) MOVE 0 TO CC                 71b
   PERFORM CHK-SEV THRU CHK-SEV-END.                                  71c
   GO TO TRY-AGAIN.                                                   71d
OTPOS.                                                                72
   IF INDATA (INPC) NOT = CARRET GO TO OTPOS1.                        72a
   IF TRCT = 0 GO TO OTEND. MOVE HEX00 TO INDATA (INPC).              72b
   IF TRCT NOT > 122 ADD 1 TO TRCT MOVE INDATA (INPC) TO              72c
   BUFFER (TRCT). PERFORM WRT-TAPE. COMPUTE LIN-NUM-C =               72d
   LIN-NUM-C + 10. MOVE LIN-NUM-C TO LIN-NUM.                         72e
   GO TO OTEND.                                                       72f
OTPOS1.                                                               73
   IF TRCT > 122 MOVE '***>123***' TO LYN3                            73a
   PERFORM WRT-ERR PERFORM WRT-TAPE                                   73b
   PERFORM FND-CAR-RET THRU CAR-RET-END COMPUTE                       73c
   LIN-NUM-C = LIN-NUM-C + 10 MOVE LIN-NUM-C TO LIN-NUM               73d
   GO TO OTEND. ADD 1 TO TRCT.                                        73e
   MOVE INDATA (INPC) TO BUFFER (TRCT), LYN2 (TRCT).                  73f
OTEND. EXIT.                                                          74
CHK-CODE.                                                             75
```

```
   ADD 1 TO TRCT, MOVE PREC-COD TO BUFFER (TRCT), LYN2 (TRCT).          75a
   PERFORM OTPOS THRU OTEND.                                            75b
   MOVE INDATA (INPC) TO NMBR (1).                                      75c
   PERFORM INPOS. PERFORM OTPOS THRU OTEND.                             75d
   MOVE INDATA (INPC) TO NMBR (2). MOVE ZERO TO VLCT.                   75e
CHK1.                                                                   76
   ADD 1 TO VLCT. IF VLCT IS > 21 GO TO CKER.                           76a
   IF CDES (VLCT) = NUMR, GO TO PREC-END.                               76b
   GO TO CHK1.                                                          76c
CKER.                                                                   77
   MOVE '**********' TO LYN3. MOVE NUMR TO NUMR1.                       77a
   PERFORM WRT-ERR. MOVE '7' TO BUFFER (TRCT).                          77b
   SUBTRACT 1 FROM TRCT. MOVE '7' TO BUFFER (TRCT).                     77c
   ADD 1 TO TRCT.                                                       77d
PREC-END.  EXIT.                                                        78
CHK-SEV.                                                                79
   COMPUTE PGE-NUM-C = PGE-NUM-C + 10. MOVE PGE-NUM-C                   79a
   TO PGE-NUM. MOVE 10 TO LIN-NUM-C.                                    79b
   MOVE LIN-NUM-C TO LIN-NUM. PERFORM WRT1.                             79c
   ADD 1 TO NMPG.                                                       79d
CHK-SEV-END.  EXIT.                                                     80
NEWSECT.                                                                81
   MOVE 1 TO INDX. MOVE 1 TO NP.                                        81a
   PERFORM MOVE-NAM 7 TIMES. IF NAMCHK IS NOT = TO                      81b
   'NEWSECT' AND NAMCHK IS NOT = TO 'N??????' AND NAMCHK IS             81c
```

```
    NOT = TO '???????' PERFORM CHK-DIGITS THRU                          81d
    CHK-END GO TO NEW-PGE-ERR.                                          81e
    PERFORM GET-PGE-NUM THRU GET-pGE-END. IF                            81f
    ERR-SWITCH = 1 MOVE 0 TO ERR-SWITCH GO TO CHK-AGAIN.                81g
CONT-NEW-PAG.                                                           82
    MOVE 0 TO CC. MOVE PGE-NUM TO LYN3. WRITE TXTOT                     82a
    FROM ER AFTER POSITIONING CC.                                       82b
    MOVE 10 TO LIN-NUM-C. MOVE LIN-NUM-C TO LIN-NUM.                    82c
NPGE1.                                                                  83
    IF INDATA (INPC) = PREC-COD PERFORM INPOS GO TO TRY-1.              83a
    PERFORM INPOS. GO TO NPGE1.                                         83b
NEW-PGE-ERR.                                                            84
    IF ERR-SWITCH = 0 MOVE '*** NEWPAGE ASSUMED ***'                    84a
    TO LYN3 PERFORM WRT-ERR GO TO CONT-NEW-PAG.                         84b
    MOVE 0 TO ERR-SWITCH. GO TO CHK-AGAIN.                              84c
MOVE-NAM.                                                               85
    MOVE INDATA (INPC) TO CHECKER (INDX). PERFORM INPOS.                85a
    COMPUTE INDX = INDX + 1.                                            85b
GET-PGE-NUM.                                                            86
    PERFORM SKP-BLNKS THRU SKP-END. IF INDATA (INPC) = CARRET           86a
    MOVE 1 TO ERR-SWITCH GO TO GET-PGE-END. MOVE SPACES TO              86b
    NAMCHK. MOVE 1 TO INDX. PERFORM MOV-DIG THRU MOV-DIG-END.           86c
    IF ERR-SWITCH = 1 GO TO GET-PGE-END. MOVE 1 TO NUM.                 86d
    PERFORM CHK-CHAR THRU CHK-CHAR-END. IF                              86e
    ERR-SWITCH = 1 GO TO GET-PGE-END.                                   86f
```

```
   PERFORM MOV-NUM THRU MOV-NUM-END.                                    86g
GET-PGE-END. EXIT.                                                      87
MOV-NUM.                                                                88
   MOVE ZEROES TO PGE-NUM. MOVE NUM TO NUM-CHAR.                        88a
   MOVE 1 TO INDX. COMPUTE NUM = 129 - NUM-CHAR. PERFORM                88b
   MOV-NUM-2 NUM-CHAR TIMES.                                            88c
MOV-NUM-END. EXIT.                                                      89
MOV-NUM-2.                                                              90
   MOVE CHECKER (INDX) TO BUFFER (NUM).                                 90a
   COMPUTE INDX = INDX + 1. COMPUTE NUM = NUM + 1.                      90b
MOV-DIG.                                                                91
   MOVE INDATA (INPC) TO CHECKER (INDX). IF INDX > 5                    91a
   MOVE 1 TO ERR-SWITCH GO TO MOV-DIG-END.                              91b
   PERFORM INPOS. COMPUTE INDX = INDX + 1. IF                           91c
   INDATA (INPC) = CARRET OR BLNK COMPUTE INDX = INDX - 1               91d
   GO TO MOV-DIG-END. GO TO MOV-DIG.                                    91e
MOV-DIG-END. EXIT.                                                      92
MOV-CHAR.                                                               93
   MOVE INDATA (INPC) TO BUFFER (INDX). PERFORM INPOS.                  93a
   COMPUTE INDX = INDX + 1.                                             93b
CHK-DIGITS.                                                             94
   IF INDATA (INPC) NOT = BLNK MOVE 1 TO ERR-SWITCH                     94a
   GO TO CHK-END.                                                       94b
   PERFORM GET-PGE-NUM THRU GET-PGE-END.                                94c
CHK-END. EXIT.                                                          95
```

```
SKP-BLNKS.                                                              96
   PERFORM INPOS. IF INDATA (INPC) NOT                                  96a
   = BLNK GO TO SKP-END. GO TO SKP-BLNKS.                               96b
SKP-END.  EXIT.                                                         97
BLK-BCK.                                                                98
   MOVE 123 TO INDX.                                                    98a
BEG.                                                                    99
   IF BUFFER (INDX) NOT = BLNK GO TO LATT.                              99a
   COMPUTE INDX = INDX - 1. GO TO BEG.                                  99b
LATT.                                                                   100
   IF INDX = 123 GO TO BLK-END. COMPUTE INDX = INDX + 1.                100a
   MOVE HEX00 TO BUFFER (INDX).                                         100b
BLK-END.                                                                101
CHK-CHAR.                                                               102
   IF CHECKER (NUM) < '0' OR CHECKER (NUM) > '9'                        102a
   MOVE 1 TO ERR-SWITCH GO TO CHK-CHAR-END.                             102b
   COMPUTE NUM = NUM + 1. IF NUM IS NOT GREATER THAN INDX               102c
   GO TO CHK-CHAR. COMPUTE NUM = NUM - 1.                               102d
CHK-CHAR-END.                                                           103
WRT-TAPE.                                                               104
   MOVE LIN-NUM TO EC4.                                                 104a
   WRITE FORMF FROM OUTBUF. WRITE TXTOT FROM ER1 AFTER                  104b
   POSITIONING CAR. MOVE SPACES TO ER2.                                 104c
   MOVE SPACES TO TXT. MOVE 0 TO TRCT.                                  104d
   ADD 1 TO NORC.                                                       104e
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```
FND-CAR-RET.                                                          105
   IF INDATA (INPC) = CARRET GO TO CR1, PERFORM INPOS.                105a
   GO TO FND-CAR-RET.                                                 105b
CR1.                                                                  106
   PERFORM INPOS.                                                     106a
CAR-RET-END.  EXIT.                                                   107
MOV-LINE.                                                             108
   IF TRCT > 122 GO TO MOV-END.                                       108a
   IF INDATA (INPC) = CARRET PERFORM INPOS                            108b
   MOVE '*** UNEXPECTED CARRIAGE RETURN ***' TO LYN3                  108c
   PERFORM WRT-ERR GO TO NXT-LIN.                                     108d
   IF INDATA (INPC) NOT = TAB-CHAR ADD 1 TO TRCT                      108e
   MOVE INDATA (INPC) TO BUFFER (TRCT) PERFORM INPOS                  108f
   GO TO MOV-LINE. PERFORM INPOS.                                     108g
MOV-END.                                                              109
SEXTION.                                                              110
   MOVE 1 TO INDX. MOVE SPACES TO NAMCHK.                             110a
   PERFORM MOVE-NAM 7 TIMES. IF NAMCHK IS NOT = TO                    110b
   'SECTION' AND 'S??????' AND '???????'                              110c
   PERFORM CHK-DIGITS THRU CHK-END GO TO PGE-ERR.                     110d
   PERFORM GET-PGE-NUM THRU GET-PGE-END.                              110e
   IF ERR-SWITCH = 1 MOVE 0 TO ERR-SWITCH GO TO CHK-AGAIN.            110f
   ADD 1 TO NMPG.                                                     110g
CONT-PAG.                                                             111
   MOVE 0 TO CC. MOVE PGE-NUM TO LYN3.                                111a
```

```
    WRITE TXTOT FROM ER AFTER POSITIONING CC.                          111b
    PERFORM FND-CAR-RET THRU CAR-RET-END. GO TO NXT-LIN.               111c
MOV-TXT.                                                               112
    MOVE SPACES TO TXT.                                                112a
    MOVE 0 TO TRCT. PERFORM MOV-LINE THRU MOV-END.                     112b
MOV-TXT-1.                                                             113
    MOVE 129 TO INDX. PERFORM MOV-CHAR 4 TIMES.                        113a
    MOVE SPACES TO NAMCHK. MOVE LIN-NUM TO NAMCHK.                     113b
    MOVE 1 TO NUM. MOVE 4 TO INDX.                                     113c
    PERFORM CHK-CHAR THRU CHK-CHAR-END. IF ERR-SWITCH = 1              113d
    MOVE 0 TO ERR-SWITCH PERFORM FND-CAR-RET THRU                      113e
    CAR-RET-END MOVE '*** INVALID LINE NUMBER ***'                     113f
    TO LYN3 PERFORM WRT-ERR GO TO NXT-LIN.                             113g
    MOVE TXT TO LYNE.                                                  113h
    IF BUFFER (1) NOT = PREC-COD GO TO VAL-PREC.                       113i
    IF BUFFER (2) = 'M' OR '?' GO TO CHK-MOV-SYN.                      113j
    IF (BUFFER (2) = 'D' OR '?') AND (BUFFER (3) NOT = BLNK)           113k
    GO TO CHK-DEL. IF BUFFER (2) = 'D' OR '?' GO TO VAL-PREC-1.        113l
VAL-PREC.                                                              114
    MOVE 0 TO TRCT. PERFORM PREC-COD-CHK THRU COD-CHK-END.             114a
    PERFORM BLK-BCK THRU BLK-END.                                      114b
VAL-PREC-1.                                                            115
    IF INDATA (INPC) NOT = CARRET MOVE                                 115a
    '*** LINE TOO LONG - TRUNCATED ***' TO LYN3                        115b
    PERFORM WRT-ERR PERFORM FND-CAR-RET THRU CAR-RET-END               115c
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```
   PERFORM WRT-TAPE ELSE PERFORM WRT-TAPE PERFORM INPOS.                115d
NXT-LIN.                                                                116
   MOVE INDATA (INPC) TO INDATE.                                        116a
   IF INDATE = CARRET PERFORM INPOS GO TO NXT-LIN.                      116b
   IF INDATE NOT = PREC-COD GO TO MOV-TXT.                              116c
   PERFORM INPOS.                                                       116d
   MOVE INDATA (INPC) TO INDATE.                                        116e
   IF INDATE = 'S' OR '?' GO TO SEXTION.                                116f
   IF INDATE = 'N' OR '?' GO TO NEWSECT.                                116g
   MOVE SPACES TO TXT.                                                  116h
   MOVE PREC-COD TO BUFFER (1). MOVE 1 TO TRCT.                         116i
   PERFORM MOV-LINE THRU MOV-END. GO TO MOV-TXT-1.                      116j
CHK-MOV-SYN.                                                            117
   MOVE SPACES TO NAMCHK. MOVE 1 TO NUM. MOVE 4 TO INDX.                117a
   MOVE LIN-NUM-2 TO NAMCHK PERFORM CHK-CHAR THRU CHK-CHAR-END.         117b
   IF ERR-SWITCH = 1 MOVE ERR-SWITCH TO ERR-SWITCH-2 MOVE 0 TO          117c
   ERR-SWITCH MOVE '*** INVALID ENDING MOVE LINE ***' TO LYN3           117d
   PERFORM WRT-ERR.                                                     117e
   MOVE SPACES TO NAMCHK. MOVE 1 TO NUM. MOVE 5 TO INDX.                117f
   MOVE PGE-NUM-2 TO NAMCHK PERFORM CHK-CHAR THRU CHK-CHAR-END.         117g
   IF ERR-SWITCH = 1 MOVE ERR-SWITCH TO ERR-SWITCH-2 MOVE 0 TO          117h
   ERR-SWITCH MOVE '*** INVALID FINAL PAGE NUMBER ***' TO LYN3          117i
   PERFORM WRT-ERR.                                                     117j
   MOVE SPACES TO NAMCHK. MOVE 1 TO NUM. MOVE 4 TO INDX.                117k
   MOVE LIN-NUM-3 TO NAMCHK PERFORM CHK-CHAR THRU CHK-CHAR-END.         117l
```

```
    IF ERR-SWITCH = 1 MOVE ERR-SWITCH TO ERR-SWITCH-2 MOVE 0 TO          117m
    ERR-SWITCH MOVE '*** INVALID MOVED TO LINE NUMBER ***' TO            117n
    LYN3 PERFORM WRT-ERR.                                                117o
    IF ERR-SWITCH-2 NOT = 0 MOVE 0 TO ERR-SWITCH-2                       117p
    MOVE SPACES TO TXT GO TO NXT-LIN.                                    117q
    IF RETURN-CODE NOT = 8 MOVE 4 TO RETURN-CODE.                        117r
    GO TO VAL-PREC-1.                                                    117s
PREC-COD-CHK.                                                            118
    IF TRCT > 122 GO TO COD-CHK-END. ADD 1 TO TRCT.                      118a
    IF BUFFER (TRCT) NOT = PREC-COD GO TO PREC-COD-CHK.                  118b
    ADD 1 TO TRCT. MOVE BUFFER (TRCT) TO NMBR (1).                       118c
    ADD 1 TO TRCT MOVE BUFFER (TRCT) TO NMBR (2) MOVE ZERO TO            118d
    VLCT. PERFORM CHK1 THRU PREC-END. GO TO PREC-COD-CHK.                118e
COD-CHK-END.  EXIT.                                                      119
CHK-DEL.                                                                 120
    MOVE SPACES TO NAMCHK. MOVE 1 TO NUM. MOVE 4 TO INDX.                120a
    MOVE LIN-NUM-2 TO NAMCHK. PERFORM CHK-CHAR THRU                      120b
    CHK-CHAR-END. IF ERR-SWITCH = 1 MOVE 0 TO ERR-SWITCH                 120c
    PERFORM FND-CAR-RET THRU CAR-RET-END                                 120d
    MOVE '*** INVALID ENDING LINE NUMBER ***' TO LYN3                    120e
    PERFORM WRT-ERR GO TO NXT-LIN. GO TO VAL-PREC-1.                     120f
PGE-ERR.                                                                 121
    IF ERR-SWITCH = 0 MOVE '*** SECTION ASSUMED ***' TO LYN3             121a
    PERFORM WRT-ERR GO TO CONT-PAG.                                      121b
    MOVE 0 TO ERR-SWITCH.                                                121c
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COBOL PROGRAM

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CHK-AGAIN.                                                              122
   MOVE '*** INVALID - LINE IGNORED ***' TO LYN3.                       122a
   PERFORM WRT-ERR. PERFORM FND-CAR-RET THRU CAR-RET-END.               122b
   IF INDATA (INPC) NOT = PREC-COD GO TO CHK-AGAIN.                     122c
   PERFORM INPOS.                                                       122d
   IF INDATA (INPC) = 'S' OR '?' GO TO SEXTION.                         122e
   IF INDATA (INPC) = 'N' OR '?' GO TO NEWSECT.                         122f
   GO TO CHK-AGAIN.                                                     122g
INPOS.                                                                  123
   ADD 1 TO INPC.                                                       123a
   IF INPC IS > TRCS                                                    123b
      MOVE 1 TO INPC.                                                   123b1
      MOVE 0 TO TRCS.                                                   123b2
      MOVE 0 TO TIN.                                                    123b3
      PERFORM REDIN THRU REDEND.                                        123b4
      PERFORM TRNSLAT THRU TREND VARYING TRCT1 FROM 1 BY 1 UNTIL TIN
      IS NOT = 0.                                                       123b5
WRT1.                                                                   124
   MOVE PGE-NUM TO LYN3. WRITE TXTOT FROM ER AFTER                      124a
   POSITIONING CC. MOVE SPACES TO ER.                                   124b
WRT-ERR.                                                                125
   WRITE TXTOT FROM ER AFTER POSITIONING CC.                            125a
   MOVE SPACES TO ER. MOVE 8 TO RETURN-CODE.                            125b
TRNSLAT.                                                                126
   ADD 1 TO TRCS.                                                       126a
```

```
    MOVE INDATA (TRCT1) TO INDATA (TRCS), INDATE.                    126b
    IF INDATE = BACKSPAC AND TRCS = 1 SUBTRACT 1 FROM TRCS           126c
    SUBTRACT 1 FROM TRCT GO TO TRIP.                                 126d
    IF INDATE = BACKSPAC SUBTRACT 2 FROM TRCS GO TO TRIP.            126e
    IF INDATE = SWITCH-CODE OR STOP-CODE OR FEED-CODE                126f
    OR STOP-TRANS                                                    126g
    SUBTRACT 1 FROM TRCS GO TO TRIP.                                 126h
    IF INDATE = REFCODE MOVE CARRET TO INDATA (TRCS) GO TO TRIP.     126i
TRIP.                                                                127
    IF INDATE NOT = HEX00 AND 200 > TRCT1 GO TO TREND.               127a
    MOVE TRCS TO TIN. IF INDATE = HEX00 SUBTRACT 1 FROM              127b
    TRCS. ADD TRCS TO NUCH.                                          127c
TREND. EXIT.                                                         128
REDIN.                                                               129
    READ MTSTP INTO ITXT  AT END GO TO KLOSER.                       129a
    ADD 1 TO NIRC.                                                   129b
REDEND. EXIT.                                                        130
KLOSER.                                                              131
    MOVE SPACES TO ER1.                                              131a
    MOVE NUCH TO REFRM2.                                             131b
    MOVE REFRM2 TO CDNO.                                             131c
    MOVE ' NUMBER OF CHARACTERS PROCESSED' TO DUMP.                  131d
    WRITE TXTOT FROM ER1 AFTER POSITIONING CAR.                      131e
    WRITE MSG FROM ER1 AFTER POSITIONING CAR.                        131f
    MOVE SPACES TO ER1.                                              131g
```

```
MOVE NIRC TO REFORM.                                                    131h
MOVE REFORM TO CDNO.                                                    131i
MOVE ' NUMBER OF RECORDS READ' TO DUMP.                                 131j
WRITE TXTOT FROM ER1 AFTER POSITIONING CAR.                             131k
WRITE MSG FROM ER1 AFTER POSITIONING CAR.                               131l
MOVE SPACES TO ER1.                                                     131m
MOVE NORC TO REFORM.                                                    131n
MOVE REFORM TO CDNO.                                                    131o
MOVE ' NUMBER OF RECORDS WRITTEN' TO DUMP.                              131p
WRITE TXTOT FROM ER1 AFTER POSITIONING CAR.                             131q
WRITE MSG FROM ER1 AFTER POSITIONING CAR.                               131r
MOVE SPACES TO ER1.                                                     131s
MOVE NMPG TO REFORM.                                                    131t
MOVE REFORM TO CDNO.                                                    131u
MOVE ' NUMBER OF PAGES PROCESSED' TO DUMP.                              131v
WRITE TXTOT FROM ER1 AFTER POSITIONING CAR.                             131w
WRITE MSG FROM ER1 AFTER POSITIONING CAR.                               131x
MOVE SPACES TO ER1. MOVE 'END OF PREPROCESSOR RUN' TO DUMP              131y
WRITE TXTOT FROM ER1 AFTER POSITIONING CAR.                             131z
WRITE MSG FROM ER1 AFTER POSITIONING CAR.                               131a@
CLOSE CHNGE, LISTING, MTSTP, MESSAGE.                                   131aa
STOP RUN.                                                               131ab
WRITE TXTOT FROM ER1 AFTER POSITIONING CAR.                             131ac
WRITE MSG FROM ER1 AFTER POSITIONING CAR.                               131ad
MOVE SPACES TO ER1.                                                     131ae
```

```
MOVE NIRC TO REFORM.                                                    131af
MOVE REFORM TO CDNO.                                                    131ag
MOVE ' NUMBER OF RECORDS READ' TO DUMP.                                 131ah
WRITE TXTOT FROM ER1 AFTER POSITIONING CAR.                             131ai
WRITE MSG FROM ER1 AFTER POSITIONING CAR.                               131aj
MOVE SPACES TO ER1.                                                     131ak
MOVE NORC TO REFORM.                                                    131al
MOVE REFORM TO CDNO.                                                    131am
MOVE ' NUMBER OF RECORDS WRITTEN' TO DUMP.                              131an
MOVE TXTOT FROM ER1 AFTER POSITIONING CAR.                              131ao
WRITE MG FROM ER1 AFTER POSITIONING CAR.                                131ap
MOVE SPACES TO ER1.                                                     131aq
MOVE NMPG TO REFORM.                                                    131ar
MOVE REFORM TO CDNO.                                                    131as
MOVE ' NUMBER OF PAGES PROCESSED' TO DUMP.                              131at
WRITE TXTOT FROM ER1 AFTER POSITIONING CAR.                             131au
WRITE MSG FROM ER1 AFTER POSITIONING CAR.                               131av
MOVE SPACES TO ER1. MOVE 'END OF PREPROCESSOR RUN' TO DUMP.             131aw
WRITE TXTOT FROM ER1 AFTER POSITIONING CAR.                             131ax
WRITE MSG FROM ER1 AFTER POSITIONING CAR.                               131ay
CLOSE CHNGE, LISTING, MTSTP, MESSAGE.                                   131az
STOP RUN.                                                               131b@
```

COBOL PROGRAM

(J25480) 26-FEB-75 08:35;;;; Title: Author(s): Elizabeth K. Michael/EKM; Distribution: /WEC([ACTION]) RWW([INFO-ONLY]) HGL([INFO-ONLY]) DSM([INFO-ONLY]) ; Sub-Collections: SRI-ARC; Clerk: EKM; Origin: < MICHAEL, AFTAPE.NLS;6, >, 25-FEB-75 11:03 EKM
;;;; ####;

MEH 26-FEB-75 08:39 25481

My NLS Initial File The Way it Was 2/26/75.

****
*** 1

LINKS 2

****	(journal)	Documents
****	(author)	My journal entries
****	(message:dbtrzf)	In messages not sorted
****	(mhis:dbtzf)	Message history
****	(letter:zgf)	Letter format
****	(memo:zgf)	Memo format
****	(jindex)	Journal Indices
****	<documentation,help,>	NLS Help
****	<leavitt,arc,work>	Current ARC people; titles, room, ext.
****	<leavitt,arc,home>	Current ARC people; home addrs, phone 2a

****
*** 3

(Journal) Journal documents (most recent first) 4

JHB 25-FEB-75 22:21 25478
THE BASIC TNLS-8 COURSE OUTLINE
Location: (HJOURNAL, 25478, 1:W)
*****Note: [INFO-ONLY] *****
4a

Comments: This is a newly revised version of the first course in NLS, designed by ARC to be minimally complex and yet contain the commands necessary to enable a user to enter, edit, and 'mail' text. Course completion time ranges from 1/2 to 2 days. Printed copies are available from Trainers, Feedback, or JHB. 4a1

JHB 25-FEB-75 21:51 25477
TNLS COURSE OUTLINE #2: INTRODUCTION TO STRUCTURE AND VIEWING
Location: (HJOURNAL, 25477, 1:W)
*****Note: [INFO-ONLY] *****
4b

Comments: This is the outline for the second TNLS course which introduces NLS structure (hierarchical) and special tools for viewing structured information ('view specs'). It is derived from the TNLS Courses master file which contains 5 graduated course levels (by filtering on statement name keys which are then turned off for printing). This distribution is to KWAC and ARC; printed copies are available from Trainers or by request to myself or Feedback. 4b1

JDH 25-FEB-75 20:51 25475

MEH 26-FEB-75 08:39 25481

My NLS Initial File The Way it Was 2/26/75.

Journal Cut-off
Message: 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.
*****Note: [ACTION] *****

4c

RWW 25-FEB-75 10:02 25470
Invitation to an Irish Wake and Birth Shower
Message: 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
*****Note: [ACTION] *****

4d

JBP 24-FEB-75 22:35 25453
Journal Citations vs. ARPA Network Standards
Message: 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.
*****Note: [INFO-ONLY] *****

4e

RLL 24-FEB-75 15:04 25451
'Final' citation template with complete discussion.
Location: (HJOURNAL, 25451, 1:W)
*****Note: [INFO-ONLY] *****

4f

Comments: 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.

4f1

(author) Journal documents authored

5

MEH 26-FEB-75 08:39 25481

My NLS Initial File The Way it Was 2/26/75.

MEH 24-JAN-75 09:38 23809
Workstation Equipment Reference Manual
Location: (HJOURNAL, 23809, 1:w)
*****Note: Author Copy*****

5a

Comments: This is the journalized version of the Workstation Equipment Reference Manual. Offline copies are available at SRI-ARC.

5a1

MEH 22-JAN-75 14:54 25182
Equipment Status Summary
Location: (HJOURNAL, 25182, 1:w)
*****Note: Author Copy*****

5b

JCN MEH 3-JAN-75 16:02 24992
Current ARC Project and Overhead Charge Numbers
Location: (GJOURNAL, 24992, 1:w)
*****Note: Author Copy*****

5c

MEH 15-NOV-74 10:04 24523
NSW: ISU 74-132 Schedule F Revised and Updated
Location: (MJOURNAL, 24523, 1:w)
*****Note: Author Copy*****

5d

MEH 6-NOV-74 17:39 24431
My Thoughts about Recording Written Dialogue, and a Suggestion, Ref: 24393, 24404,
Location: (MJOURNAL, 24431, 1:w)
*****Note: Author Copy*****

5e

MEH 6-NOV-74 17:28 24430
My thoughts about recording dialogue, and a suggestion: ref: 24393, 24404,
Location: (MJOURNAL, 24430, 1:w)
*****Note: Author Copy*****

5f

MEH 24-OCT-74 14:01 24313
Line Processor Protocol
Location: (MJOURNAL, 24313, 1:w)
*****Note: Author Copy*****

5g

SRI-ARC 16-OCT-74 16:22 23912

MEH 26-FEB-75 08:39 25481

My NLS Initial File The Way it Was 2/26/75.

NLS-8 Command Summary [as of 6-OCT-74]
Location: (MJOURNAL, 23912, 1:w)
*****Note: Author Copy*****

5h

MEH 1-OCT-74 10:23 24110
Lineprocessor: Summary of My Sept 74 Trip to SRI-WASH to Debug the Their Workstation
Location: (JJOURNAL, 24110, 1:w)
*****Note: Author Copy*****

5i

MEH 13-SEP-74 06:46 23963
OFFICE-1, The Equipment We Initially Started With.
Location: (HJOURNAL, 23963, 1:w)
*****Note: Author Copy*****

5j

SRI-ARC 5-SEP-74 19:56 31039

Location: (HJOURNAL, 31039, 1:w)
*****Note: Author Copy*****

5k

Comments: This is a brief description of the ways in which the new version of NLS differs from the old (NLS-7). It will be discussed at length during the Architect's Seminar. It's being sent to you now in case you might have a chance to look at it before the meeting, for example, on the plane. Have a good trip....

5k1

MEH 5-AUG-74 13:13 23734
Lineprocessor, SRI purchase.
Location: (GJOURNAL, 23734, 1:w)
*****Note: Author Copy*****

5l

MEH 15-JUL-74 08:52 23621
PDP-10, request to charge Computer Maintenance and Supplies to Contingent Account 9602.
Location: (GJOURNAL, 23621, 1:w)
*****Note: Author Copy*****

5m

MEH 15-JUL-74 08:44 23620
Hudson Institute,Letter to Saul Levy requesting assistance to contact Saul Amarel, to obtain his permission to connect Hudson Institute to the Rutger-Tip.
Location: (GJOURNAL, 23620, 1:w)

MEH 26-FEB-75 08:39 25481

My NLS Initial File The Way it Was 2/26/75.

*****Note: Author Copy*****

5n

SRI-ARC 10-JUL-74 10:14 22127
Quarterly Management Report 10
Location: (GJOURNAL, 22127, 1:w)
*****Note: Author Copy*****

5o

MEH 5-JUL-74 16:24 23535
Lineprocessor paper for final report.
Location: (GJOURNAL, 23535, 1:w)
*****Note: Author Copy*****

5p

Comments: DIRK:
This is the updated Lineprocessor paper. I did not get a chance to have the diagrams redone, I will leave them with the changes marked, on you desk, along with a hard copy of this file. The paper needs to be proofed, and edits read in. I willl be on vacation until July 15. See you then.
...martin..

5p1

MEH 5-JUL-74 15:52 23534
Drum Comparisons
Location: (GJOURNAL, 23534, 1:w)
*****Note: Author Copy*****

5q

MEH 5-JUL-74 12:37 23531
Hudson Office-1 Connection, Rutgers TIP Connection.
Location: (GJOURNAL, 23531, 1:w)
*****Note: Author Copy*****

5r

MEH 5-JUL-74 12:31 23530
PDP-11 DL11E justification
Location: (GJOURNAL, 23530, 1:w)
*****Note: Author Copy*****

5s

Comments: DIC:
This Memo, and the ANTS one, are just to complete purchasing files, the equipment has been ordered long ago.
...martin..

5s1

MEH 5-JUL-74 12:15 23529
PDP-11 ANTS Interface, justification.
Location: (GJOURNAL, 23529, 1:w)

MEH 26-FEB-75 08:39 25481

My NLS Initial File The Way it Was 2/26/75.

*****Note: Author Copy*****

5t

MEH 27-JUN-74 11:22 30902
TIP connection for Hudson Inst.
Location: (GJOURNAL, 30902, 1:w)
*****Note: Author Copy*****

5u

MEH 25-JUN-74 23:58 23474
Office-1, Memo to B Wing, Explanation for request to add memory.
Location: (GJOURNAL, 23474, 1:w)
*****Note: Author Copy*****

5v

MEH 25-JUN-74 22:49 23473
PROMs, Memo update #2, Explaining request to purchase on overhead.
Location: (GJOURNAL, 23473, 1:w)
*****Note: Author Copy*****

5w

MEH 25-JUN-74 21:24 23472
PROMs, Memo 23461 update, Explanation to purchase on overhead.
Location: (GJOURNAL, 23472, 1:w)
*****Note: Author Copy*****

5x

MEH 25-JUN-74 12:20 23461
PROM, Memo to Bob Wing explaining request to purchase on Overhead.
Location: (GJOURNAL, 23461, 1:w)
*****Note: Author Copy*****

5y

MEH 25-JUN-74 08:18 23455
Office-1, MF-10, Purchasing Explanation.
Location: (GJOURNAL, 23455, 1:w)
*****Note: Author Copy*****

5z

MEH 24-JUN-74 21:54 23450
Hudson Institute, Walden's approval to connect to Rutgers TIP.
Location: (GJOURNAL, 23450, 1:w)
*****Note: Author Copy*****

5a@

MEH 24-JUN-74 21:23 23449
PDP-10, SCI and IBM visitors, discussion about word conversion and archiving.
Location: (GJOURNAL, 23449, 1:w)

MEH 26-FEB-75 08:39 25481

My NLS Initial File The Way it Was 2/26/75.

*****Note: Author Copy*****

5aa

MEH 24-JUN-74 17:17 23446
PDP-10, buy-out, what we need to do by Thursday june 27.
Location: (GJOURNAL, 23446, 1:w)
*****Note: Author Copy*****

5ab

MEH 24-JUN-74 17:35 23447
PDP-10, Buy-out, wWhet we need to do by Thursday June 27.
Location: (GJOURNAL, 23447, 1:w)
*****Note: Author Copy*****

5ac

MEH 24-JUN-74 16:32 23445
PDP-10, letter from DEC confirming buy-out price and rent if we do not buy.
Location: (GJOURNAL, 23445, 1:w)
*****Note: Author Copy*****

5ad

MEH 24-JUN-74 12:16 23437
VISITORS, subject: Evaluation of PDP-10 Equipment to be Transfered.
Location: (GJOURNAL, 23437, 1:w)
*****Note: Author Copy*****

5ae

MEH 24-JUN-74 08:47 23434

Location: (GJOURNAL, 23434, 1:w)
*****Note: Author Copy*****

5af

MEH 30-MAY-74 08:39 23162
Office-1, Line Scanner bug, request to fix.
Location: (GJOURNAL, 23162, 1:w)
*****Note: Author Copy*****

5ag

Comments: Jim: This is the request to Tymshare to fix the Line-Scanner bug that pervents Bell Canada from inputing cassette through their Mux link. John Swarbrick (Tymshares Service Mgr) said they would correct ASAP.

5ag1

MEH JHB KIRK 16-MAY-74 14:45 23023
lineprocessor feedback
Location: (MJOURNAL, 23023, 1:w)

MEH 26-FEB-75 08:39 25481

My NLS Initial File The Way it Was 2/26/75.

*****Note: Author Copy*****

5ah

MEH 15-MAY-74 08:28 23002
Maintenance, Request to extend our PDP-10 contract.
Location: (MJOURNAL, 23002, 1:w)
*****Note: Author Copy*****

5ai

MEH 15-MAY-74 08:03 23001
Maintenance, Tymshare Quote Request, Changes to PDP-10/11 List.
Location: (MJOURNAL, 23001, 1:w)
*****Note: Author Copy*****

5aj

MEH 10-MAY-74 15:57 22955
StudY Request Approval, Change Request For Spring (74) Quarter.
Location: (MJOURNAL, 22955, 1:w)
*****Note: Author Copy*****

5ak

MEH 10-MAY-74 08:58 22948
Maintenence, Tymshare Quote Request, REVISED, PDP-10/11.
Message: This is journal item 22921 revised, it has a updated
pDp-11 equipment list.
*****Note: Author Copy*****

5al

MEH 8-MAY-74 16:57 22921
Maintenance, Tymshare Quote Request, PDP-10/11.
Location: (MJOURNAL, 22921, 1:w)
*****Note: Author Copy*****

5am

DIA DCW MEH 15-APR-74 16:54 22737
ARC Facility, What To do, Recommended Actions By Task Group Number
2.
Location: (LJOURNAL, 22737, 1:w)
*****Note: Author Copy*****

5an

MEH 15-APR-74 16:18 22732
ARC Facility, some possible configurations.
Location: (LJOURNAL, 22732, 1:w)
*****Note: Author Copy*****

5ao

MEH 12-APR-74 22:05 22724
Line Processor, a LP Workstation at ARPA.

MEH 26-FEB-75 08:39 25481

My NLS Initial File The Way it Was 2/26/75.

Location: (LJOURNAL, 22724, 1:w)
*****Note: Author Copy*****

5ap

MEH 12-APR-74 17:39 22723
Line Processors, availability.
Location: (LJOURNAL, 22723, 1:w)
*****Note: Author Copy*****

5aq

MEH 25-MAR-74 12:23 22477
LINE PROCESSOR, Request for a holding account.
Location: (JJOURNAL, 22477, 1:w)
*****Note: Author Copy*****

5ar

MEH 22-MAR-74 10:54 22456
LETTER, To Professor J. D. Nicoud, Switzerland.
Location: (JJOURNAL, 22456, 1:w)
*****Note: Author Copy*****

5as

MEH 15-FEB-74 17:39 21954
ARC Facility Costs, PDP-10, 1974-76
Location: (HJOURNAL, 21954, 1:w)
*****Note: Author Copy*****

5at

MEH 15-FEB-74 16:18 21953
explanation of line processor shipment to Dept. of Commerce
Location: (HJOURNAL, 21953, 1:w)
*****Note: Author Copy*****

5au

MEH 18-FEB-74 17:36 21977
ARC Facility Costs, PDP-10, 1974-76
Location: (HJOURNAL, 21977, 1:w)
*****Note: Author Copy*****

5av

MEH 11-FEB-74 15:08 21843
Draftsman for Line Processor Layout
Location: (HJOURNAL, 21843, 1:w)
*****Note: Author Copy*****

5aw

MEH 8-FEB-74 15:53 21842
Draftsman for Line Processor Development
Location: (HJOURNAL, 21842, 1:w)

MEH 26-FEB-75 08:39 25481

My NLS Initial File The Way it Was 2/26/75.

*****Note: Author Copy*****
5ax

MEH 25-JAN-74 17:23 21618
Request to lease two GE terminet teleprinters
Location: (GJOURNAL, 21618, 1:w)
*****Note: Author Copy*****
5ay

MEH 22-JAN-74 17:05 21556
TERMINAL: TI's 733ASR
Location: (GJOURNAL, 21556, 1:w)
*****Note: Author Copy*****
5az

MEH 21-JAN-74 15:04 21533
Terminal comparison, Hazeltine-Delta
Location: (GJOURNAL, 21533, 1:w)
*****Note: Author Copy*****
5b0

MEH 16-JAN-74 11:50 21433
ENERGY, DEIs CC EQUIPMENT
Location: (GJOURNAL, 21433, 1:w)
*****Note: Author Copy*****
5ba

MEH 4-JAN-74 16:14 16958
COMPCON 74, Letter to Session Chairman
Location: (GJOURNAL, 16958, 1:w)
*****Note: Author Copy*****
5bb

MEH 4-JAN-74 15:52 21292
Video Display, Hazeltine
Location: (GJOURNAL, 21292, 1:w)
*****Note: Author Copy*****
5bc

MEH 4-JAN-74 15:42 21291
pro-log (PROM Programmer)
Location: (GJOURNAL, 21291, 1:w)
*****Note: Author Copy*****
5bd

MEH 4-JAN-74 15:37 21290
motor-gen
Location: (GJOURNAL, 21290, 1:w)

MEH 26-FEB-75 08:39 25481

My NLS Initial File The Way it Was 2/26/75,

*****Note: Author Copy*****

5be

MEH 4-JAN-74 08:39 21283
LINE PROCESSOR, MEH IEEE CompCon 74, Microprocessor Technology To Extend The Utility of Computer Peripherals
Location: (MJOURNAL, 21283, 1:w)
*****Note: Author Copy*****

5bf

(message) In messages not sorted

6

(mhis) message history

7

SANDY

7a

14-FEB-75 1635-PST JORDAN at OFFICE-1: 1200 Baud
Distribution: JOHNSON AT SRI-ARC, hardy at sri-arc, jordan
Received at: 14-FEB-75 16:34:48

7a1

Sandy: I have gotten in touch with the salesman and he is finally getting the paperwork started to ship it from WDC to Ca. He promised me that he would do it ASAP. The only thing he needs is a letter confirming the order from our Purchasing Department, whom I have already gotten in touch with to handle it. He (the salesman) said he would get right on it without waiting for the letter. Rita,

7a1a

14-FEB-75 1329-PST JOHNSON: 1200 baud
Distribution: JORDAN AT OFFICE-1, hardy
Received at: 14-FEB-75 13:29:43

7a2

rita, what developments are there on getting the 1200 baud terminette back here...martin says we will be needing it very soon..sandy

7a2a

12-FEB-75 1000-PST HARDY: Missing Proberty
Distribution: JOHNSON, hardy, norton, watson, engelbart
Received at: 12-FEB-75 10:00:17

7a3

Sandy:
As you know, SRI Propery has been conducting a property inventory check of project 1868. The followinv is a list of the pro8erty they, and Rodney, have not been able to find. They are now waiting for use to declair where abouts (stolden, at home, etc).
Would you please send a journal item to ARC people to try to locate.
thanks... martin.

7a3a

My NLS Initial File The Way it Was 2/26/75.

1) tape recorder model 230 ser #9040
2) tape recorder model 124cs ser # 29935
3) mouse ser # 07
4) file cabinet model 18354 sri ser # g00109801
5) tape recorder model tc126 ser # 10372
6) tZ terminal model 725 property tag # g00112045
7) miniture joystick model x2438
8) mouse property tag #g59190017
---------- 7a3b

11-FEB-75 1417-PST HARDY: My computer room phone extention
Distribution: JOHNSON, hardy
Received at: 11-FEB-75 14:17:40 7a4

Please have it disconnected,
thanks
,,martin,, 7a4a

11-FEB-75 1006-PST HARDY: LP documentation for Maj Lloyd at the Pentagon,
Distribution: JOHNSON, hardy, norton, watson, bair, irby
Received at: 11-FEB-75 10:06:20 7a5

Sandy:
Would you please send a copy of "WORKSTATION EQUIPMENT REFERENCE MANUAL" and "MICROPROCESSOR TECHNOLOGY TO EXTEND THE UTILITY OF COMPUTER PERIPHERALS" to:
Maj James Lloyd
AFDSC/XM Pentagon, Wash, D.C,, 20301, 7a5a

Thanks,,
,,,martin,, 7a5b

11-FEB-75 0943-PST JOHNSON: 1200 baud
Distribution: HARDY
Received at: 11-FEB-75 09:43:37 7a6

rita is handling it,,,,will have more final info this afternoo n, shez had trouble getting aa hold of the salees people,,,but whold nice typing should have it taken care of today 7a6a

11-FEB-75 0938-PST JOHNSON:
Distribution: HARDY
Received at: 11-FEB-75 09:38:42 7a7

the adm guys will come this aft or tomorroW morning, 7a7a

10-FEB-75 1052-PST HARDY: 1200 baud G,E TermiNet

My NLS Initial File The Way it Was 2/26/75.

Distribution: JOHNSON, hardy, norton
Received at: 10-FEB-75 10:52:16 7a8

Sandy:
Apparently no one has done anything about getting the 1200 baud G.E. terminal that Col Russel has at the ARPA office moved to ARC.
Would you please check with Rita for status, then do what ever is still needed to gt it moved.
Thanks
...martin.. 7a8a

10-FEB-75 1008-PST HARDY: adm2 service
Distribution: JOHNSON, hardy, watson
Received at: 10-FEB-75 10:08:52 7a9

Sandy:
The two adm-2 displays on the yellow table in the Tasker consile area are not working. They have keyboard troubles. Would you please call the service rep and ask them to repair. Request they give you a date when they will come.
Thanks
...martin.. 7a9a

6-FEB-75 1514-PST HARDY: Data Media Displays
Distribution: JOHNSON, hardy
Received at: 6-FEB-75 15:14:53 7a10

As you know we recently recieved eight Data Media displays -out of the 13 or so we have on order. PBe sure to log their serial numbers in the book. I will give you charge numbers later.
..martin.. 7a10a

4-FEB-75 1026-PST JOHNSON:
Distribution: HARDY
Received at: 4-FEB-75 10:26:05 7a11

ok, i sent request for phone stuff and also status request for other previously requested change. 7a11a

4-FEB-75 0932-PST HARDY: Dial-up Phones for our 11.
Distribution: JOHNSON, hardy, watson, irby, victor, andrews
Received at: 4-FEB-75 09:32:21 7a12

Sandy:
Sometime ago we requested? our 10 data phone 329-8226 be disconnect from the ring loop so we could connect it to our 11. Ring Loop: when you dial any number in the loop:

329-8220 to 8226 if it is busy you automatically get switched to the next number, hence you don't have to redial) Could you check with the phone company to see if this has happened, also request they disconnect 329-8224,5 from the loop too,
...martin,, 7a12a

4-FEB-75 0812-PST HARDY: Door and Cabinet Locks
Distribution: JOHNSON, hardy, feinler
Received at: 4-FEB-75 08:12:14 7a13

Sandy:
You kind of have to keep bugging maintenance to get them to do things, would you please keep on top of them until we get the locks installed?
thanks,,
....martin... 7a13a

29-JAN-75 1105-PST HARDY: Drum papers for SCI
Distribution: JOHNSON, hardy
Received at: 29-JAN-75 11:05:50 7a14

Sandy:
Yesterday the temp gal copied some papers for that we must send to Bob Burns at SCI, I put them in you in basket stapled together with bobs name on them,
His address is: BoB Burns, 1801 Page Mill Rd, P.A,, 94304
Please send, thanks,, martin,, 7a14a

28-JAN-75 1440-PST HARDY: Locks for NC (P.S.).
Distribution: JOHNSON, hardy, feinler
Received at: 28-JAN-75 14:40:49 7a15

Sandy:
I forgot to mention that we also want to put locks on all the file cabinets in the NIC room, Some already have them, We want the type that is built in (like the ones that are already installed).
Please request these locks also, Thanks again
martin 7a15a

28-JAN-75 1436-PST HARDY: Locks for NIC
Distribution: JOHNSON, hardy, feinler
Received at: 28-JAN-75 14:36:42 7a16

Sandy:
Would you please call security? or maintenance? and request they put two locks on the NIC room J2028, The room has four doors, We want locks on only two; one the door nearest the

printer room, and the other the door nearest Jeffs office, We want a lock without handle on the door nearest Jeff, Please ask them to do as soon as possible and let me know their reply,
thanks
martin 7a16a

APPL 7b

14-FEB-75 1635-PST JORDAN at OFFICE-1: 1200 Baud
Distribution: JOHNSON AT SRI-ARC, hardy at sri-arc, jordan
Received at: 14-FEB-75 16:34:48 7b1

Sandy: I have gotten in touch with the salesman and he is finally getting the paperwork started to ship it from WDC to Ca. He promised me that he would do it ASAP. The only thing he needs is a letter confirming the order from our Purchasing Department, whom I have already gotten in touch with to handle it. He (the salesman) said he would get right on it without waiting for the letter. Rita, 7b1a

14-FEB-75 1329-PST JOHNSON: 1200 baud
Distribution: JORDAN AT OFFICE-1, hardy
Received at: 14-FEB-75 13:29:43 7b2

rita, what developments are there on getting the 1200 baud terminette back here,,,martin says we will be needing it very soon,,sandy 7b2a

13-FEB-75 1718-PST NORTON: ARC Applications Group Meeting Friday 2/14
Distribution: BAIR, LIEBERMAN, HOPPER, PETERS, ENGELBART, FEINLER,, JORDAN AT OFFICE-1, ROETTER, JOHNSON, BONDURANT, KEENEY,, HARDY, norton
Received at: 13-FEB-75 17:18:24-PST 7b3

We need to meet to discuss our plans for the KWAC Meeting next week. We have a tentative agenda to go over. Also, the organization of Applications as it is now shaping up needs discussion.
I'm planning for 1:30 Friday in the conference room, I'd like to hear from anyone who cannot make it at that time. If too many, we can try to reschedule. Jim 7b3a

10-FEB-75 1052-PST HARDY: 1200 baud G.E TermiNet
Distribution: JOHNSON, hardy, norton
Received at: 10-FEB-75 10:52:16 7b4

Sandy:

My NLS Initial File The Way it Was 2/26/75.

Apparently no one has done anything about getting the 1200 baud G.E. terminal that Col Russel has at the ARPA office moved to ARC,
Would you please check with Rita for status, then do what ever is still needed to gt it moved,
Thanks
...martin..

7b4a

7-FEB-75 0930-PST BAIR at OFFICE-1: Rough suggestions for KWC meet
Distribution: BRIGNOLI, bair, lieberman, hardy at sri-arc, norton
Received at: 7-FEB-75 10:03:43

7b5

< BAIR, ARCHMEET.NLS;2, >, 5-FEB-75 20:17 JHB ;;;;
Some off the Top suggestions for the Architect's Seminar (in addition
to FGB's list)
>Training in DNLS for those who what it
>Discussion of User Development, its role, and ideas about the
service that can be provided:
>Training: review courses(?), explain the design and plan
User programs operation and training
>The amount of service to be provided
>the difference between training and user assistance
>The Feedback service operation and how much should architects
intercept, and how direct inquiries to Feedback can be coordinated with the arch,
>Discussion of support that ARC and Applications can and is planning
to provide
>The ARPA Net problems experiencesd and potential solutions
>Documentation: status, needs and plans
>Special ARC involvements, such as NSF (DCE), the DPCS (DVN)
>Office-2 ?
>Equipment demo -- local vendors and their wares (MEH)
Have vendors bring in equipment for demo, particularly printers
>Marketing definition, plans and strategy (RLL)
>Analysis, needs and possibilities

7b5a

5-FEB-75 0815-PST HARDY: TYmnet
Distribution: LIEBERMAN, PANKO, hardy, norton
Received at: 5-FEB-75 08:15:55

7b6

My NLS Initial File The Way it Was 2/26/75.

I would like to come but I am just to busy to get involved at this time. Be sure to ask them if it will be Full duplex and what if any protocal will be required.
...martin.. 7b6a

4-FEB-75 1638-PST JOHNSON:
Distribution: HARDY
Received at: 4-FEB-75 16:38:53 7b7

had to log in as you, the fine is in your directory then, called bailey, --sanday 7b7a

4-FEB-75 1519-PST LIEBERMAN: TYMSHARE visit
Distribution: NORTON, BAIR, HARDY, PANKO, lieberman
Received at: 4-FEB-75 15:19:32 7b8

JIM Norton, et al:
Ray Panko and I will be visiting Tymshare FRIDAY, Feb 7 at 930 to discuss the TYmnet. Anyone else interested in coming? any prticular questions that you would liked asked?
ROBERT
(types of questions we expect toask:
cost- recurring, initial
time- how soon,
effort- what really is neede to be done
reliability
capability) 7b8a

31-JAN-75 0815-PST HARDY: G.E. 1200 Baud TermiNet,
Distribution: JORDAN AT OFFICE-1, hardy
Received at: 31-JAN-75 08:15:15 7b9

Reta:
No, I have not gotten a hold of George Rangitch. If you could handle it would be very helpful. You might want to wait until abxout tue of next week to give Russell a chance to respond.
..martin.. 7b9a

31-JAN-75 0626-PST JORDAN at OFFICE-1: 1200 Terminette
Distribution: HARDY AT SRI-ARC, jordan
Received at: 31-JAN-75 06:36:16 7b10

Martin: Were you able to get ahold of George Rangitch or should I call him. Rita. 7b10a

28-JAN-75 1746-PST HARDY: A Case For a Minute Man.
Distribution: NORTON, WATSON, ENGELBART, hardy
Received at: 28-JAN-75 17:46:38 7b11

My NLS Initial File The Way it Was 2/26/75.

I would like to keep Rena Ochoa on after March 1 to help with operations and hardware things.
Specifically:
1) Operate the PDP_11's during normal work days
2) Assit with property control
3) Assist with purchase orders
4) Assit with hardware repairs and equipment set-ups 7b11a

I think he is a very stable person quite suited for this work 7b11b

,,martin,, 7b11c

28-JAN-75 1552-PST HARDY: TI 735 to L.A.
Distribution: JOHNSON, hardy, geoff
Received at: 28-JAN-75 15:52:33 7b12

Sandy:
If we have one available and there is no conflict with other user needs. Geoff is going to do some stuff for Jake (NIC stuff) while he is there so we want it to happen if possible.
martin 7b12a

28-JAN-75 0910-PST JOHNSON: ti 735
Distribution: HARDY
Received at: 28-JAN-75 09:10:42 7b13

geoff wants to take a 735 to l.a. this weekend. Have you agreed? 7b13a

28-JAN-75 0845-PST HARDY: Spencer
Distribution: NORTON, hardy
Received at: 28-JAN-75 08:45:34 7b14

Jim:
As you probably are aware of already, Spencer Floyd is getting nervous. He say you were to send him a page or two explaining how the new Office-1 contracts might be handled (stuff you were talking with duane s about). And, he says contract people are primed to go in to action to implement NSA $10K order as soon as you give it to them, says it does not have to be any more than a modified work statement and build_up justification of slot cost (should be greater than $10K sine that is all they will allow and it will insure that we will get it),. Also wants to know state of ARPA order (his main concern); say ROME just needs informal sndmsg, phone call, canfirming order. Says he needs insurance because SRI is on the limb with tymshare for costs

encured before contract is dated. Feels that if he does not get it soon he will recommend Tymshare turn off services.. hmm
martin.
P.S
If there is any thing I can do let me know, most likely should you should give Spence a call. 7b14a

16-JAN-75 0814-PST WATSON: delivery of 11
Distribution: HARDY
Received at: 16-JAN-75 08:14:52 7b15

when is the second 11 and printer for it coming in? I'm still worried about the number of terminals that will be available here for everybody. I need at least 8 around here for my people. Thanks Dick 7b15a

15-JAN-75 1333-PST HARDY: TI Jeanne took to WASH
Distribution: JOHNSON, hardy
Received at: 15-JAN-75 13:33:36 7b16

Youask her to send you the serial num, for the records.. bye.. martin 7b16a

15-JAN-75 1330-PST JOHNSON:
Distribution: HARDY
Received at: 15-JAN-75 13:30:52 7b17

rita sez jeanne did bring a terminal with her so she is returning two. 7b17a

8-JAN-75 1645-PST HARDY: Delta Data Displays
Distribution: MCLINDON AT USC-ISI, hardy, norton
Received at: 8-JAN-75 16:45:20 7b18

Connie:
Our lease for the Delta Data displays at ARPA is about up. I intend to replace them with less expensive Data Media displays which we feel are better. They have a detached keyboard are labled special for NLS use: IE: CA, CD keytops, etc.
If you would like to discuss (I haven't placed the order yet) please call or SNDMSG
Bye for now.. martin.. ARC 7b18a

6-JAN-75 1719-PST NORTON: Meeting Tuesday 1/7 at 2pm: Applications Happenings
Distribution: BAIR, LIEBERMAN, ENGELBART, LEE, HOPPER,

My NLS Initial File The Way it Was 2/26/75.

HARDY, PETERS, MEYER,, BECK, FEINLER, JOHNSON, norton
Received at: 6-JAN-75 17:19:44 7b19

It's time for a meeting to get at least a little caught up on what's been going on at the different Applictaions fronts. 2pm tommorrow in the ARC conference room., for about an hour. Hmm wonder if I'll recognize everybody.. Jim 7b19a

1-JAN-75 2352-PST LIEBERMAN: NBS visit and info request
Distribution: NORTON, HARDY, lieberman
Received at: 1-JAN-75 23:52:51 7b20

To repeat sndmsg sent to JCN just in case the rcent crash destroyed the original (30dec74 1430pst).
plan to meet with Cotton and pike of NBS Thursday at 930.
Would like following info. What models do we have of pdp11?
Do we have the network interface between the 11 and the imp working?(is this the one from NBS?)
They are interested in putting NLS on an 10 with a different operatinng system. What will it take? moneywise, teme wise, technically wise???
How will the front end backend split help this? (it clearly will be how much).
These questins are based on the talk I had with Tom Pke on the phone. Will put off any serious answers to them but wwould like in general t know the answers so I can at least indicat the ballpark in which we are working toards. Thanks for the help Robert 7b20a

30-DEC-74 1125-PST HARDY: Office-1 Picture For FLY 75.
Distribution: NORTON, hardy
Received at: 30-DEC-74 11:25:17 7b21

Jim:
Is this a valid picture?< HARDY, PROPOSALS.NLS;4, >,
30-DEC-74 11:15 MEH ;;;;
The following are the current Office-1 related proposals for FLY 75:

name	slots	money
RADC	5	200K
JCN 23-DEC-74 21:40		24730
Proposal ISU 74-258		Continued NLS Workshop Support for RADC
Location: (GJOURNAL, 24730, 1:w)		
*****Note: [INFO-ONLY] *****		

Comments: Signed hardcopy printed today, to be mailed to RADC

tomorrow 12/24. In addition, an advance draft with complete
cost estimate has been transferred to Stone's directory at
office-1: radc.nls jcn
ARPA : 12; 480K
BELL : 1; 40K
JCN 23-DEC-74 21:15 24726
Proposal ISC 74-255 Continued NLS Workshop Support for Bell
Location: (GJOURNAL, 24726, 1:w)
*****Note: [INFO-ONLY] *****

Comments: Hardcopy signed and printed today, to be mailed
tomorrow. Bell has an invoice for the first half year at $
20,000 (jcn to lhd by hand)
BRL : 1; 40K
JCN 23-DEC-74 21:20 24727
Proposal ISU 74-256 Continued NLS Workshop Support for BRL
Location: (GJOURNAL, 24727, 1:w)
*****Note: [INFO-ONLY] *****

Comments: Signed hardcopy printed today and to be mailed to
BRL and RADC tomorrow.
NSRDC : 2; 80K
JCN 23-DEC-74 21:34 24729
Proposal ISU 74-259 Continued NLS Workshop Support for NSRDC
Location: (GJOURNAL, 24729, 1:w)
*****Note: [INFO-ONLY] *****

Comments: Signed hardcopy printed today, to be mailed tomorrow
12/24
HUDSON : 1; 40K
JCN 23-DEC-74 21:25 24728
Proposal ISD 74-257 Continued NLS Workshop Support for the
Hudson Institute 7b21a

Location: (GJOURNAL, 24728, 1:w)
*****Note: [INFO-ONLY] *****

Comments: Signed hardcopy printed today to be mailed tomorrow

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```
      AFAA          :  1;       40K
         JCN 23-DEC-74 21:10  24724
         Proposal ISU 74-253  NLS Workshop Support for AFAA
         Location: (GJOURNAL, 24724, 1:W)
         *****Note:  [ INFO-ONLY ] *****

            Comments: signed hardcopy printed today, to be sent
   to RADC
            and AFAA tomorrow 12/24
      NSA           :  1;       40K
         JCN 23-DEC-74 21:31  24736
         Proposal ISU 74-260  Continued NLS Workshop Support
   for NSA
         Location: (GJOURNAL, 24736, 1:W)
         *****Note:  [ INFO-ONLY ] *****

            Comments: signed hardcopy printed today to be
   mailed tomorrow
            12/24
                  --------------------
      TOTAL         : 25;      960K
      MACHINE costs:           710,280
      OTHERS costs:            308,946
                              ----------
      TOTAL                   1,019,226
   ...martin...                                              7b21b

22-DEC-74 1554-PST  JOHNSON:  documentaion
   Distribution:  RUGGLES AT OFFICE-1, BRIGNOLI AT OFFICE-1,,
TAYLOR AT OFFICE-1, BEDFORD AT OFFICE-1,, ANASTASIO AT
OFFICE-1, MCLINDON AT OFFICE-1,, SHEPPARD AT OFFICE-1, DRAPER
AT OFFICE-1,, HILL AT OFFICE-1, WINGFIELD AT OFFICE-1, hardy
   Received at:   22-DEC-74 15:54:50                         7b22

   lineprocessor documentation is on the way to you,  sorry for
   the delay.                                                7b22a

21-DEC-74 1722-PST  JOHNSON:
   Distribution:  HARDY
   Received at:   21-DEC-74 17:22:24                         7b23

hi martin,  i'm working today getting your stuff together and
sending out those papers.....i just couldn't get to it during
the week,  i am also sending sndmsgs to all the people who are
online to let them know they are on the way ... another
reminder that i am leaving xmas and won't be back until either
the day after new years or maybe take one more day after
that...about which more later.........---later, the shady lady
of shady lane                                                7b24
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MEH 26-FEB-75 08:39 25481

My NLS Initial File The Way it Was 2/26/75.

20-DEC-74 0807-EST MALMAN at BBN-TENEX: TYMSH BUFFERS
Distribution: HARDY AT SRI-ARC
Received at: 20-DEC-74 05:07:19 7b25

MARTIN,
AS OF YESTERDAY THEY ARE: 7b25a

PORT	INBUF	OUTBUF	
1-3	67	157	
4-6	33	67	
7-14	11	22	
15	135	427	
16	135	272	
17-77		11	22

7b25b

ALL NUMBERS ARE OCTAL, 7b25c

JOEL MALMAN 7b25d

16-DEC-74 0953-PST JOHNSON: lp workstation document
Distribution: NORTON, hardy
Received at: 16-DEC-74 09:53:29 7b26

has jim bair made any comments on this document yet? Martin would like to know since he is interested in sending it out, thanks. 7b26a

JNH 30-DEC-74 06:49 31557
Documentation
Message: Martin,
Got the Line Processor info just before Christmas,,, Made a nice present, Thanks much,,, Jess
*****Note: [INFO-ONLY] *****
7b27

11-DEC-74 1005-PST NORTON: tym-tip
Distribution: HARDY, norton
Received at: 11-DEC-74 10:05:36 7b28

We should assume that April 1 we ill hae another hot at tymshare either for nsw/arc or for the second office-1-type service machine,,,,,cant let the port go away and should be ready for connecting with interfaces etc..ok? Jim 7b28a

11-DEC-74 0947-PST HARDY: TIP Host Interface for Office-2.
Distribution: NORTON, hardy
Received at: 11-DEC-74 09:47:57 7b29

Jim:

My NLS Initial File The Way it Was 2/26/75.

A while back when we were being serious about Office-2 I contacted RML and requested they make arrangements for installing another Host interface at the Tymshare TIP. I am sure that they haven't implemented since they required us to get ARPA approval first which we did not carry through because of the machine purchase problem.
I would like to send RML a sndmsg saying we no longer have the need, so that they don't think we call wolf just for the sake of it.
By the wat what is the status of things; Tymshare quote, and contract renewals? 7b29a

9-DEC-74 1423-PST NORTON: workstation piece
Distribution: HARDY, bair, norton
Received at: 9-DEC-74 14:23:09 7b30

Martin: I really DO want Jim Bair to see the draft of your workstation thing before it goes out.... can yo send him a link to it. Sorry to nose in, but I am interested n his opinion before stuff gos out to KWAC, ok? Jim N 7b30a

9-DEC-74 0900-PST JOHNSON:
Distribution: HARDY
Received at: 9-DEC-74 09:00:17 7b31

the p.o. number is A55925. 7b31a

7-DEC-74 0909-PST HARDY: Memorex Terminal
Distribution: JOHNSON, hardy
Received at: 7-DEC-74 09:09:59 7b32

Sandy:
Me again, have you obtained the P.O. defining the Memorex terminal we want to get from the other SRI group? When you do please send it in a send message to me.
Thanks
...martin... 7b32a

6-DEC-74 1045-PST NORTON: Call to Major Carlstrom re IMP interface ARC 10
Distribution: HARDY, norton
Received at: 6-DEC-74 10:45:37 7b33

Martin: we need to talk today. Major Carlsrom (not Carlson) called. He is trying to "coordinate" some of the transfer of the arc machine to sci. he knows of the april date. What he needs to know is what interfaces (the 10 interface and/or the IMP interface) we are planning to ship to sci. He has some ideas about our shipping both and getting an

arpa-provided replacement imp interface "later" but not clear when, In addition, i dont know whether yo are counting on the imp interface staying or n
... he also asked abouut cable lengths, the sci guys got only 1 imp interface and not 2 they needed,,so the question... can you call me and then him? he i at (202) 694-4001 at arpa....charge to our credit card: unles you have an sri phone there,, cc no.: 176-5315-159Z ok? Jim 7b33a

5-DEC-74 1228-PST JOHNSON:
Distribution: HARDY, johnson
Received at: 5-DEC-74 12:28:20 7b34

735's promised maybe next wed, definitely friday, ti 733'asr with cassette recorder two week delivery, tom wants you to write memo about borrowing imp interface and subsequent impace on the division...he needs it before his review...really needs it he sez, to look good to his boss, do it if you can, hazeltines: first 6 due here installed 20 dec, earliest possible, other 5 cancelled, data media quoting 3 to 6 weeks, shooting for 4, they will let us know, anything else you want...i'll b
here.....have fun fixing up the new house hold, sandy... 7b34a

5-DEC-74 0902-PST HARDY: Some things I would Like you to do,
Distribution: JOHNSON, hardy
Received at: 5-DEC-74 09:02:05 7b35

Sandy:
How is your day today going?? I hope it nice because mine is,,
There are several things I would like you to check on for Application,
1)
Frank Brignoli is asking where is his 735, (we said we would send him one, maybe 2, as soon as possible) Would you please check with Tom delivery sechedule, and how many we have on order,
2)
Also ask Tom what deliveries would be for TI 735's with cassette recorder built in,,' I'm not sure that 735 is the right number however it's the only terminal that TI makes that has a built in cassette,)
3)
We are thinking of transfering a Memorex printer terminal from another SRI group to us, What we need to know before transfering is what accesories it has, The SRI property tag is 109553, Would you call property and ask them to give you the purchase Order number it was purchased on, Then call

Tom in purchasing and ask him to send you a copy of the P.O.
That way we can see what was really ordered,,
Thats all,, talk to you tomorrow,, 7b35a

martin,, 7b35b

4-DEC-74 0838-EST MALMAN at BBN-TENEX: SETTING PORTS WILD AT THE REQUEST OF HARDY
Distribution: HARDY AT SRI-ARC, poh at isi, rutgers at bbn, plynch at isi
Received at: 4-DEC-74 05:39:01 7b36

HI,
THE FOLLOWING PORTS ON THE FOLLOWING TIPS HAVE BEEN SET WILD, 7b36a

TYMSHARE TIP PORT 15
TYMSHARE TIP PORT 16
MITRE TIP PORT 34
RUTGER TIP PORT 71
ARPA TIP PORT 3
ARPA TIP PORT 7 7b36b

THESE SETTING WILL STAND WHEN TIP 327 IS RELEASE (SHORTLY), THEY WILL
IN EFFECT BE "FREE" PORTS, SNDMSG TO HARDY@SRI-ARC FOR DETAILS, 7b36c

JOEL MALMAN 7b36d

P.S, ALL PORT NUMBERS ARE OCTAL, 7b36e

27-NOV-74 1052-PST HARDY: "Wild" ports for Lineprocessor connections,
Distribution: MALMAN AT BBN, hardy, hardware
Received at: 27-NOV-74 10:52:09 7b37

Joel:
First, Thanks for implementing the device rate change for ARPA Lineprocessor connection,
Second, We have developed some test programs to assist us in debuging and repairing Lineprocessor connections, These programs operate from a remote terminal ans esentually reach out and test each Lineprocessor device in the circuit in sort of a loop back mode, To operate these programs from a remote terminal requires the TIP port to be set "Wild", A TIP port set permanently wild does not interfer with normal Lineprocessor operation, Hence, could you please set the following ports permanen

MEH 26-FEB-75 08:39 25481

My NLS Initial File The Way it Was 2/26/75.

y "WILD" for us:
Tymshare TIP port: 15 base 8
tymshare TIP port: 16 base 8
MITRE TIP port 34 base 8
Rutgers TIP port 71 base 8
ARPA TIP port 3 base 8
ARPA TIP port 7 base 8 7b37a

thanks
...martin... HARDY@SRI-ARC
P.S. Please notify me when completed.. bye.. 7b37b

26-NOV-74 1856-PST HARDY: SRI-ARC TIP User List,
Distribution: FIELDS AT ISI, norton, watson, engelbart, hardy
Received at: 26-NOV-74 18:56:51 7b38

Craig:
The following is a copy of the letter we placed in the mail today to you containing the list of SRI-ARC users that need access to ARPA Network TIPs.
...martin... HARDY@SRI-ARC 7b38a

-- 7b38b

< HARDY, TIPLIST.NLS;11, >, 26-NOV-74 18:29 MEH ;;;; 7b38c

-- 7b38d

Augmentation

Research Center

Menlo Park,

California 94025

Stanford Research

Institute

26 NOV 74 7b38e

Dr. Craig Fields
Advanced Research Projects Agency
1400 Wilson Blvd,
Arlington, Va 22209 7b38f

Dear Dr. Fields: 7b38g

Here is the required information for the list of SRI-ARC staff
that needs access to the ARPANET. 7b38h

Staff: 7b38i

MEH 26-FEB-75 08:39 25481

My NLS Initial File The Way it Was 2/26/75.

Network address: SRI-ARC
Phone number: 326-6200
TIPs they require access to: ALL 7b38j

Andrews, Don I.	password:	DIA
Bair, James H.	password:	JHB
Beach, Mark Alexander	password:	MARK
Beck, Jeanne M.	password:	JMB
Belleville, Robert Louis	password:	RLB2
Bondurant, Rodney A.	password:	RAB
Engelbart, Douglas C.	password:	DCE
Feinler, Elizabeth J.	password:	JAKE
Ferguson, William R.	password:	WRF
Goodfellow, Geoffrey S.	password:	GSG
Hamilton, Joan	password:	JOAN
Hardy, Martin E.	password:	MEH
Hopper, J. D.	password:	JDH
Irby, Charles H.	password:	CHI
Johnson, Sandy L.	password:	SLJ
Keeney, Marcia Lynn	password:	MLK
Kelley, Kirk E.	password:	KIRK
Leavitt, Jeanne M.	password:	JML
Lee, Susan R.	password:	SRL
Lehtman, Harvey G.	password:	HGL
Lieberman, Robert N.	password:	RLL
McGinnis, Adrian C.	password:	ACM
Martin, Karolyn J.	password:	KJM
Maynard, David S.	password:	DSM
Meyer, N. Dean	password:	NDM
Michael, Elizabeth K.	password:	EKM
Norton, James C.	password:	JCN
Ochoa, Rene C.	password:	RCO
Peters, Jeffrey C.	password:	JCP
Postel, Jonathan B.	password:	JBP
Ratliff, Jake	password:	JR
Ratner, Robert S.	password:	RSR
Van De Riet, Edwin K.	password:	EKV
Van Nouhuys, Dirk H.	password:	DVN
Victor, Kenneth E.	password:	KEV 7b38k

page 1 7b38l

-- 7b38m

Watson, Richard W.	password:	RWW
Weinberg, Ann	password:	POOH
White, James E.	password:	JEW 7b38n

MEH 26-FEB-75 08:39 25481

My NLS Initial File The Way it Was 2/26/75.

Paying Organization Information 7b380

Augmentation Research Center
333 Ravenswood Ave,
Menlo Park, Ca. 94025
Attn: J. C. Norton 7b38p

Sincerely, 7b38q

Augmentation Research Center 7b38r

J. C. Norton
Assistant Director
(415) 326-6200 X2124 7b38s

JCN/DCE
RWW
MEH 7b38t

page 2 7b38u

--------- 7b38v

26-NOV-74 1344-PST HARDY: Change in Lineprocessor TIP ports.
Distribution: MALMAN AT BBN, hardy
Received at: 26-NOV-74 13:44:10 7b39

We have istalled anotherLineprocessor Workstation in the ARPA office. The port it is connected to is 7 base 8. The port has enough buffer but needs the port device rate set perminately to 697. Could you please take care of this and let me know when thanks
...martin.. HARDY@SRIZ-ARC 7b39a

21-NOV-74 1217-PDT OPER at OFFICE-1: TENEX 13141
Distribution: BAIR AT SRI-ARC, NORTON AT SRI-ARC, KUDLICK AT SRI-ARC,, LEE AT SRI-ARC, HARDY AT SRI-ARC, HOPPER AT SRI-ARC,, FEEDBACK, POLLACK, MARTINEZ, WHEAT
Received at: 21-NOV-74 12:17:40 7b40

ON FRIDAY 11/22/74 1500 (3:00 PM) MONITOR VERSION 13141 WILL BE BROUGHT UP. THIS INSTALLATION WILL INCORPORATE FEATURES AND
MODIFICATIONS WHICH WE ANTICIPATE WILL ENHANCE THE EFFICIENCY AND
FLEXIBILITY OF TENEX AT OFFICE-1 (AND SO ON).
PARTICULAR DETAILS CAN BE VIEWED IN

My NLS Initial File The Way it Was 2/26/75.

<DOCUMENTATION>TENEX,CHANGES;13141,
YOU ARE INVITED TO LOG ON AT THAT TIME AND GIVE 13141 A WORKOUT,
FEEL FREE TO POUND,STRETCH, WIGGLE AND OTHERWIZE SHAKE LOOSE ANY WEAKNESSES, BUGS OR GLITCHES THAT MAY POSSIBLY REMAIN IN THE
CODE SO THEY CAN BE CORRECTED,
BOBM
TYM/OFFICE-1 7b40a

21-NOV-74 0854-PST HARDY: Connecting Office-2 to the Network,
Distribution: NORTON, WATSON, ENGELBART, hardy
Received at: 21-NOV-74 08:54:36 7b41

The following text is a snap shot of sndmsgs discussing connecting Office-2 to the Network via the Tymshare TIP,
< HARDY, TIPCONNECTIONS,NLS;2, >, 21-NOV-74 08:39 MEH ;;;;
14-NOV-74 1133-PST HARDY: Request to connect Office-2 to the Tymshare
TIP,
Distribution: PEARCE AT ISI, hardy, norton, watson, young at isi,
fields at isi,, russell at isi, carlson at isi
Received at: 14-NOV-74 11:33:50
< HARDY, OFFICE-2,NLS;5, >, 14-NOV-74 11:20 MEH ;;;;
Pearce:
Here are the two sndmgs discussing our request to connect a second
host
computer (Office-2) to the Tymshare TIP by Jan 1 75 to provide
Workshop
Utility Service (NLS) to APRA contractors, with emphises on service
to
the NSW program,
11-NOV-74 1219-PST HARDY: Request to Connect a Second SRI-ARC
Computer (Office-2) to the ARPA network via the Tymshare TIP,
Distribution: YOUNG AT ISI, hardy, norton
Received at: 11-NOV-74 12:19:08
< HARDY, TYMTIP,NLS;6, >, 11-NOV-74 10:23 MEH ;;;;
Starting Jan 1975 SRI-ARC intends to operate a second PDP-10
computer
host similar to it's Office-1 host located at Tymshare Inc,
Similarly

My NLS Initial File The Way it Was 2/26/75,

ARC will use this host computer to provide Workshop Utility Service (NLS) to ARPA funded contractors on a contractual basis.

The Office-1 computer connects to the ARPA network via the Tymshare TIP. It is necessary that we connect this second computer (Office-2) to the TYmshare TIP also. I have been informed by BBN that this is possible. However, the Tymshare TIP is not configured for two host computers and will require additional hardware and your approval.

BBN also informs me that there is a spare Tymshare TIP host interface

already paid for that could be used for this second host connection if 7b41a

it is approved.

Originally the TYmshare TIP was installed to connect Office-1 to provide a stable reliable NLS resource service to ARPA contractors.

This second host will extend that service, with the emphasis on special services to the National Software Works (NSW) program.

...martin,, HARDY@SRI-ARC
8-NOV-74 0935-EST MCKENZIE at BBN-TENEX: Second Host at Tymshare TIP

Distribution: HARDY AT SRI-ARC, mckenzie
Received at: 8-NOV-74 06:36:04

Martin:

The Tymshare TIP is not currently configured to handle two Hosts.

First, you should determine whether a "local" Host

interface or
a "distant" Host interface is required (see BBN Report #1822).
Then you should determine whether the government will permit the
connection, and if they will, whether they wish to use an
already-purchased "spare" interface or if you must purchase a new
interface. There are two possible ways to persue this topic:
1- I believe the "formal" approach is to discuss the situation
with
Charles Pearce (PEARCE@ISI) or Mike Young (YOUNG@ISI) of
Range Measurements Lab.
2- If the second Host is being added at ARPA's request, then you
could talk to whoever in the ARPA office is handling the
project.
If the result is that an existing "spare" should be used, then
the
government must merely tell us to install it at Tymshare, and we
will
do so as soon as possible. If you must yourselves pay, then
someone
will have to figure out how to get your money to BBN; this is a
complicated subject because the government must end up owning the
interface.
Regards,
Alex
...martin... HARDY@SRI-SRI, or HARDY@OFFICE-1
18-NOV-74 1200-PST FIELDS at USC-ISI: A SECOND OFFICE MACHINE 7b41b

Distribution: HARDY AT SRI-ARC, RUSSELL, CARLSON, MCKENZIE AT BBN
Received at: 18-NOV-74 12:12:06
GENTLEMEN:
THESE ARE SOME COMMENTS ON THE RECENT MESSAGES I HAVE
SEEN REGARDING A SECOND OFFICE MACHINE. I SEE NO REASON

My NLS Initial File The Way it Was 2/26/75.

FOR
A SECOND OFFICE MACHINE NOT TO BE CONNECTED TO THE CURRENT TIP
UNDER THE FOLLOWING CONDITIONS: (1) ALL ACCESS TO THAT MACHINE
OVER THE NETWORK SHOULD BE IN SUPPORT OF ARPA CONTRACTOR RESEARCH
ARPA OFFICE USE, OR DOD RESEARCH. (2) SOMEONE SHOULD PAY FOR THE
INITIAL COST OF THE CONNECTION AND THE YEARLY COST OF THE CONNECTION.
I WILL BE HAPPY TO ARRANGE THE CONNECTION WHEN I GET APPROPRIATE
ASSURANCES FROM SRI REGARDING POINT #1 (PRESUMABLY NOPROBLEM) AND
WHEN
I HEAR FROM SRI HOW THE EXPENSES WILL BE PAID.
BEST, CRAIG FIELDS
19-NOV-74 1138-PST HARDY: Connecting Office-2 to the ARPA Network
Distribution: FIELDS AT ISI, russell at isi, carlson at isi, stubbs
at isi,, pearce at isi, norton, watson, engelbart, hardy
Received at: 19-NOV-74 11:39:00
< HARDY, FIELDS,NLS;3, >, 19-NOV-74 11:28 MEH ;;;;
Craig:
We do intend to connect only appropriate ARPA/DOD related users to
the
Office-2 machine via the ARPA Network.
To facilitate our planning we need to know the expected initial and
annual costs of the connection and who is to be paid. Who can
answer
this for us?
...martin... HARDY@SRI-ARC
20-NOV-74 0543-PST FIELDS at USC-ISI: OFFICE-2
Distribution: HARDY AT SRI-ARC
Received at: 20-NOV-74 05:44:04
THE INITIAL COST SHOULD BE LESS THAN 35K AND
THE ANNUAL COST SHOULD BE LESS THAN 50K. I CAN'T
BE MRE EXACT AT THIS TIME, BECAUSE THE
EXACT COST DEPENDS ON THE POPULATION
ON THE NET, NO ONE NOW KNOWS WHO IT SHOULD BE PAID TO.
BEST
CRAIG 7b41c

...martin... 7b41d

MEH 26-FEB-75 08:39 25481

My NLS Initial File The Way it Was 2/26/75.

20-NOV-74 0908-PST HARDY: Network login procedure and authorized user list.
Distribution: NORTON, BAIR, WATSON, IRBY, LIEBERMAN, hardy
Received at: 20-NOV-74 09:08:14 7b42

< HARDY, TIPLOGGIN,NLS;10, >, 20-NOV-74 09:01 MEH ;;;; 7b42a

I have read through the latest letter from NCC (TIPUG: 5 NOV 74)
describing the login procedures that will be initiated Dec, 1. I have
pieced together what I think is the scenario of what a typical
Lineprocessor user will have to type-in, and the typical response he
will get, in order to login to Office-1,2. This procdure is very
cumbersome to say the least, and I expect that we will want to respond
to NCC of our concern. 7b42b

In addition, related to TIP login, NCC requires that we send them a
list defining authorized Network users, and who to bill. As of yet we
have not responded. The list requires USER NAME, PASSWORD, ADDRESS,
TELEPHONE NUMBER, NETWORK ADDRESS, TIps THEY WANT AUTHORIZATION TO
ACCESS, and the PERSON AND ORGANIZATION TO BILL. 7b42c

We should have a meeting today to discuss our response to the login
procedure and to finalize the Network user list, say about 11:00, or
tommorrow--but I may not be here because I have a doctor appointment
this afternoon that may lay me up for a couple of days. 7b42d

Please send me a message if this meeting date is ok. 7b42e

LINEPROCESSOR TIP LOGIN SCENARIO: 7b42f

USER: @N 7b42g

RESPONSE: WAIT, ... 7b42h

At this point the RSEXEC will prompt an account host computer and

attempt to verify you as a legal Network user from an authorized
TIP. 7b42i

RESPONSE: OPEN,
NAME OF THE ACCOUNTING HOST,
VERSION NUMBER,
INSTRUCTIONS. 7b42j

Response that the RSEXEC can make the connection to an accounting
host 7b42k

OR: TIMEOUT,,,OK to proceed 7b42l

Response that the RSEXEC can not make the connection to an
accounting host. What it is telling you here is that you can
go ahead and use the Network FREE, without charge, during this
transaction. 7b42m

USER: FULL DUPLEX (if the last response was: OPEN) 7b42n

The RSEXEC is half duplex. The Lineprocessor is full duplex, so
at this point in order to see what you type because you are now
connected to the RSEXEC you must tell the RSEXEC you are a full
duplex connection. 7b42o

USER: LOGIN 7b42p

OR: DESCRIBE LOGIN 7b42q

RESPONSE: PROMPTS FOR THE USER NAME, IDENT, ETC,. 7b42r

USER: REPLY TO PROMPTS FOR THE USER NAME, IDENT, ETC. 7b42s

RESPONSE: NOTIFICATION OF LOGIN SUCCESS OR FAILURE 7b42t

(legal user from a authorized TIP,) 7b42u

USER: @CLOSE, or @QUIT (if successfully verified above) 7b42v

My NLS Initial File The Way it Was 2/26/75.

This breaks the RSEXEC connection with the accounting host and
Login procedures to the Network are complete. 7b42w

USER: L 2, 7b42x

OR the appropriate number of whichever host you wish to login to. 7b42y

From here on it is the same 7b42z

...martin.... 7b42a@

20-NOV-74 0543-PST FIELDS at USC-ISI: OFFICE-2
Distribution: HARDY AT SRI-ARC
Received at: 20-NOV-74 05:44:04 7b43

THE INITIAL COST SHOULD BE LESS THAN 35K AND
THE ANNUAL COST SHOULD BE LESS THAN 50K, I CAN'T
BE MRE EXACT AT THIS TIME, BECAUSE THE
EXACT COST DEPENDS ON THE POPULATION
ON THE NET, NO ONE NOW KNOWS WHO IT SHOULD BE PAID TO,
BEST
CRAIG 7b43a

19-NOV-74 1138-PST HARDY: Connecting Office-2 to the ARPA Network
Distribution: FIELDS AT ISI, russell at isi, carlson at isi, stubbs at isi,, pearce at isi, norton, watson, engelbart, hardy
Received at: 19-NOV-74 11:39:00 7b44

< HARDY, FIELDS.NLS;3, >, 19-NOV-74 11:28 MEH ;;;; 7b44a

Craig:
We do intend to connect only appropriate ARPA/DOD related users to the
Office-2 machine via the ARPA Network, 7b44b

To facilitate our planning we need to know the expected initial and
annual costs of the connection and who is to be paid, Who can answer
this for us? 7b44c

...martin... HARDY@SRI-ARC 7b44d

19-NOV-74 0838-PST HARDY: Office-2 TIP connection.

My NLS Initial File The Way it Was 2/26/75.

Distribution: POLLACK AT OFFICE-1, hardy, norton
Received at: 19-NOV-74 08:38:33 7b45

Ed:
I need to know what type of TIP connection you intend to use to connect Office-2 so that I can make the final arrangements with ARPA to have the appropriate cards installed in the TIP.
...martin... 7b45a

18-NOV-74 1200-PST FIELDS at USC-ISI: A SECOND OFFICE MACHINE
Distribution: HARDY AT SRI-ARC, RUSSELL, CARLSON, MCKENZIE AT BBN
Received at: 18-NOV-74 12:12:06 7b46

GENTLEMEN: 7b46a

THESE ARE SOME COMMENTS ON THE RECENT MESSAGES I HAVE SEEN REGARDING A SECOND OFFICE MACHINE. I SEE NO REASON FOR A SECOND OFFICE MACHINE NOT TO BE CONNECTED TO THE CURRENT TIP
UNDER THE FOLLOWING CONDITIONS: (1) ALL ACCESS TO THAT MACHINE
OVER THE NETWORK SHOULD BE IN SUPPORT OF ARPA CONTRACTOR RESEARCH
ARPA OFFICE USE, OR DOD RESEARCH, (2) SOMEONE SHOULD PAY FOR THE
INITIAL COST OF THE CONNECTION AND THE YEARLY COST OF THE CONNECTION. 7b46b

I WILL BE HAPPY TO ARRANGE THE CONNECTION WHEN I GET APPROPRIATE
ASSURANCES FROM SRI REGARDING POINT #1 (PRESUMABLY NOPROBLEM) AND WHEN
I HEAR FROM SRI HOW THE EXPENSES WILL BE PAID. 7b46c

BEST, CRAIG FIELDS 7b46d

14-NOV-74 1133-PST HARDY: Request to connect Office-2 to the Tymshare TIP.
Distribution: PEARCE AT ISI, hardy, norton, watson, young at isi, fields at isi,, russell at isi, carlson at isi
Received at: 14-NOV-74 11:33:50 7b47

< HARDY, OFFICE-2.NLS;5, >, 14-NOV-74 11:20 MEH ;;;; 7b47a

Pearce:
Here are the two sndmgs discussing our request to connect a second host

My NLS Initial File The Way it Was 2/26/75.

computer (Office-2) to the Tymshare TIP by Jan 1 75 to provide Workshop
Utility Service (NLS) to APRA contractors, with emphises on service to
the NSW program. 7b47b

11-NOV-74 1219-PST HARDY: Request to Connect a Second SRI-ARC
Computer (Office-2) to the ARPA network via the Tymshare TIP.
Distribution: YOUNG AT ISI, hardy, norton
Received at: 11-NOV-74 12:19:08 7b47c

< HARDY, TYMTIP.NLS;6, >, 11-NOV-74 10:23 MEH ;;;; 7b47d

Starting Jan 1975 SRI-ARC intends to operate a second pDP-10
computer
host similar to it's Office-1 host located at Tymshare Inc.
Similarly
ARC will use this host computer to provide Workshop Utility Service
(NLS) to ARPA funded contractors on a contractual basis. 7b47e

The Office-1 computer connects to the ARPA network via the Tymshare
TIP. It is necessary that we connect this second computer
(Office-2)
to the Tymshare TIP also. I have been informed by BBN that this is
possible. However, the Tymshare TIP is not configured for two host
computers and will require additional hardware and your approval.
BBN
also informs me that there is a spare TYmshare TIP host interface
already paid for that could be used for this second host connection
if
it is approved. 7b47f

Originally the Tymshare TIP was installed to connect Office-1 to
provide a stable reliable NLS resource service to ARPA contractors.

This second host will extend that service, with the emphasis on special services to the National Software Works (NSW) program. 7b47g

...martin.. HARDY@SRI-ARC 7b47h

8-NOV-74 0935-EST MCKENZIE at BBN-TENEX: Second Host at Tymshare TIP
Distribution: HARDY AT SRI-ARC, mckenzie
Received at: 8-NOV-74 06:36:04 7b47i

Martin:
The Tymshare TIP is not currently configured to handle two Hosts.
First, you should determine whether a "local" Host interface or a "distant" Host interface is required (see BBN Report #1822).
Then you should determine whether the government will permit the connection, and if they will, whether they wish to use an already-purchased "spare" interface or if you must purchase a new interface. There are two possible ways to persue this topic:
1- I believe the "formal" approach is to discuss the situation with Charles Pearce (PEARCE@ISI) or Mike Young (YOUNG@ISI) of Range Measurements Lab.
2- If the second Host is being added at ARPA's request, then you could talk to whoever in the ARPA office is handling the project.
If the result is that an existing "spare" should be used, then the government must merely tell us to install it at Tymshare, and we will do so as soon as possible. If you must yourselves pay, then someone will have to figure out how to get your money to BBN; this is a complicated subject because the government must end up owning the interface.
Regards,
Alex 7b47j

MEH 26-FEB-75 08:39 25481

My NLS Initial File The Way it Was 2/26/75.

...martin... HARDY@SRI-SRI, or HARDY@OFFICE-1 7b47k

11-NOV-74 1504-PST PETERS: ARC DIRECTORIES AT OFFICE-1
Distribution: NORTON, HARDY
Received at: 11-NOV-74 15:04:07 7b48

THE NEW DIRECTORIES <HARDY>, <MIRANDA>, AND <HARDWARE> HAVE BEEN
COMPLETED AND TESTED AND ARE READY TO USE AT OFFICE-1. THEY ARE
ALL NORMAL DIRS EXCEPT <HARDWARE> WHICH IS WHEEL, OPER, SPECIAL
ALLOCATION GROUP ETC. - JEFF 7b48a

11-NOV-74 1219-PST HARDY: Request to Connect a Second SRI-ARC Computer (Office-2) to the ARPA network via the Tymshare TIP.
Distribution: YOUNG AT ISI, hardy, norton
Received at: 11-NOV-74 12:19:08 7b49

< HARDY, TYMTIP,NLS;6, >, 11-NOV-74 10:23 MEH ;;;; 7b49a

Starting Jan 1975 SRI-ARC intends to operate a second PDP-10 computer
host similar to it's Office-1 host located at Tymshare Inc. Similarly
ARC will use this host computer to provide Workshop Utility Service
(NLS) to ARPA funded contractors on a contractual basis. 7b49b

The Office-1 computer connects to the ARPA network via the Tymshare
TIP. It is necessary that we connect this second computer (Office-2)
to the Tymshare TIP also. I have been informed by BBN that this is
possible. However, the Tymshare TIP is not configured for two host
computers and will require additional hardware and your approval. BBN
also informs me that there is a spare Tymshare TIP host interface
already paid for that could be used for this second host connection if
it is approved. 7b49c

Originally the Tymshare TIP was installed to connect Office-1 to
provide a stable reliable NLS resource service to ARPA contractors.

My NLS Initial File The Way it Was 2/26/75.

This second host will extend that service, with the emphasis on special
services to the National Software Works (NSW) program. 7b49d

...martin.. HARDY@SRI-ARC 7b49e

11-NOV-74 0844-PST HARDY: Host interface
Distribution: POLLACK AT OFFICE-1, hardy
Received at: 11-NOV-74 08:44:18 7b50

Edward:
Sounds to me that in the long run the distant host interface would be your best bet, We use have a distant here, and from what I7m aware of the only difference is the cable driver stuff, one uses twisted pair and the other coaxial cable, I'm not sure of price differences.
...martin.. 7b50a

8-NOV-74 1700-PDT POLLACK at OFFICE-1: NETWORK INTERFACE
Distribution: NORTON, NORTON AT SRI-ARC, HARDY AT SRI-ARC, martinez, pollack
Received at: 8-NOV-74 17:01:31 7b51

JIM- WE ORDERED A LOCAL INTERFACE BUT I AM HAVING SECOND THOUGHTS.
THE LIMIT ON A LOCAL IS 30 FEET FROM HOST INTERFACE TO TIP. ON OFFICE-1 THE DISTANCE IS ABOUT 4 FEET SO WE HAVE A LOCAL. ON OFFICE-2 IT WILL BE EITHER 15 OR 35. I HOPE TO MAKE A FIRM DECISION ON PHYSICAL LOCATION OF OFFICE-2 MONDAY MORNING.
I'LL LET U KNOW THEN EXACTLY WHAT WE'LL GO WITH. I'M NOT AWARE
OF ANY DISADVANTAGE OF THE DISTANT HOST AND MAY PLAY IT SAFE AND JUST ORDER THAT BUT WILL TALK TO BBN AGAIN TO SEE IF
THERE IS ANY REASON WHY IT SHOULD BE AVOIDED IF POSSIBLE. 7b51a

GOT YOUR LETTER TO WARREN. ALSO WILL HOPEFULLY HAVE FIRM PRICES
TO YOU MONDAY AFTERNOON OR AT WORST (I HOPE)TUESDAY. I NEED ONLY
30 HOURS A DAY FOR US ALL TO GET THIS DONE. WE'LL BE WORKING HARD ON
SCHEDULING ALL THE EVENTS REQUIRED FOR IT ALL TO HAPPEN BUT IT IS
CERTAINLY GOING TO BE CLOSE ALL AROUND. 7b51b

TALK TO U AGAIN MONDAY. HAVE A GOOD WEEKEND. SAN DIEGO WAS A FUN

TOWN. I CAN RECCOMMEND SOME NICE SPOTS. ANY IDEAS FOR PHILLY?
(THAT'S WHERE I HEAD OFF TO NEXT WEEK.) 7b51c

BYE
...EDWARD 7b51d

8-NOV-74 1404-PST HARDY: Network interface for Office-2.
Distribution: POLLACK AT OFFICE-1, hardy
Received at: 8-NOV-74 14:04:58 7b52

Ed:
Did you order a LOCAL or DISTANT Net interface?
Also, what is the Office-1 one?
...martin.. 7b52a

8-NOV-74 0935-EST MCKENZIE at BBN-TENEX: Second Host at Tymshare TIP
Distribution: HARDY AT SRI-ARC, mckenzie
Received at: 8-NOV-74 06:36:04 7b53

Martin:
The Tymshare TIP is not currently configured to handle two Hosts.
First, you should determine whether a "local" Host interface or
a "distant" Host interface is required (see BBN Report #1822).
Then you should determine whether the government will permit the
connection, and if they will, whether they wish to use an already-purchased "spare" interface or if you must purchase a new
interface. There are two possible ways to persue this topic:
1- I believe the "formal" approach is to discuss the situation with
Charles Pearce (PEARCE@ISI) or Mike Young (YOUNG@ISI) of Range Measurements Lab.
2- If the second Host is being added at ARPA's request, then you
could talk to whoever in the ARPA office is handling the project.
If the result is that an existing "spare" should be used, then the
government must merely tell us to install it at Tymshare, and we will
do so as soon as possible. If you must yourselves pay, then someone

will have to figure out now to get your money to BBN; this is a
complicated subject because the government must end up owning the
interface,
Regards,
Alex 7b53a

7-NOV-74 1337-PST HARDY: Second Host connection for Tymshare TIP.
Distribution: MCKENZIE AT BBN-TENEX, hardy
Received at: 7-NOV-74 13:37:25 7b54

Alex:
I am not sure if you can help me but perhaps if not you can piont me to the right guy?
We (ARI-ARC) intend to operate a second PDP-10 NLS computer facility (Office-2) starting about Jan 1 1975. This facility Like Office-1 will connect to the Tymshare TIP. ARC administers that TIP and we would like to know if it is configured to operate two host computers? If not we need to know the process byy which we can get it configured as soon as possible. Any help you can give would be greatly appreciated. 7b54a

oops: (ARI-ARC) really should be (SRI-ARC).
...martin , HARDY@SRI-ARC... 7b54b

7-NOV-74 0914-PDT NORTON at OFFICE-1: finding Rod today
Distribution: MCLINDON, norton, hardy at sri-arc, hardware at sri-arc,, bondurant at sri-arc
Received at: 7-NOV-74 09:15:40 7b55

Connie: So the equipment did arrive, Today is the ONR presentatin, I think, Rod may well be at ONR with Lieberman and Engelbart,.most of the day, a telephone number probably still operative and "near" Marvin Dennicoff's office at ONR: (202) 692-4304 Suspect too that Rod may be at the Marriott tonight, but m not at ARC now, so not sure of his scheduled return to the West (Friday, maybe?).. 7b55a

Martin: Any ideas? Jim 7b55b

6-NOV-74 1440-PST NORTON: Advance Copy: Journal Item 24427 Tymshare TENEX Service to Support OFFICE-1 and OFFICE-2 for the Year Starting 18 January 1975
Distribution: POLLACK AT OFFICE-1, hardy
Received at: 6-NOV-74 14:40:58 7b56

MEH 26-FEB-75 08:39 25481

My NLS Initial File The Way it Was 2/26/75.

Edward: Here's a copy of what we are mailing to yo and Warren Prince today: 7b56a

AUGMENTATION RESEARCH CENTER (ARC)
STANFORD RESEARCH INSTITUTE 7b56b

To: Warren Prince, Tymshare, Inc. 6 November 1974 7b56c

From: Jim Norton, ARC cc: Edward Pollack, Martin Hardy 7b56d

- 7b56e

At the meeting Martin Hardy and I had with you and Ed Pollack at
Tymshare last Wednesday afternoon, we agreed that I would present you
with our estimate of the funding ARC is gathering that will support
both the present OFFICE-1 and the planned OFFICE-2 PDP-10 facilities
during the second Workshop Utility Service year, starting this January.
Our estimates are presented below. 7b56f

Also note that the Institute submitted to Tymshare, on 1 November, a
Request for Proposal for Continuation of SRI Subcontract No. 13872.
Several alternative computer system configurations are now under
study at ARC, with the amount of memory, drum, and disk capacities
being the variables. We will decide on the appropriate configuration
soon after receipt of your Proposal. 7b56g

The system we will need this January has as its core two PDP-10 KA
TENEX CPU's with BBN pagers and ARPANET interfaces. The first is, of
course, the OFFICE-1 machine you are now operating for us. As we
discussed, the most likely CPU and pager to meet our timing
requirements for the second machine is the one at Stanford University.
After discussions we have had with Dr. Licklider and Al Blue

at ARPA,
Stanford is now in a position to negotiate with you on this matter,
Timing pressures do seem to exist for all of us, including Stanford,
Their need for a DEC KI machine as early as possible in December still
exists, I am told, If you are in a position to help them in this
matter, I know they will be most appreciative, 7b56h

Although, as the RFP states, SRI is not yet in a position to
negotiate the extension contract, we at ARC do believe we have a
reasonable assessment of the funding that will be forthcoming for
such support on the basis of our telephone discussions and personal
visits to clients' sites during the past few weeks, 7b56i

Here is the presently planned two-machine loading starting 18 January
1975 on OFFICE-1 and OFFICE-2, We are still looking at what will be the
best balance of standard and special service users between the two
machines, 7b56j

The OFFICE-1 machine will support an estimated 25 concurrently
running userjobs with a full configuration (256k core and 3 or 4
drums), we think, The OFFICE-2 machine, due to the heavier computing
loading, will support an estimated 20 simultaneous userjobs, (256k
core and 4 drums), 7b56k

OFFICE-1 (Standard Workshop Utility Service) 7b56l

Users	Slots	(# of guaranteed concurrent user jobs)	7b56m
RADC	5	Rome Air Development Center	7b56n
Bell	1	Bell Canada (they dial in direct)	7b56o

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My NLS Initial File The Way it Was 2/26/75.

ARPA	5	ARPA offices' use (35-40 people now using)	7b56p
MIT-Ssmc	2	Part of NMRO Seismic program	7b56q
SRI	1	SRI bought a slot themselves	7b56r
ETS	1	ARPA CBI program,,to continue we hope	7b56s
BRL	1	Ballistic Research Labs, Maryland	7b56t
NSRDC	2	Naval Ship Res and Dev Center, Maryland	7b56u
Hudson	1	Hudson Institute, ARPA contractor, New York	7b56v
NSA	1	NSA use getting ready for NSANET NLS use	7b56w
AFAuditA	1	So. Calif AF Audit people: good mgt people	7b56x
NIC-users	1	Access to NIC database via ARPANET	7b56y
NIC-Oper	1	Operational use by Feinler's NIC staff	7b56z
-----	-		7b56a@
Total	23	just about full (2 slots left to sell)	7b56aa

This represents funding of about $ 920k/year (at $40k per slot per year) behind OFFICE-1 alone, including funding for our subcontract with Tymshare and for additional services to be provided by ARC that include NLS software, hardware, administration, special documentation, user development, and consultation efforts, 7b56ab

We now have several additional organizations very interested, enough so that it looks as if we will have to put some of them on a waiting list for Office-3, which we are considering starting next summer, 7b56ac

They include: NIOSH, DCA, DOT, Public Technology Inc, and several Army and Navy organizations. Others will follow, we are quite sure, accessing the service via the ARPANET or other means as appropriate. 7b56ad

OFFICE-2 (NSW and ARC Special Workshop Service) 7b56ae

(NSW = National Software works program
AF and ARPA sponsored) 7b56af

Users	Slots	Funding first 6 months ($000)	
MCA	5	100	Mass Comp Assoc: bcpl programming 7b56ah
ARPA-NSW	4	80	AF use of NLS,,part of NSW involvement 7b56ai
ARC-NSW	5	100	Watson's NSW development ARPA contract 7b56aj
ARC-OH/ADAG	2	40	Watson's Development Grp Overhead 7b56ak
ARC-OH/AAG	1	20	Norton's Applications Grp Overhead 7b56al
ARC-OH/Gen	1	20	Arc general Overhead 7b56am
ARC-UTIL	2	-	Split by OFFICE-1,2 Users 7b56an
-----	-----	---	7b56ao
Total	20	360	- $720K/year includes 2+ ARC staff 7b56ap

We expect that the NSW funding listed above will be continued after June 1975, for this year is the start of a major ARPA/AF program, with more work anticipated to follow. ARC Overhead funding is a line item in our ARC 1975 SRI Budget now in the process of final resolution. 7b56aq

My NLS Initial File The Way it Was 2/26/75.

We hope the foregoing will aid you in your decision about the immediate
acquisition (at your risk) of the Stanford PDP-10 CPU, pager and
associated equipment. Should you or Edward wish to discuss this
further, please call or sndmsg to: NORTON@SRI-ARC. 7b56ar

Sincerely,

Jim Norton

Assistant Director
Augmentation Research Center
Stanford Research Institute 7b56as

5-NOV-74 2243-PDT BAIR at OFFICE-1: Policy on the establishment of new directories
Distribution: MARTINEZ, OPER, LEE, PETERS, norton, lieberman at sri-arc, hopper, hardy at sri-arc
Received at: 5-NOV-74 22:44:04 7b57

A new policy has been implemented by Jim Norton so that requests may be honored by Tymshare for new dirs from myself and Susan Lee (the Arpa users). The standard format should be used and sent to Jeff, Bob, Marsha, JCN, and JHB for each request.
The present coordination between Jeff, Bob, and Marsha works great. Thanks, Jim 7b57a

4-NOV-74 1205-PDT LEHTMAN: New cassette program for Phoenix machine test
Distribution: HARDY, LEAVITT, watson, lehtman
Received at: 4-NOV-74 12:05:12 7b58

I've written and loaded a version of the Cassette program which knows about the 3-Phoenix machine. If we ever get one which works, we can test it out. If we really wanted the Phoenix machine, the cassette program could be made
more elaborate to take advantage of features not available on the
Termicette or Techtran. The program is <lehtman>cas2.sav; 7b58a

Please let me know when we have amachine to test. Also, we

should
check to see if cas2 works with techtran and termicette, 7b58b

HGL 7b58c

4-NOV-74 1055-PDT HARDY: ONR and TV's
Distribution: HARDWARE, lieberman, hardy
Received at: 4-NOV-74 10:55:27 7b59

Hi Rod: good news about the car (money talks,.) Let us know the status of the equipment and any trouble you might encounter, If you are busy Wednesda I think we can set it up as long as you checked it all out befor e Wednesday, Robert and Martin 7b59a

4-NOV-74 0815-PDT HARDWARE at SRI-ARC: none
Distribution: HARDY AT ARC
Received at: 4-NOV-74 08:15:49 7b60

hello , have arrived in fine shapedid get a car without any trouble AM going to onr to see if i can get a room to test that tv stuff on wed since it can't be set up for real until 3 pm wed was snowing in denver 7b60a

31-OCT-74 1616-PDT LEAVITT: Testing of Cassette Program Modifications
Distribution: LEHTMAN, hardy, peters, bair, norton
Received at: 31-OCT-74 16:16:03 7b61

Harvey,
I ran the dex program using the techtran device, and as far as I can see there are no problems,
I have been loading it from <lehtman>casETTE, but I see no reason why it shouldn't be brought up as the running version, from my user standpoint,
Jeanne L, 7b61a

31-OCT-74 1412-PDT LEHTMAN: Cassette Program
Distribution: LEAVITT, HARDY, PETERS, bair, norton
Received at: 31-OCT-74 14:12:35 7b62

Does anyone know the status of he cassette program modification I made several weeks ago? As far as I know, the mod
was successful, but I don't know if it has been brought up as the
running version here and at OFFICE-1,, Last I heard was that
Jeanne was going to do some tests, What's the story? 7b62a

My NLS Initial File The Way it Was 2/26/75.

HGL 7b62b

22-OCT-74 1018-PDT JOHNSON:
Distribution: HARDY
Received at: 22-OCT-74 10:18:27 7b63

mark will take 4 hours vacation today and all day tomorrow if its ok, he will try to call you later today or tomorrow. 7b63a

18-OCT-74 1554-PDT JOHNSON: Rod's Trip to MITRE
Distribution: COSELL AT BBN-TENEX, hardy
Received at: 18-OCT-74 15:54:02 7b64

Rod will not be coming to MITRE on Monday. It looks like we won't be able to schedule the trip until later in the week. We will call you on Monday. Sorry for any inconvience.
--Martin 7b64a

18-OCT-74 1021-PDT HARDY: directory for me at office-1
Distribution: NORTON, hardy
Received at: 18-OCT-74 10:21:24 7b65

Jim:
I am doing more and more on-line (sndmsg stuff) work directly related to office-1 contract. I should be doing this on the office-1 machine, Can I get a directory there as soon as possible?
...martin.. 7b65a

17-OCT-74 1324-PDT HARDY: requesting tymshare to bid next years system
Distribution: NORTON, hardy
Received at: 17-OCT-74 13:24:37 7b66

Jim:
If we don't request Tymshare to bid our next years system soon (this week or early next) we will have a timming problem and ARPA negotiations will not be complete by first of year. If we do not know exactly what configuration we will want, we sshould request a bod bid for the stuff we do and what we speculate. We could ask them to give us a cost for exchanging particular equipment (like the drum) before end of next year. I expect this would not be to bad cost wise if tymsare has the equip
nt around and what we want to exchange is something they did not have to bbuy specifically for us.
In any case we should do something very soon.
P.S.

My NLS Initial File The Way it Was 2/26/75,

perhaps if you have a copy of the last request for bid form tymshare ZI could read it to come familiar with it before this next go around,,
...martin,, 7b66a

17-OCT-74 1112-PDT HARDY: justification for tymshare supply order
Distribution: JOHNSON, hardy
Received at: 17-OCT-74 11:12:45 7b67

Sandy:
Type up the following,
These supplies are needed to support our Office-1 computer service provided by Tymshare Inc, It is cheaper to purchase these supplies from them because they buy in bulk and will pass these saving on to us, In addition, we save the overhead cost of purchasing from several suppliers. 7b67a

17-OCT-74 1021-PDT JOHNSON:
Distribution: HARDY
Received at: 17-OCT-74 10:21:59 7b68

tom little needs justification for tymshare order for 4000 dollars..... 7b68a

16-OCT-74 1133-PDT IRBY: tip buffer sizes
Distribution: HARDY
Received at: 16-OCT-74 11:33:15 7b69

have you found out how big they are yet?? -- Charles. 7b69a

15-OCT-74 0922-PDT WATSON: TIP Buffer situation
Distribution: NORTON, ENGELBART, LIEBERMAN, HARDY
Received at: 15-OCT-74 09:22:27 7b70

Reading Martins note on the TIP buffer situation indicates we have a serious problem and I would recommend that we not market Line Proecessors further unless we can guarantee adequate buffers at both the Tenex and TIP ends, We need to get a much better agreement with ARPA about the importance of what we are doing and solicit their help in resolving the issues, Its important to note tthat OFfice 1 is also not supporting the appropriate sizee buffers because there is a suspected bug that noone
s looking for, Dick 7b70a

10-OCT-74 0939-PDT LEAVITT: work
Distribution: HARDY
Received at: 10-OCT-74 09:39:40 7b71

MEH 26-FEB-75 08:39 25481

My NLS Initial File The Way it Was 2/26/75.

Status of the 3 files I am working on for you.
1) The draft called CONTRACTS sits in leavitt,con,). It's ready for you to work on.
2)The draft called HARDWARE is stuck in my directory in a file called buggy,jm1). I can't get the DEX command to turn it into an NLS file and no one will help me because they say only harvey can fix it easily cause its his project.
3)The notebook to edit (the microprocessor paper). I'm calling back a version of that file FREP from archive so I can work on it. Hopefully we have some version in archive that somewhat matches the draft editing worked on. 7b71a

9-OCT-74 0721-PDT WATSON: lessons of the recent past
Distribution: ENGELBART, NORTON, IRBY, ANDREWS, PETERS, HARDY, VICTOR,, HOPPER
Received at: 9-OCT-74 07:21:10 7b72

gentlemen: There are a cople of observations from the fiasco of yesterday and recent experience with office 1 and line processor that could help us in the future.
1) Operations should have some contingency plans for events such as yesterday, know where to find monitors with appropriately set buffers, know where the latest versions of nls are etc. Between the slow speed caused by the small buffers and having to hit reset on every jump command we had to abandon the demonstration and switch to the movie and talk. The top management of the data services center were polite and sympathetic but it was still unnecessarily embarrassing.
2) Plan B had been to use Office 1 as backup. Response was so poor even when illegally setting mrp to 40% that delays to execution of simple things was to be measured in 10s of second to minutes. There is no way development will be able to use ooofice 1 unless we find out whats happening and get that system properly configured. Office 1 will also quickly lose its customers , NSW will fail. When I get back I would like to have ameeting Mon with Bob L, DIA, CHI ,JDH, KEV to see what can be do
quickly to understand whats happening over there in retrospect and with the new memory.
3) The line processor at this end of the country is very sensitive to buffer sizes apparently. Even with no load it puts stuff on the screen in bursts of about 150 -200 chars with serious delays between bursts. We need to experiment with bigger Tenex and TIP buffer sizes as whats in use nnow seems too smalll by a factor of 2-5.
4) Jim I guess has a demo friday and we will have some important ones thurs and friday as yet unscheduled, would appreciate Jeff having some contingenecy plans etc as demos

seem to invite trouble.
I have seen the future and only some of it works. D8ck 7b72a

6-OCT-74 2109-PDT LIEBERMAN: Undelivered journal mail, re: KWAC minutes
Distribution: HARDY, RATNER AT OFFICE-1, HOPPER, BAIR, PETERS, lieberman
Received at: 6-OCT-74 21:09:43 7b73

Please see (24167,) for KWAC minutes. The journal system has not been delivering myy mail this week. Thanks, ROBERT 7b73a

1-OCT-74 1401-EDT MALMAN: EXTREMELY IMPORTANT NEWS RE TIP ACCESS CONTROL AND ACCOUNTING
Distribution: ENGELBART, NORTON, WATSON, IRBY, HARDY, RATNER AT OFFICE-1
Received at: 2-OCT-74 16:18:02 7b74

DEAR TIP USER: 7b74a

BEGINNING DECEMBER 1, 1974 ALL ACCESS TO THE ARPANET THROUGH TIPS WILL BE CONTROLLED BY A LOGIN PROCEDURE. AFTER CONNECTING TO A TIP IT WILL BE NECESSARY TO TYPE YOUR NAME IDENTIFIER AND SECRET PASSWORD. IF YOU CANNOT SUCCESSFULLY LOGIN YOU WILL BE DISCONNECTED. 7b74b

BEGINNING NOVEMBER 1, 1974 THE SYSTEM WILL START A TESTING
PHASE DURING WHICH ANY NAME IDENTIFIER AND PASSWORD WILL WORK. 7b74c

IN ORDER TO GET AN ACCOUNT YOU SHOULD BE AN AUTHORIZED USER AND SUBMIT A REQUEST. AUTHORIZED USERS ARE (1) ARPA CONTRACTORS USING THE ARPANET IN SUPPORT OF THE WORK OF THEIR ARPA CONTRACT, OR (2) MILITARY PERSONNEL
OR PERSONNEL OF NATIONAL SECURITY AGENCIES USING THE NETWORK FOR R & D PURPOSES. USERS OF THE NETWORK WHO DO NOT FIT INTO EITHER CATEGORY ARE ENCOURAGED TO MAKE A SPECIAL
REQUEST FOR ACCESS. 7b74d

IN THE FUTURE, THERE WILL BE A CHARGE FOR TIP USEAGE.
HENCE, REQUESTS FOR ACCOUNTS MUST CONTAIN INFORMATION ABOUT THE INDIVIDUAL REQUESTING THE ACCOUNT AND THE ORGANIZATION THAT WILL PAY FOR THE ACCOUNT. THE INFORMATION ABOUT THE ORGANIZATION MUST BE ACCOMPANIED BY AN AUTHORIZED SIGNATURE. THE REQUEST MUST INDICATE SPECIFIC TIPS TO BE ACCESSED.

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FOR THE OWNERS OF SOME TIPS MAY WISH TO RESTRICT ACCESS. SPECIAL ACOUNTS WILL BE AVAILABLE ALLOWING ACCESS TO ALL TIPS. THESE WILL BE ASSIGNED TO OPERATORS AND MAINTAINERS OF THE NETWORK, AND OTHERS UNDER EXTRAORDINARY CIRCUMSTANCES, BY REQUEST. 7b74e

INDIVIDUAL INFORMATION: NAME IDENTIFIER, FULL NAME, PASSWORD REQUESTED,
ADDRESS, TELEPHONE NUMBER, NETWORK ADDRESS (IF ANY), AND LIST OF TIPS TO BE ACCESSED.
PAYING ORGANIZATION INFORMATION: NAME, NAME OF AUTHORIZING INDIVIDUAL, ADDRESS AND TELEPHONE NUMBER OF AUTHORIZING
INDIVIDUAL 7b74f

CHARGES FOR TIP USE WILL BEGIN IN FY76, AND A CHARGING
SCHEME HAS NOT YET BEEN WORKED OUT. SUGGESTIONS ARE WELCOME. 7b74g

PLEASE SEND LETTERS (NOT NETWORK MAIL) REQUESTING ACCOUNTS TO: 7b74h

DR. CRAIG FIELDS
ARPA
1400 WILSON BLVD.
ARLINGTON, VIRGINIA 22209 7b74i

CRAIG FIELDS 7b74j

_qui 7b74k

27-SEP-74 0745-PDT NORTON: Meeting Today at 2pm
Distribution: BAIR, LIEBERMAN, RATNER AT OFFICE-1, HOPPER, engelbart, norton, hardy
Received at: 27-SEP-74 07:45:15 7b75

There will be a meeting today at 2pm in the conference room to discuss Applications planning,,the factors involved andsome scenarios. Between many of os, there have been planning discssions that have been very helpful to me, Now is the time to combine forces to help me (us) get a better picture together, We have to make some important decisions soon that will have a direct bearing on what our growth, staffing, and other targets are, a Hint: be prepared to think big. Jim 7b75a

(big is not dropping characters,,as above?) 7b75b

MEH 26-FEB-75 08:39 25481

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NIC 7c

28-JAN-75 1440-PST HARDY: Locks for NC (P.S.).
Distribution: JOHNSON, hardy, feinler
Received at: 28-JAN-75 14:40:49 7c1

Sandy:
I forgot to mention that we also want to put locks on all the file cabinets in the NIC room. Some already have them. We want the type that is built in (like the ones that are already installed).
Please request these locks also. Thanks again
martin 7c1a

28-JAN-75 1436-PST HARDY: Locks for NIC
Distribution: JOHNSON, hardy, feinler
Received at: 28-JAN-75 14:36:42 7c2

Sandy:
Would you please call security? or maintenance? and request they put two locks on the NIC room J2028. The room has four doors. We want locks on only two; one the door nearest the printer room, and the other the door nearest Jeffs office. We want a lock without handle on the door nearest Jeff. Please ask them to do as soon as possible and let me know their reply.
thanks
martin 7c2a

JAKE 26-NOV-74 18:47 24622
TIP Access Request Letter
Location: (GJOURNAL, 24622, 1:w)
*****Note: [INFO-ONLY] ***** 7c3

ME 7d

11-FEB-75 1417-PST HARDY: My computer room phone extention
Distribution: JOHNSON, hardy
Received at: 11-FEB-75 14:17:40 7d1

Please have it disconnected.
thanks
..martin.. 7d1a

30-JAN-75 1643-PST HARDY: Brown Box Coupler
Distribution: JOHNSON, hardy
Received at: 30-JAN-75 16:43:05 7d2

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Sandy:
You do remember that I loaned one to a frend? If we must now return them ?, I can fetch..
martin 7d2a

17-JAN-75 0913-PST JOHNSON:
Distribution: HARDY
Received at: 17-JAN-75 09:13:05 7d3

you turkey
i think the beach will be lovely today 7d3a

17-JAN-75 0824-PST HARDY: ME
Distribution: JOHNSON, hardy
Received at: 17-JAN-75 08:24:20 7d4

SANDY:
I STILL DON'T FEEL SUPER TODAY SO I DON'T THINK I WILL COME IN.P.S
TIMECARD..
CHARGE ONE DAY TO 3074 THE REST (EXCEPT FRI; SICK) TO OVERHEAD.
MARTIN.. BYE SEE YOU MONDAY 7d4a

26-DEC-74 0903-PST HARDY: me
Distribution: NORTON, hardy, johnson
Received at: 26-DEC-74 09:03:47 7d5

Jim:
Still under the weather, Cought the Flu Sunday last and spent most of Xmas day in bed, Feal some what better today but still pimpy, expect to shake it by Mon, see you then..
martin.. 7d5a

19-DEC-74 1020-PST HARDY: Me
Distribution: NORTON, hardy, johnson
Received at: 19-DEC-74 10:20:13 7d6

Jim:
Hi, I am going to try and stay home for the rest of the day today and all day tomorrow. If there is anything HOT please call and I will take care of. I will check my mail in the morring and most likely come in over the week-end .
...martin.. 7d6a

EPAC 7e

16-DEC-74 1116-PST HARDY: EPAC East Lineprocessor Workstation

My NLS Initial File The Way it Was 2/26/75.

Distribution: NORTON, hardy
Received at: 16-DEC-74 11:16:34 7e1

Jim:
Dave Brown's Memo to you Dec 3 states that the EPAC project 2513 no longer needs the Delta Data Mouse Keyset and Modems at SRI-Wash. Dave would like to stop paying for that equipment by the end of this year. He says some other people may be interested in using (talk to him for more detail and names, or say so and I will).
Unless I hear from you otherwise I will make arrangements next week to have the equipment returned and the line disconnected.
...martin... 7e1a

ARPA/RADC 7f

13-FEB-75 0844-PST HARDY: MITRE TIP Buffer Space.
Distribution: BRIGNOLI AT OFFICE-1, hardy, hardware
Received at: 13-FEB-75 08:44:23 7f1

Frank:
The project that was using the 208A modem connection we have connected to the MITRE TIP no longer needs it. However, we foresee a need again in a few months. In the mean time if it will help your case tell iseli that it is alright with us if he gives you those buffers.
...martin... 7f1a

12-FEB-75 1025-PST BECK: Equipment at ARPA
Distribution: HARDY, BONDURANT
Received at: 12-FEB-75 10:25:15 7f2

We got the Lineprocessor equip installed and they all tested out all right.
I'm mailing back the replaced stuff. So far so good.
Thanks. 7f2a

7-FEB-75 0539-PST BECK at OFFICE-1: Many thanks for the yellow tables
Distribution: HARDY AT SRI-ARC, HARDY, BAIR AT SRI-ARC, NORTON AT SRI-ARC
Received at: 7-FEB-75 10:05:19 7f3

The ARPA people love them!! Bright yellow is an unusual and welcome addition to the decor here. One is on the 8th floor--Connie's office--so will be great for demonstrations as well as for people here to work at; the other is on the 10th floor where it is being ussed by 3 beginning DNLS users

(we had a hard time deciding who should be the lucky ones). And Keydata (and children) thanks you for the Great wooden boxes they arrived in. 7f3a

30-JAN-75 0958-PST HARDY: G.E. 1200 Baud TermiNet.
Distribution: RUSSELL AT ISI, hardy, norton, jordan at office-1, beck
Received at: 30-JAN-75 09:58:04 7f4

Dave:< HARDY, GE.NLS;1, >, 30-JAN-75 09:51 MEH ;;;; 7f4a

In Sept 74 we ordered a 1200 baud G.E. TermiNet terminal for use on SRI EPAC project 2513. This terminal was delivered to SRI-WASH then later moved to the ARPA office. 7f4b

Dave Brown and Arlie Capps have informed me that project 2513 has been extended, but without funds to continue leasing the TermiNet. 7f4c

I have asked Reta Jordan to make arrangement with the leasing company to have the Terminett removed from the ARPA office and installed here at SRI for use on another project. 7f4d

If for some reason you would like to keep the TermiNet and transfer the lease please advise, 7f4e

..martin.. HARDY@SRI-ARC 7f4f

29-JAN-75 1121-PST HARDY: workstation tables for ARPA
Distribution: NORTON, hardy, johnson
Received at: 29-JAN-75 11:21:58 7f5

Jim: 7f5a

We have 10 or so tables, Ittakes about 2 to 4 weeks to get more, this means that we could get more by March 1 if we sent 4 to ARPA now.
If for some reason construction takes longer we can double up the smaller ones.
martin.. 7f5b

29-JAN-75 0904-PST HARDY: Sandy:

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Distribution: JOHNSON, hardy, norton
Received at: 29-JAN-75 09:04:30 7f6

Sandy:
As you know Jim N is at ARPA. He would like to know construction cost of a Workstation (the large tables we just had built) and how much it would cost to ship to ARPA. He needs this info this morning, so would you find the work order and match it with the PSR showing the costs, and ask receiving to estimate shipping costs (give them sort of general dementions and weight).
thanks
..martin.. 7f6a

29-JAN-75 0653-PST NORTON: Workstation Tables for ARPA
Distribution: HARDY, norton
Received at: 29-JAN-75 06:53:10 7f7

I'm thinking of sending 4 of the new workstation tables to ARPA to solve their configuration problem...a question: Can we spare 4 now? How long to replace them by having more built? How much do they cost? How about shipping cost...like stacked [] [] offset
Since they are just the right thing for the terminal and ARPA cant get them easily I do want to find a way to help them out...let me know fairly early today if you can so I can discuss with COnnie? Thanks Jim 7f7a

28-JAN-75 1501-EST KEYDATA at BBN-TENEX: PORT PARAMETERS FOR FOURTH LINE PROCESSOR AT ARPA-TIP
Distribution: MALMAN, mclindon at isi, plynch at isi, hardy at sri-arc,, bondurant at sri-arc
Received at: 28-JAN-75 17:08:13 7f8

JOEL,
PLEASE SET ARPA-TIP PORT #5 WITH THE SAME PARAMETERS AS 3, 6 , AND 7,
TO WHIT: NO HUNT, 2400 IN,4800 OUT,D R 697...DELTA-DATA LINE PROCESSOR
BUFFERS ARE ALREADY SET TO 56 IN AND 134 OUT. 7f8a

THE FOURTH DELTA-DATA PROCESSOR WAS SENT
YESTERDAY...PROBABLY WONT ARR-
IVE 'TILL LATE THIS WEEK OR SOMETIME NEXT WEEK. PORT 5 USED TO BE THE
IMLAC PORT.(SINCE THE IMLAC IS NOT IN USE, ITS PORT SEEMS THE LOGICAL
CHOICE.) I MENTIONED TO ROD BONDURANT THAT WE MIGHT USE

My NLS Initial File The Way it Was 2/26/75.

#1, SO IF YOU
GET ANY MSG FROM HIM OR HARDY , READ IT AS 5, 7f8b

THANKS, 7f8c

ALX 7f8d

27-JAN-75 0548-PST BECK at OFFICE-1: Sick Delta Data on 8th floor ARPA (Connie's dept)
Distribution: HARDY AT SRI-ARC, BONDURANT AT SRI-ARC
Received at: 27-JAN-75 05:48:00 7f9

-- 7f9a

I'm sorry I didn't tell you that the Delta Data repairman had
been here. But he has worked on it twice, replacing sets of cards; each time he was here, it wouldn't go blank while he was
here, so he couldn't tell if it was fixed. But we are still having trouble with it (the screen will go blank all of a sudden,
leaving one's job in a wierd state) and I have placed another
call with their answering service. Connie is feeling fairly frustrated about this workstation's problems, so I haven't told
her it did it again. My response is to leave it off for a while,
rescue my job to some safe place from another terminal, and then
to turn the LP/DeltaData on again and attach to my job. We just
need the terminal too much to be able to leave it in its blank
state till repairman gets here. Even so the whole trip is inconvenient if a new user is using the workstation, 7f9b

1 7f9c

--------- 7f9d

22-JAN-75 1603-PST HARDY: Your Broken Delta Data, and the Fourth one,
Distribution: VANDERBURGH AT USC-ISI, MCLINDON AT USC-ISI,, BECK AT OFFICE-1, hardy, norton
Received at: 22-JAN-75 16:03:01 7f10

Connie:

My NLS Initial File The Way it Was 2/26/75,

We sentanother DD display to you today, should arrive tomorrow or the next, If Alex has time it would be nice if he could replace the broken one to see if it really is broken, Tommorrow, or the next, we will send you another Lineprocessor, Mouse, and Keyset to make up the fourth Lineprocessor Workstation.
P.S.
If Alex is still having trouble getting the service rep out to look at the display, let me know and i will see what I can do from here. 7f10a

16-JAN-75 1201-PDT ROETTER at OFFICE-1: Lineprocessor problem cont.
Distribution: HARDY AT SRI-ARC, bair at sri-arc, norton at sri-arc, feedback
Received at: 16-JAN-75 12:06:27 7f11

I'll give you a call next time it happens. 7f11a

In answer to the things you suggested, When this happens the mouse does not track, System reset has no effect and TIP commands are not recognized (seems its no respecter of commands - none do anything!). 7f11b

I edon't know whether to hope it happens again or not - but I'll call if it does. 7f11c

P.S. Don't forget Jeannie is here noW so if there is any news or helpful hints about lineprocessors send her a copy, Thanks 7f11d

16-JAN-75 0910-PST VANDERBURGH at USC-ISI: DELTA-DATA SERVICE
Distribution: HARDY AT SRI-ARC, vanderburgh, plynch
Received at: 16-JAN-75 09:21:08 7f12

MARTIN,
I SENT YOU A MSG AT OFFICE 1. I'LL REPEAT IT HERE JUST IN CASE YOU
ARE LIKE ME AND DONT READ MAIL AT OFFICE 1 TOO OFTEN. THE NEWEST DELTA-
DATA TERMINAL HAS A TENDENCY TO GET INTO A STATE WHERE THE TTY LIGHT
WILL NOT COME ON. THE CURE SEEMS TO BE TO TURN OFF POWER ; BUT IT DOES
NOT ALWAYS CURE IT. I TRIED TO CALL FRANK LASOTA,BUT HIS NUMBER SEEMS
TO HAVE BEEN DISCONNECTED. CAN YOU TELL ME WHAT TO DO? 7f12a

ALX 7f12b

MEH 26-FEB-75 08:39 25481

My NLS Initial File The Way it Was 2/26/75.

PLEASE REPLY TO VANDERBURGH @ISI 7f12c

16-JAN-75 0833-PST HARDY: Your message about suspected Lineprocessor problem.
Distribution: ROETTER AT OFFICE-1, hardy, bair, norton, feedback at office-1
Received at: 16-JAN-75 08:33:54 7f13

When that happens again you should give us a call to see if we can help. At first because you did not see any responce in the lights it sounded like the display goofed, however since you did not get auto loged out or detached this seems not likely. One thing you might check and do if it happens to you again: note if the mouse is still tracking and what happens when you push the reset button on the lineprocessor, also you might try typing the TIP intercept character (control y or at sign) to
e if the TIP responds.
martin., HARDY@SRI-ARC 7f13a

16-JAN-75 0730-PDT ROETTER at OFFICE-1: Lineprocessor problems
Distribution: BONDURANT AT SRI-ARC, HARDY AT SRI-ARC, FEEDBACK, norton
Received at: 16-JAN-75 07:30:06 7f14

Yesterday afternoon about 5 p.m. and again today about 10 minutes agoI was working in nls when the lineprocessor screen went blank. It wouldn't respond to anything except being turned off. (This is the one in Connie's office). 7f14a

When I typed on the keyboard the characters were not being sent or received, according to the lps lpr lrs lights. 7f14b

Last night my job didn't get detached in the whold process soI couldn't do anything with that job around and the file Iwas working on busy (can't attach to an UN-detached job.) Today my job got detached so that when I finally managed to get a screen back I could continue to work. 7f14c

Thought you should know the latest! 7f14d

JCN 23-DEC-74 21:40 24730
Proposal ISU 74-258 Continued NLS Workshop Support for RADC
Location: (GJOURNAL, 24730, 1:w)
*****Note: [INFO-ONLY] *****
7f15

Comments: Signed hardcopy printed today, to be mailed to

My NLS Initial File The Way it Was 2/26/75.

RADC tomorrow 12/24, In addition, an advance draft with complete cost estimate has been transferred to Stone's directory at office-1: radc,nls jcn 7f15a

9-DEC-74 0529-PDT LEE at OFFICE-1: status of ARPA-TIP post parameters
Distribution: HARDY AT SRI-ARC, BONDURANT AT SRI-ARC, hardware at sri-arc
Received at: 9-DEC-74 05:30:44 7f16

Keydata is maintaining a file at ISI describing port parameters of the ARPA-TIP. You might be interested in taking a look. For one thing the buffers have been decreased and are scheduled to be decreased again soon. This document gives all the amounts. It is at ISI and the name is:
<KEYDATA>TIP-BUFFERS.DOC 7f16a

For the most part all else is o.k. for now! 7f16b

27-NOV-74 0830-EST MALMAN at BBN-TENEX: ARPA TIP PORT 7
Distribution: HARDY AT SRI-ARC
Received at: 27-NOV-74 05:30:30 7f17

MARTIN,
IT IS DONE..... JOEL 7f17a

18-NOV-74 1949-PDT FEEDBACK at OFFICE-1: Internal string error with Imlacs
Distribution: KENNEDY, CAVANO, STONE, PANARA, LAFORGE, feedback, michael at sri-arc, maynard at sri-arc,, hardy at sri-arc, watson at sri-arc
Received at: 18-NOV-74 19:49:58 7f18

Hi, In responding to this latest notice about the problem when you use ? with the Imlac, I can forward good news! ARC is trying to rejuvenate its Imlac so that we can duplicate the problem and somehow fixthe bug. Its taking some doing to wire it up, move it, etc., and some day it might even be useful to find the bug. I say this in good humor because I know you've sent so many messages about the problem, and we are trying very hard to fix it.
The copy to our own people is just to remind us that you still are having the problem and that our programmers efforts are in great need. Please be patient -- I'll send you any news on the matter as soon as it happens. Best to all, Feed/jim 7f18a

7-NOV-74 1026-PST HARDY: Installing second Lineprocessor at

My NLS Initial File The Way it Was 2/26/75.

ARPA
Distribution: MCLINDON AT OFFICE-1, hardy, norton
Received at: 7-NOV-74 10:26:49 7f19

Connie:
Glad to see that the Linepr
second Lineproessor and display has arrived, Rod is still in the WASH area. He is working at MITRE with NCC people trying to resolve a TIP problem. Also he is helping Doug and Lieberman setup for an ONR demo scheduled for THUR (today). It is planned that he will install you second Lineprocessor Workstation beore returning to SRI-Menlo. However it is not sure when, this depends on when he finishes with at MITRE.
I have sent this message to Rod also, he will contact you soon to schedule installation.
...martin.. 7f19a

11-OCT-74 0847-PDT HARDY: Cassette recorder
Distribution: VANDERBURG AT USC-ISI, hardy
Received at: 11-OCT-74 08:47:59 7f20

There are several to choose from. I will send you some information on the ones that are compatible with our dex operating system. One thing you will need to decide is what tape capacity you will need (you will want to get all of one typed in file on one tape if at all possible, this will make it easier to load into the computer). Installation will require a large input buffer in the TIP (cassette date is spooled into the TIP a line at a time (max 80 characters, so yoou will need TIP buffer
handle it).
Talk to you later if you have more questions. I expect yu wiill get hardcopy information this Mon or Tue.
...martin.. 7f20a

11-OCT-74 1225-PDT HARDY: cassette recorder
Distribution: VANDERBURGH AT USC-ISI, hardy
Received at: 11-OCT-74 12:25:41 7f21

Ther are several to choose from. I will send you some infrmattion about the ones that are compatible with our Dex operating system. One thing you will need to decide is what tape capacity will be required: (you want a cassette recorder that can hold a complete file, if at all possible.) This will make it easier to load the file into the computer. The cassette recorder will require a TIP input buffer large enough to hold one line of text (80 characters).
Talk you you later if you have more questions. I expect

My NLS Initial File The Way it Was 2/26/75,

you will receive the hardcopy stuff Tue or Wed,
..martin.. 7f21a

10-OCT-74 1211-PDT VANDERBURGH at USC-ISI; TERMICETTE INFO
Distribution: HARDY AT SRI-ARC, keydata
Received at: 10-OCT-74 12:12:54 7f22

MARTIN: JIM NORTON TELLS ME YOU HAVE ALL THE GOOD STUFF ON TERMICETTES
AND OTHER TERMINAL TAPE RECORDERS. CAN YOU TELL ME A COUPLE OF
MANUFACTURER'S NAMES SO THAT I CAN GET PRICES AND THINGS LIKE THAT?
THANKS
ALX 7f22a

VANDERBURGH @ISI OR @OFFICE-1 7f22b

10-OCT-74 1143-PDT NORTON at OFFICE-1: Trmicette
Distribution: VANDERBURGH, norton, hardy at sri-arc
Received at: 10-OCT-74 11:44:53 7f23

Alex: Martin Hardy at SRI-ARC has the information you need for you and Connie on the Termicette (and other) tape recording units. Call him at (415) 326-6200 or sndmsg to hardy at sri-arc or journal item to MEH ident, ok? jim 7f23a

HUDSON 7g

JCN 23-DEC-74 21:25 24728
Proposal ISD 74-257 Continued NLS Workshop Support for the Hudson Institute
Location: (GJOURNAL, 24728, 1:w)
*****Note: [INFO-ONLY] ***** 7g1

Comments: Signed hardcopy printed today to be mailed tomorrow 7g1a

11-DEC-74 0927-PST HARDY: Hudson
Distribution: NORTON, hardy
Received at: 11-DEC-74 09:27:06 7g2

Jim:
All is well again, at least for today. Apparently Last week Mary dumped on of Rutgers computer operators (girl) bretty bad, she told her sup (Web), and the next time Mary called she got Web and demanded he help her for ten minutes.....Any way it is all

patch over and I don't think it will occur again, (bretty = pretty) 7g2a

6-NOV-74 1433-PST HARDY: hudson tip port number
Distribution: HARDWARE, hardy
Received at: 6-NOV-74 14:33:41 7g3

rod:
you hhaven't told me the port number yet? Send it in a message,, thanks
,,,martin,, 7g3a

6-NOV-74 0858-PST HARDY: Rutgers TIP Lineprocessor buffer size
Distribution: RUGGLES AT OFFICE-1, hardy
Received at: 6-NOV-74 08:58:07 7g4

I was not able to verify The Lineprocessor port number at Rutgers. I must do that before I can have buffer size increased, Expect verification today. Will let you know when I get it. 7g4a

5-NOV-74 1337-PDT HARDY: Hudson buffer size for Lineprocessor
Distribution: HARDWARE, hardy
Received at: 5-NOV-74 13:37:50 7g5

Rod:
I want to have the buffer size increased at Rutgers for Hudson Lineprocessor connection, What port number are they connected to know??
,,martin,, 7g5a

NSA 7h

30-JAN-75 1659-PST HARDY: The Character of NLS and Office-1,
Distribution: JOHNSON, hardy, norton
Received at: 30-JAN-75 16:59:01 7h1

Sandy:
Bailey at NSA want some information about our character and Office-1 configuration, Susan and I are collecting what information we can answering some question he has listed in Journal Item 31733. This infxormation will be valuable to us also so it seems like a good thing to do to compile it in one common file. You could help us by creating a file containing the questions Bailey has asked in 31733, Susan and I will answer, as best we can, then add to your file and verify with other people it's correctness.

MEH 26-FEB-75 08:39 25481

My NLS Initial File The Way it Was 2/26/75.

After you create file out put quickprint and pass to me, thanks..
..martin.. 7h1a

JCN 23-DEC-74 21:31 24736
Proposal ISU 74-260 Continued NLS Workshop Support for NSA
Location: (GJOURNAL, 24736, 1:W)
*****Note: [INFO-ONLY] *****
7h2

Comments: signed hardcopy printed today to be mailed tomorrow 12/24 7h2a

BBN 7i

<HJOURNAL>25407.NLS;1, 16-FEB-75 09:31 XXX ;;;; Title:
Author(s): Richard W. Watson/RWW; Distribution: /SRI-ARC([
INFO-ONLY]) ; Sub-Collections: SRI-ARC; Clerk: RWW;
Origin: < WATSON, NLS.NLS;1, >, 16-FEB-75 08:35 RWW ;;;;####;
7i1

Replys Received as of Feb 16 on Complaint About Network Delays

15-FEB-75 0716-EST WALDEN at BBN-TENEX: NLS OVER THE NET TEST
Distribution: WATSON AT SRI-ARC, carlson at isi, walden
Received at: 15-FEB-75 04:17:46 711a

WHEN DID YOU DO YOUR TEST? CETAINLY IT WAS NOT
A CONTROLLED TEST SINCE I (AND THEREFORE PROBABLY
THE NCC TOO) DIDN'T KNOW ANYTHING ABOUT IT. WHO KNOWS
WHAT WAS HAPPENING IN THE NET DURING YOUR TEST -- MAYBE
TWO OUT OF THREE CROSS COUNTRY LINES WERE
DOWN RESULTING IN HEAVY LOADING OF THE REMAINING ONE
AND 28 HOPS FROM TYMSHARE TO BBN. FURTHER, WHAT
WAS THE LOAD AT BBN; SWAPPING OFF THE DISK, EXPERIENCE
SHOWS THE SYSTEM HAS POOR RESPONSE WITH A LOT
SMALLER LOAD AVERAGE THAN ON A DRUM SWAP SYSTEM.
ALTHOUGH THERE WAS A LOW LOAD AVERAGE AT BBN,
WAS THERE POSSIBLY SOME USER AT BBN SENDING
TRAFFIC OUT TO THE NETWORK TO A VERY UNRESPONSIVE
RECEIVER, THUS CAUSING INTERFERENCE WITH YOUR
EXPERIMENT. 711a1

LET'S DO THE EXPERIMENT AGAIN WITH SYSTEM
PROGRAMMERS WATCHING AT EVERY
STEP ALONG THE WAY (TIP, TENEX'S, NET) TO SEE
WHERE THE PROBLEM IS, IF ANY. 711a2

I WOULD HAVE LIKED TO HEAR ABOUT
THIS FIRST, RATHER THAN IN A COPY
OF A LETTER TO EVERY WHEEL IN THE WORLD
BLASTING THE NET. 711a3

REGARDS,
DAVE 711a4

P.S., BILL, WE HAVE NO MORE PEOPLE LEFT TO WORK
ON ANY MORE CRISES THIS WEEK. 711a5

P.P.S., BILL, THIS APPEARS TO ME TO BE ANOTHER
EXAMPLE OF SOMEBODY MAKING BIG PLANS WITH OUT
EVER TALKING TO US. THE
FIRST I HEARD OF NLS AT BBN WAS WHEN
I HAPPENED TO TALK TO DICK IN THE HALL AT BBN 1 AND 1/2
WEEKS AGO, AND EVEN THEN HE DIDN'T TELL
ME ABOUT THE EXPERIMENT TO WHICH
HE NOW REFERS. MAYBE THE NET HAS TO
BE RECONFIGURED SOMEWHAT TO HANDLE
NLS ACROSS THE NETWORK; MAYBE THE NLS
PEOPLE HAVE TO MODIFY IT TO MAKE IT SUITABLE
TO RUN ACROSS A NETWORK (THE NETWORK

IS NOT TRANSPARENT -- USER HABITS OFTEN HAVE
TO CHANGE). 7i1a6

15-FEB-75 1736-EST WALDEN at BBN-TENEX: NLS OVER THE NET
Distribution: WATSON AT SRI-ARC, walden, carlson at isi
Received at: 15-FEB-75 23:36:24 7i1b

DICK, 7i1b1

THANKS FOR YOUR REPLY TO MY MESSAGE. 7i1b2

I, OF COURSE, DESPARATELY WANT TO
MAKE THE NET WORK PERFECTLY AND TO HAVE YOU AND
OTHER CUSTOMERS SATISFIED. THE NET WILL NEVER
BE THE SAME AS BEING ON YOUR OWN SYSTEM (AS
I SAID IN MY PREVIOUS MESSAGE, THE NET
IS NOT TRANSPARENT), BUT (WITH
THE POSSIBLE REQUIREMENT OF SOME CHANGE IN THE
USERS EXPECTATIONS AND HABITS) I AM SURE
THAT THE NET AND THE NET SERVICE HOSTS
CAN BE MADE TO WORK TOGETHER IN A WAY WHICH
LETS WORK BE DONE OVER THE NETWORK CONVENIENTLY.
I AM WILLING TO PUT ALL AVAILABLE RESOURCES
INTO UNDERSTANDING WHAT YOU ARE CURRENTLY SEEING
AND WHAT MUST BE DONE TO FIX IT AND (TO THE
EXTENT IT IS NOT INHERANT IN THE NETWORK
TOPOLOGY OR THE HOST OPERATING SYSTEMS AND SUBSYSTEMS)
FIXING IT. HOWEVER, I CAN NOT BEGIN TO WORK
ON YOUR PROBLEM UNTIL I GET THE PRESENT PROBLEMS
(E.G., WITH OFFICE-1) SOLVED. HOPEFULLY, SOLVING
THE OFFICE-1 PROBLEM MAY HAVE FALLOUT FOR YOU.
IN ANY CASE, I THINK IT IS EXTREMELY UNLIKELY
WE CAN PARTICIPATE IN ANY EXPERIMENT TUESDAY
OF PERHAPS FOR ALL OF NEXT WEEK. IN FACT,
MEMBERS OF OUR SENIOR NETWORK
STAFF HAVE BEEN WORKING ROUND THE CLOCK
FOR A NUMBER OF DAYS NOW, INCLUDING ALL OF THIS
HOLIDAY WEEKEND. AS CARLSON SAID IN HIS MESSAGE,
ARPA IS IN CLOSE CONTACT WITH US ON THIS AND
WE WILL GET TO YOUR PROBLEM AS SSON AS WE ARE ABLE. 7i1b3

REGARDS,
DAVE 7i1b4

P.S., IT OCCURS TO ME TO MENTION THAT THE AVAILABLE
TERMINAL BUFFERING IN THE AMES TIP DURING YOUR
EXPERIMENT MIGHT HAVE ADDED TO THE PROBLEM;
I.E., THERE IS NOT MUCH AVAILABLE. ALSO,
THERE IS PLENTY OF INSTRAMENTATION IN THE NETWORK

SYSTEM WHICH SHOULD HELP US PIN POINT
THE SOURCE(S) OF DIFFICULTIES, 711b5

15-FEB-75 1151-EST CLEMENTS at BBN-TENEXA: RUNNING NLS AT BBN SYSTEM A OVER THE NET
Distribution: WATSON AT ARC, carlson at isi, norton at arc, engelbart at arc, irby at arc,, victor at arc, clements at bbn, strollo at bbn, walden at bbn,, licklider at isi, russell at isi, lynch at sri-ai
Received at: 15-FEB-75 23:38:28 711c

JUST A COUPLE OF ITEMS TO ADD TO YOUR NOTE OF LAST
EVENING, 711c1

THE CONFIGURATION AT BBN-TENEXA (WHERE WE HAVE BEEN
TESTING)
HAS A BRYANT DRUM (IDENTICAL TO
THE ONE AT SRI-AI, I BELIEVE), WHILE THE INTENDED SERVICE
SYSTEM
HAS THE 3330-EQUIVALENT DISCS, 711c2

ONE EXPERIMENT WHICH COULD ADD USEFUL DATA WOULD BE
SPENDING THE
PRICE OF A TOLL CALL TO ONE OF SYSTEM A'S DIRECT DATASET
LINES,
ADMITTEDLY ONLY 300 BAUD, TO SEE WHAT DELAYS
ARE SEEN. THE 300 BAUD SHOULD NOT MATTER MUCH WHEN "J I"
IS SENT
ONE WAY AND "UMP TO TEM" IS THE RESPONSE,
(WE DO NOT NORMALLY HAVE DIRECT DATASETS ON SYSTEM B, BUT
WE CAN PATCH ONE IN FOR A TEST THERE, TOO,) 711c3

FOR PAST EXPERIENCE ON BOTH THE SHOCK OF CROSS-COUNTRY
NET DELAYS
AFTER BEING USED TO LOCAL TERMINALS,
AND THE THROUGHPUT OF SWAPPING ON A DISC, THE INTERLISP
PEOPLE
SHOULD BE A GOOD SOURCE. FOR EXAMPLE, WARREN TEITELMAN
USED
BBN-SYSTEM-A FOR QUITE A WHILE AFTER MOVING TO
XEROX-PARC,
SOME, NOT ALL, OF THE LISP WORKERS AT BBN ARE USING
BBN-TENEXB
WITH THE 3330 SWAPPER. LOTS OF NUMBERS HAVE BEEN
PUBLISHED ON BOTH
PROBLEMS, BUT FIRST-HAND EXPERIENCE MAY BE WORTH A
THOUSAND
PUBLISHED WORDS. I FOUND THAT WORKING ON BBN-TENEX (SYS
C)

WAS LESS RESPONSIVE THAN THE DRUM ON SYS A UNDER LIGHT LOAD, BUT
UNDER ANY MEDIUM TO HEAVY LOAD IT WAS QUITE AS GOOD AS SYSTEM A, 7i1c4

I ALSO RECALL FROM MY ONE VISIT TO SRI THAT THE KEYSET USERS
RELIED HEAVILY ON THE VISUAL FEEDBACK TO ASSURE THAT THEIR KEYSET
ENTRIES WERE VALID, THUS MAKING IT DIFFICULT TO SMOOTHLY SWITCH
TO TYPING-AHEAD TO AVOID THE LATENCY OF A CROSS-COUNTRY NET.
THE THROUGHPUT Is OK, BUT THAT LATENCY MUST BE OVERCOME. 7i1c5

FINALLY, I'LL MENTION THAT MUCH OF THAT TESTING WAS DONE LAST EVENING
AROUND 1700 EST, AND THAT WE HAD BEEN SUFFERING ANOMALOUS BEHAVIOR
OF EITHER THE IMP OR THE NCP'S AT BBN-TENEX FOR A COUPLE OF HOURS
BEFORE THAT. THE CAUSE HAS NOT BEEN DETERMINED, BUT THIS MAY HAVE
ADDED TO THE LONG FACES. WE DON'T KNOW YET, 7i1c6

/RCC 7i1c7

15-FEB-75 1219-PST CARLSON at USC-ISI: NLS OVER THE NET
Distribution: WATSON AT SRI-ARC, carlson, norton at arc, engelbart at arc, irby at arc,, victor at arc, clements at bbn, strollo at bbn,, strollo at bbn, walden at bbn, licklider, russell,, lynch at sri-ai
Received at: 15-FEB-75 23:40:59 7i1d

<HJOURNAL>25410.NLS;1, 16-FEB-75 19:30 XXX ;;;; Title: Author(s): Richard W. Watson/RWW; Distribution: /SRI-ARC([INFO-ONLY]) ; Sub-Collections: SRI-ARC; Clerk: RWW; Origin: < WATSON, NLS.NLS;1, >, 16-FEB-75 08:35 RWW ;;;;####;

7i2