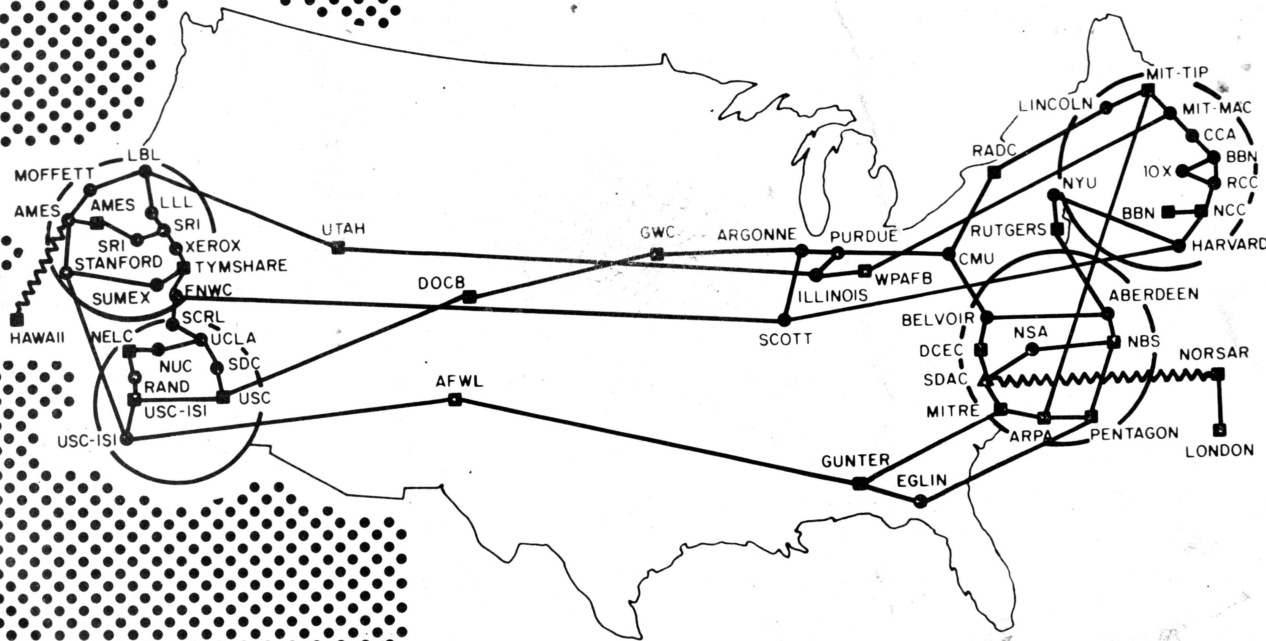




# ARPANET INFORMATION BROCHURE



**DEFENSE  
COMMUNICATIONS  
AGENCY**

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DEFENSE COMMUNICATIONS AGENCY  
WASHINGTON, D.C. 20305

IN REPLY  
REFER TO: 535

2 February 1979

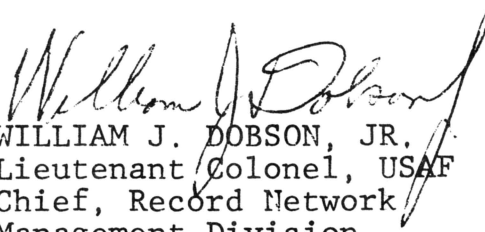
SUBJECT: ARPANET Information Brochure

1. ARPANET is an operational, resource sharing inter-computer network linking a wide variety of computers in CONUS, Hawaii, Norway, and England. Its communications system introduced the revolutionary technique of "packet switching" where each message is broken up into small packets and each packet is switched to its destination over the quickest communications path available at any given instant. ARPANET was originally designed under a research and development program by the Defense Advanced Research Projects Agency in 1969. Management responsibility of the network was transferred to Defense Communications Agency on July 1, 1975.

2. This brochure provides a general description of the ARPANET and defines the policies and procedures governing its use. Additional information for prospective users of ARPANET and extra copies of this brochure are available from:

Defense Communications Agency  
ATTN: Code 535  
Washington, D.C. 20305  
Telephone Number (202) 692-6175/6176  
AUTOVON 222-6175/6176  
ARPANET Mailbox: DCACode535@ISI

FOR THE DIRECTOR:

  
WILLIAM J. DOBSON, JR.  
Lieutenant Colonel, USAF  
Chief, Record Network  
Management Division

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## 1. PURPOSE.

The purpose of this brochure is to provide a description of the ARPANET and an overview of its operational management policies and procedures.

## 2. INTRODUCTION.

a. The ARPANET is an operational, resource sharing inter-computer network linking a wide variety of computers at Defense Advanced Research Projects Agency (DARPA) sponsored research centers and other DoD and non-DoD activities in CONUS, Hawaii, Norway, and England. The ARPANET originated as a purely experimental network in late 1969 under a research and development program sponsored by DARPA to advance the state-of-the-art in computer internetting. The network was designated to provide efficient communications between heterogeneous computers so that hardware, software, and data resources could be conveniently and economically shared by a wide community of users. As the network successfully attained its initial design goals, additional users were authorized access to the network. Today, the ARPANET provides support for a large number of DoD projects and other non-DoD government projects with an operational network of many nodes and host computers. (See enclosures 1 & 2).

b. Following the successful accomplishment of initial ARPANET design goals and the expansion of the network, it was considered appropriate to transfer the responsibility for operation of the ARPANET from DARPA to the Defense Communications Agency (DCA). In July 1975, the DCA became the operational manager of the ARPANET.

## 3. DEFINITIONS.

For ease of understanding the ARPANET and the policies governing its use, the following definitions are provided:

a. Interface Message Processor (IMP). A store and forward packet switch which can accommodate up to four host computers. There will not be any additional 516 or 316 IMPs added to the network as Honeywell has ceased manufacturing them.

b. Pluribus Interface Message Processor. A store and forward packet switch based on multiprocessor technology which can accommodate in excess of 18 host computers, depending on configuration. This type IMP has higher throughput

capacity and can be configured redundantly for improved reliability.

c. Terminal Interface Processor (TIP). A store and forward packet switch which can accommodate up to three host computers and 63 terminals. Each terminal may be either asynchronous or externally clocked, and may operate at speeds up to 2400 baud on input and 19.2 kilobaud on output. Some types of intelligent terminals are also supported.

d. Pluribus Terminal Interface Processor (PTIP). Similar to Pluribus IMP but also can accommodate 63 or more terminals depending on configuration.

e. Host. A customer owned computer which is connected to a host port on an IMP or TIP.

(1) Local Host. A host which is more than 30 feet of an IMP or TIP.

(2) Distant Host. A host which is more than 30 feet but less than 2,000 feet from an IMP or TIP.

(3) Very Distant Host. A host which is located over 2,000 feet from an IMP or TIP and requires modems on its access line.

f. Terminal. A teletypewriter, CRT or similar unit which is connected to a terminal port of a TIP.

g. Interswitch Trunk. A circuit between packet switches (e.g., IMPS and TIPS) which is used to pass packets through the network.

h. Access Line. A circuit from a host computer or terminal to an IMP or TIP. The circuit may be a local cable or a transmission facility requiring modems.

i. ARPANET Backbone. The switching nodes (e.g., IMPS - TIPS), interfaces, the communications lines interconnecting the nodes, and the Network Control Center. The backbone is also known as the communications subnet.

j. Sponsor. A MILDEP, DoD Agency, or other U.S. Government Agency which is responsible for an ARPANET User(s) and reimburses DCA for ARPANET backbone costs.

k. Node. The packet switch; an IMP/TIP or Pluribus IMP/TIP.



#### 4. DCA RESPONSIBILITIES.

a. The Director, DCA will control system engineering and exercise operational direction over those operating elements of the ARPANET which are part of the backbone. ARPANET user equipments/terminals are non-backbone facilities. However, ARPANET users must be responsive to management instructions issued by the DCA. DCA, on a continuing basis, will monitor the effectiveness of the ARPANET, evaluate those matters which have major impact or will impact adversely on the network and direct action to alleviate or prevent such impact.

b. The following are the ARPANET responsibilities of DCA:

- (1) Policies, procedures, and standards for Operation and Maintenance (O&M) of ARPANET.
- (2) Approval of new user access.
- (3) Leasing of the backbone and terminal access circuits.
- (4) Maintenance of hardware.
- (5) Changes to network.
- (6) Access criteria.
- (7) Planning, programming and budgeting of resources.
- (8) Control of government assets.
- (9) Configuration control.
- (10) Coordination of actions impacting network.
- (11) Sponsors' Group Chairmanship.
- (12) Performance evaluation of network.
- (13) Topology Studies.
- (14) Network Information Center.
- (15) Performance statistics collections.

## 5. ARPANET POLICIES.

a. The Assistant Secretary of Defense, Command Control, Communications, and Intelligence (ASD-C<sup>3</sup>I) has expressed the following guidance for DoD Data Networks and their projected users in its 16 July 1975 Memo, subject: AUTODIN II Phase I:

"Those Military Department/Defense Agency ADP systems that are currently connected to the ARPANET or who plan on connecting to the ARPANET prior to the availability of AUTODIN II Phase I should configure their design so as to minimize the impact of reconnecting to AUTODIN II Phase I once this system is operational. The final disposition of the ARPANET will be determined at a later date."

b. The ARPANET is an operational DoD network and is not intended to compete with comparable commercial service. Accordingly, before ARPANET service is provided to any non-U.S. Government activity, it must be determined that adequate commercial service is not available.

c. Authorized ARPANET Users. The ARPANET is intended to be used solely for the conduct of or in support of official U.S. Government business.

(1) DoD Users - Subject to the availability of assets, DoD activities will be connected to the ARPANET provided their requirements are processed through normal communications validating channels.

(2) Non-DoD U.S. Government Activities - Requests for ARPANET service from non-U.S. Government activities will be considered by DCA on a case-by-case basis.

(3) Non-Government U.S. Government Activities - A DoD or other U.S. Government activity authorized to use the network may sponsor, as a user, a non-government activity performing in contractual support of the U.S. Government. Justification outlining benefits to the U.S. Government for such access shall be provided to DCA by the sponsoring activity. Cost for network services provided to non-government activities shall be allocated to the sponsoring activity.

(4) Non-U.S. Activities - Non-U.S. activities will not be directly connected to the ARPANET. Access to the ARPANET may be provided through the facilities of an authorized user if coordinated with DCA.

d. The proposed use of the ARPANET must not violate applicable privacy laws.

e. All communications lines (including VDH lines) will be ordered through DCA Code 535 to the Defense Commercial Communications Office (DECCO) with appropriate charges being billed to the sponsoring activity.

f. Host equipment, host interface hardware and software, host-to-IMP communications and site preparation are the responsibility of the user.

g. For testing of new concepts and developments in data communications and computer networking, interconnection of the ARPANET with other networks is authorized. DCA elements, DARPA, and other will coordinate these plans with DCA Code 535.

h. Access Control

(1) The Sponsors are responsible to insure only authorized users are allowed access through their nodes and provided services by their hosts. A valid contract number should be available for non-government users.

(2) To effectively enforce access control, the Sponsors must have:

(a) Standards - to insure only validated accounts are established for users.

(b) Access Controls - to insure only valid users can access the host - login/password mechanisms are satisfactory.

(c) Periodic Reviews - to insure users whose access is no longer required are removed from the net.

(3) When abuse of this policy is noted, Code 535 will notify the host/terminal/user's sponsors for corrective action. If corrective action is not taken in a reasonable time, Code 535 will retain the option to configure the host/terminal out of the network.

i. Dial Up Modems - All dial up modems will have a telephone number change at least once per year. The TIP Sponsor is responsible for taking prudent actions to maintain the privacy of the numbers.

j. Interface Criteria. All users will meet ARPANET interface criteria as specified in Bolt, Beranek and Newman

(BBN) Report Number 1822, Interface Message Processor:  
Specifications for the Interconnection of a host and an IMP.

k. DCA has approved the BBN distribution list for various publications. Additions to the list require validation by a sponsor.

1. Node Accountability and Ownership. The IMPs and TIPs are owned by the sponsors and, once integrated into the ARPANET, are controlled and maintained by DCA. The IMP/TIP owners have assignment control authority over the ports on their equipment (within limits established by ARPANET Policies). Owners pay for all relocation and installation costs related to their hardware.

6. NEW ARPANET SERVICE.

a. Activities desiring to join the ARPANET which are qualified in accordance with the utilization policy will initiate contact with DCA (Code 535).

b. Types of Service.

(1) If terminal service only is required, two connections are possible:

- Hardwired to a TIP
- Dial in to a TIP

(2) If host service is required, three connections are possible (only pluribus interfaces are available):

- Local host (within 30 feet of the IMP and TIP). Estimated cost \$5200 for the node interface.

- Distant Host (30 feet to 2000 feet).  
Estimated cost \$6300 for the node interface and driver.

- Very Distant Host (over 2000 feet).  
Estimated cost \$6300 for the node interface. (May also require an increased in memory of the connected IMP).

(3) Steps to be taken and costs involved depend to a large extent on the present configuration of the net, the location of the new user and the service desired. For example, assume that an activity in the Washington, D.C. area. It would send a request for service to DCA who would determine which node(s) in the area has the capacity to

accommodate their requirement then advise them to request permission for a host connection from the owner of the node. If the node owner allows the connection, the host owner must reach an agreement with him on length of service and cost reimbursement.

(4) The non-availability of any host port is another possibility. This would necessitate that the host owner purchase a new IMP/TIP through DCA Code 535. Normally he would submit his requirement to DCA who would then process it through its supporting contracting office. Only Pluribus IMPs/TIPs are available. Present prices are approximately:

- . 69K for a two modem, one Host Pluribus
- . 76K for a two modem, three Host Pluribus
- . 123K for a two modem, no Host Pluribus

TIP plus

- . \$431 for each 2 port LIU card
- . 3.1K for first host interface
- . 3.5K for a third modem interface
- . Software license fee (\$12,500)

(5) Access line costs for planning purposes are contained in Enclosure 3.

c. Procedures for requesting service.

(1) U.S. Government activities requesting ARPANET service must apply to the Director, Defense Communications Agency, ATTN: ARPANET Management Branch, Code 535, Washington, D.C. 20305.

(2) A non-U.S. Government activity must have a U.S. Government activity acting as a sponsor. Application for service on the ARPANET must be submitted by the sponsoring activity to Director, Defense Communications Agency, ATTN: ARPANET Management Branch, Code 535. The application must clearly state how the proposed service is in the best interest of the U.S. Government, is essential to mission fulfillment, does not violate privacy laws, and adequate commercial service is not available. The contract number of the contract between the sponsoring activity and the non-government activity requiring access to the ARPANET must be provided.

(3) Each application, government and non-government, will be in the format contained in Enclosure 4 and will contain the approximate amount of traffic to be passed, the hours of operation and concurrence from the agency whose IMP/TIP will be utilized as the ARPANET entry point.

(4) Requirements for wideband (50KBPS and above) circuits must be submitted at least six (6) months in advance to give the contractor facility upgrading and circuit engineering time. All other requests for circuit leasing actions must be submitted ninety (90) days prior to the required service date to allow sufficient time for leasing actions.

## 7. SECURITY.

a. The ARPANET itself (the communications subnet or "backbone") contains no security features for privacy or for the protection of classified defense information transiting the network. Therefore, it is the responsibility of those sponsors and users operating hosts in the network to take steps to protect information resident or accessible through their host computers from access by unauthorized users and to provide protection against unauthorized access to classified information which may reside or be accessible via their host computer link to the network.

b. There are no network "login" procedures, all access control is provided by the controls of the computers on the network.

c. A secure subnet is possible by providing hosts with a Private Line Interface (PLI). The PLI has been approved by NSA and cost approximately \$60,000 per copy. The user also has to provide a KG34. The PLI subnet can include up to 128 hosts constrained to 32 nodes.

## 8. FUNDING.

The Operation and Maintenance (O&M) of the CONUS ARPANET backbone, i.e., nodes, interfaces, and internode communications circuits, is paid through the Communications Services Industrial Fund (CSIF) which is managed and operated by the Defense Communications Agency. The Defense Commercial Communications Office (DECCO) has responsibility for all leasing actions which take place under the CSIF. This function includes normal contract management activities for the ARPANET. All bills for the CSIF portion of the ARPANET are paid by DECCO. Audits of contractors are performed by the Defense Contract Audit Agency (DCAA) at the request of DECCO.

The vehicle used to request communication services is the ARPANET TSR which is forwarded to DECCO from DCA Code 535 as the ARPANET manager. Under the working capital or revolving fund concept, predetermined subscriber rates will be the basis for recovering the cost of operating and maintaining the Backbone network. The estimated cost to operate and maintain the ARPANET Backbone during a fiscal year, divided by the estimated number of IMPS and TIPS in the network, provides the annual cost per year per node:

$$\frac{\text{Total O\&M Cost}}{\# \text{ IMPS and } \# \text{ TIPS}} = \text{Annual Cost Per IMP or TIP.}$$

All ARPANET customer activities will be billed monthly based on a predetermined cost for each operational node in the Backbone. The monthly rate for FY79 and FY80 is \$6,496 (\$6,400 plus 1½%).

9. ARPANET SPONSORS' GROUP.

a. To be flexible and responsive to the requirements of the user community, an ARPANET Sponsors' Group has been established and chartered. The group enables sponsors of the network to consider and make recommendations to DCA on network operational activities and services provided by the network. It also provided a forum for the exchange of ideas and information on the operation of the ARPANET and future plans for the network of common interest to its sponsors.

b. The Sponsors' Group normally meets semi-annually. Special meetings may be called by the Chairman if the situation warrants attention to business prior to the next regularly scheduled meeting. Meetings normally are held in the Washington, D.C. area, but may be held at other locations.

c. The list of current ARPANET Sponsors' is contained in Enclosure 6.

d. Sponsors's Responsibilities.

(1) Process all IMP/TIP and associated hardware requirements through Mildep or agency channels to DCA Code 535 for procurement.

(2) Process through DCA Code 535 all requests for access lines, host interfaces, circuit rearrangements, and equipment moves.

(3) Review for Approval/Disapproval other sponsor, Government Agency requests for connection of hosts/terminals to IMPs/TIPs under that sponsors' control.

(4) Insure all hosts have well-defined access control procedures/standards to prevent unauthorized use. Insure periodic review of host accounts for unauthorized users.

(5) Insure TIP liaisons change TIP Dial-In-Modem numbers as scheduled by DCA Code 535.

(6) Insure host/TIP liaisons promptly provide information on host/terminal connection changes as they occur to the Network Information Center (NIC) and the NCC.

(7) Insure their nodes are aware of ARPANET policies as published in Sponsors' Group Minutes and DCA letters.

(8) Inform DCA Code 535 of any significant continuing network problems. File Unsatisfactory Service Reports (USR's) to DCA Code 535, information to BBN, as necessary.

(9) Attend semi-annual ARPANET Sponsors' Group Meetings and present problems, user needs, recommendations for changes in policy, etc.

(10) Validate requirements for distribution of ARPANET documentation.

## 10. ARPANET INFORMATION SERVICES.

a. Various services are provided to the ARPANET community to aid in the effective use of the network. Current available documentation includes:

(1) Information on resources which are available at each host computer and the means to access this information. (ARPANET Resource Handbook) ADA 046 452.

(2) Network protocol information (ARPANET Protocol Handbook) AD-A052 594.

(3) Listing of individuals and hosts associated with the network (ARPANET Directory) AD-A046-948.



(4) Specifications for the Interconnection of a Host and an IMP, BBN Report 1822 - May 1978 Revision, ADA 055-996.

(5) Selected Bibliography & Index to Publications About ARPANET AD-A026 900.

These documents are distributed directly to ARPANET users. Others government agencies may receive copies by submitting a request with justification to DCA Code 535. Non-government agencies may procure copies using the above "AD numbers" from

National Technical Information Service (NTIS)  
U.S. Department of Commerce  
5285 Port Royal Road  
Springfield, VA 22161  
(Phone No. (703)557-4650)

b. Information for the first three documents listed above is collected by the ARPANET Network Information Center (NIC). The NIC produces the hardpage copies as well as maintains the information on-line for the benefit of users. Additional information on the NIC is contained in Enclosure 7.

#### 11. SOFTWARE MODIFICATIONS.

a. There are two general procedures for software modifications: (1) Patches to correct deficiencies (bugs) in the operating program, (2) changes which are identified and approved for implementation. The software for the IMP/TIPs is programmed in assembly language for maximum operating efficiency and use of available software. Software changes are tested and debugged at BBN prior to release. The software change releases are scheduled for testing and implementation on Tuesdays between 0700 and 0900 Boston time.

b. To insure that users are fully aware of major software changes which may affect their operations, they will be processed in the following manner:

(1) A specification will be developed for each approved program change proposal.

(2) For those program changes viewed as having potential impact on the users, the specifications will be coordinated with the user prior to coding.

(3) Subsequently, a Software Release Notice (SRN) will be distributed to all users as far in advance as possible

but not less than 30 days prior to implementation (emergency changes excepted). The SRN will provide the data required to users to adjust to the system change being implemented.

## 12. COMPLAINT CENTER/UNSATISFACTORY SERVICE REPORTS (USR's).

A complaint center teletype is maintained at the NCC for users reporting problems or seeking assistance. Receiving and processing complaints is not purely an NCC function, thus an additional channel for reporting unsatisfactory service has been developed. The ARPANET USR has been established as the formal means of reporting deficiencies with respect to the operations of the ARPANET backbone communications. Problems/complaints which cannot be resolved through normal channels should be reported by means of the USR. The types of problems to be included are, but are not limited to, the following:

- a. Excessive response time.
- b. Inadequate restoral procedures.
- c. Unsatisfactory maintenance support.

The User (Sponsor) must make the determination of when service has reached an unsatisfactory point. The report may be passed over the ARPANET, AUTODIN, or U.S. Mail. Reports will be addressed to DCA Code 535 with information copies to the NCC (BBN) and any other activity as deemed appropriate by the originator.

## 13. THE GENERAL SERVICES ADMINISTRATION-TELEPROCESSING SERVICES PROGRAM (GSA-TSP).

GSA has established the TSP to insure that teleprocessing services are acquired in the best way from the government standpoint. While the TSP does not apply to equipment for an experiment that is a part of the ARPANET, GSA has stated that user selection, contracting, and ordering of data processing services via the ARPANET must be in accordance with FPMR 101-32, in general, and Temporary Regulation E-47, (TSP), in particular. Unless a company on the ARPANET is registered with the TSP program, an agency desiring to use that contractor will require a sole source justification and a waiver of the TSP program from GSA.

## 14. NETWORK DESCRIPTION.

- a. The ARPANET provides a capability for geographically

separated computers (hosts) to communicate with each other. The host computers typically differ from one another in type, speed, word length, operating system, etc. Each host computer is connected into the network through a node which may be either an IMP or TIP that is normally located on its premises; a typical network is shown in Figure 1. The complete network is formed by interconnecting the nodes through wideband communication lines, normally 50,000 bits per second (50KBPS), supplied by common carriers. Each node is then programmed to store and forward messages to the neighboring nodes in the network. During a typical operation, a host passes a message to its node; this message is then passed from node to node through the network until it finally arrives at the destination IMP, which in turn passes it along to the destination host. This process normally takes less than 250 milli-seconds.

b. Hosts communicate with each other via regular message, A regular message may vary in length from 96 to 8159 bits, the first 96 or which are control bits called the leader. The leader is also used for sending control messages between the host and its IMP or TIP (node). The remainder of the message is the data, or the text.

c. For each regular message, the host specifies a destination, consisting of node, host and handling type. These three parameters uniquely specify a connection between source and destination hosts. The handling type gives the connection specific characteristics, such as priority or non-priority transmission. Additional leader space has been reserved for a fourth parameter, to be used in future inter-network addressing. For each connection, messages are delivered to the destination in the same order that they were transmitted by the source.

d. For each regular message, the host also specifies a 12-bit identifier, the message-ID. The message-ID, together with the destination of the message, is used as the "name" of the message. The node uses this name to inform the host of the disposition of the message. Therefore, if the host refrains from re-using a particular message-ID value (to a given destination) until the node has responded about that message-ID, messages will remain uniquely identified and the host can retransmit them in the event of a failure within the network.

e. After receiving a regular message from a host connected to it, a node breaks the message into one to eight packets (currently the maximum data bits per packet is 1008)

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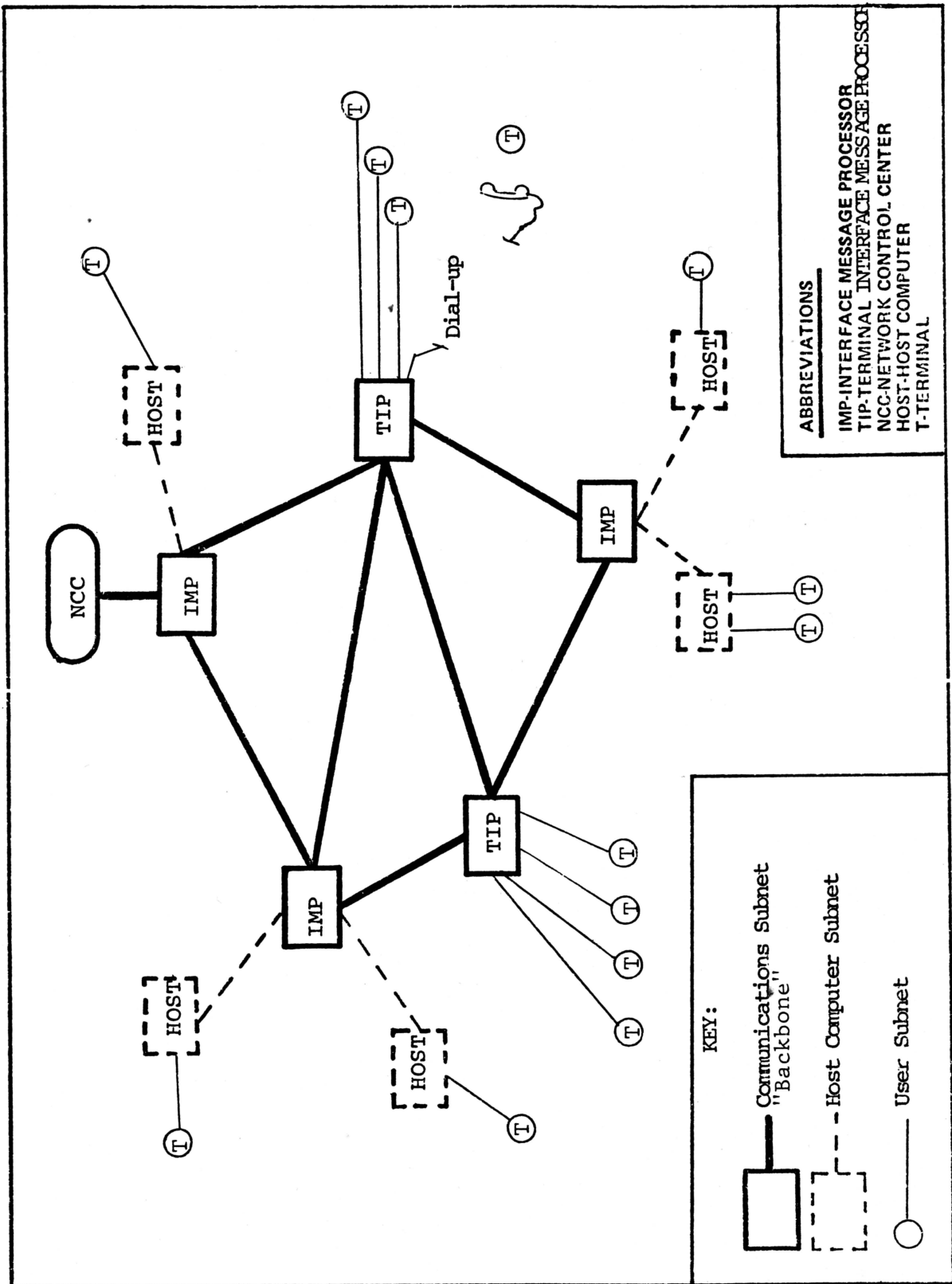


Figure 1 Conceptual Diagram of the ARPANET

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and passes these through the network in the direction of the destination. Eventually, when all packets arrive at the destination, they are reassembled to form the original message which is passed to the destination host. The destination node returns a positive acknowledgement for receipt of the message to the source host. This acknowledgement is called a Ready for Next Message (RFNM) and identifies the message being acknowledged by name. In some relatively rare cases, however, the message may not be delivered due to a node failure; line disruption, etc., in such cases an Incomplete Transmission message will be returned to the source host instead of a RFNM. In this case the message which was incompletely transmitted is also identified by name.

f. If a response from the destination node (either RFNM or Incomplete Transmission) is not delivered to the originating host, this condition will be detected by the source node, which will automatically inquire of the destination node whether the original message was correctly received and repeat the inquiry until a response is received from the destination node. This inquiry mechanism is timeout-driven, and each timeout period may vary between 30 and 45 seconds in length.

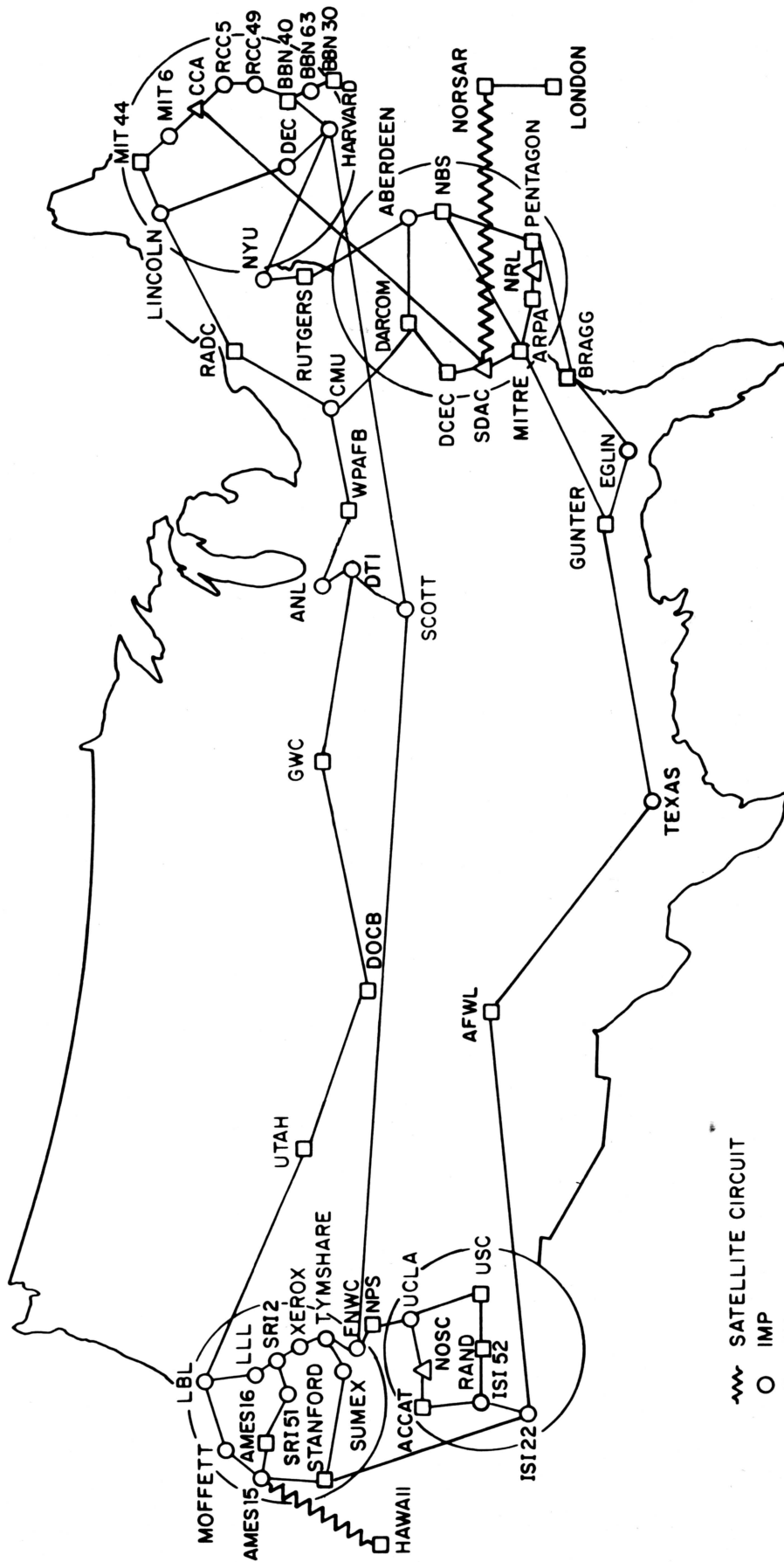
g. When a message arrives at its destination node, the leader is modified to indicate the source host, but the message-ID field is passed through unchanged. Thus, in addition to providing message identification between a host and its local node, the message-ID can provide a means for hosts to identify messages between themselves.

h. The Network Control Center (NCC) for ARPANET is primarily concerned with the detection of line failures and IMP/TIP site failures. In addition, the NCC monitors the volumes of host traffic and line traffic which can give advance warning of network elements whose capacity may need to be increased and which can be used for site usage accounting. Also, the NCC keeps account of other data, such as sense switches, auto restart, memory protect settings etc., and buffer usage, for each IMP/TIP. This data is frequently helpful in diagnosing an IMP/TIP failure. Due to the constant monitoring of the ARPANET at the NCC, the operational availability of the network is very high (consistently in excess of 99%).

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# ARPANET GEOGRAPHIC MAP, DECEMBER 1978



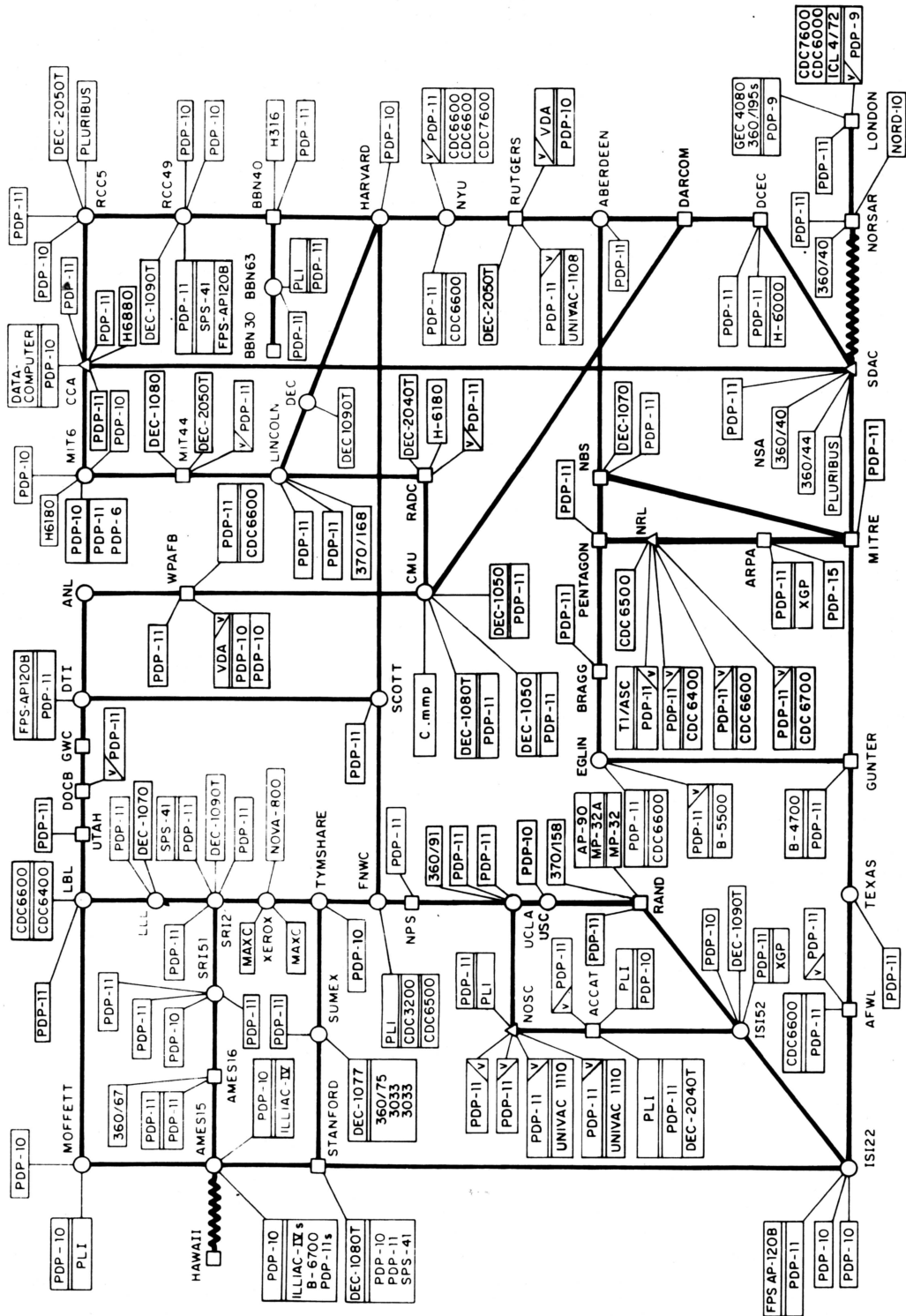
- ~w~ SATELLITE CIRCUIT
- IMP
- TIP
- △ PLURIBUS IMP

(NOTE: THIS MAP DOES NOT SHOW ARPA'S EXPERIMENTAL SATELLITE CONNECTIONS)

NAMES SHOWN ARE IMP NAMES, NOT (NECESSARILY) HOST NAMES

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# ARPANET LOGICAL MAP, DECEMBER 1978



PLEASE NOTE THAT WHILE THIS MAP SHOWS THE HOST POPULATION OF THE NETWORK ACCORDING TO THE BEST INFORMATION OBTAINABLE, NO CLAIM CAN BE MADE FOR ITS ACCURACY. HOST COMPUTER CONFIGURATION SUPPLIED BY THE NETWORK INFORMATION CENTER.

NAMES SHOWN ARE IMP NAMES, NOT (NECESSARILY) HOST NAMES

- IMP
- TIP
- △ PLURIBUS IMP
- ⊞ SATELLITE CIRCUIT
- ⊞ VERY DISTANT HOST

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ARPANET ACCESS LINE COST PLANNING

The following information may be used to determine estimated access line costs to connect terminals to a TIP or Very Distant Host computers to a TIP or IMP.

<u>ACCESS LINE RATE</u>	<u>MONTHLY SERVICE COST</u>	<u>ONE TIME INSTALLATION COST</u>
ANALOG		
300 and Less Baud two modems	\$87.00 plus 50¢/Mile \$43.00	\$108.00 54.00
301 to 1800 Baud two modems	\$87.00 plus 50¢/Mile \$76.00	108.00 108.00
2400 Baud two modems	\$87.00 plus 50¢/Mile \$119.00	108.00 162.00
4800 Baud two modems	\$87.00 plus 50¢/Mile \$270.00	108.00 326.00
9600 Baud (incl D1 conditioning two modems)	\$102.00 plus 50¢/Mile \$498.00	271.00 432.00
50 Kilobit (incl two modems)	\$920.00 plus \$6/Mile	432.00
19.2 KB Wideband	\$920 plus \$3/Mile	432.00
DDS:		
2.4KB	\$170+ <u>Mileage</u>	\$158.00
	1           \$51	
	2-15       \$1.80	
	16-25     \$1.50	
	26-100    \$1.12	
	101-1000   .66	
	1000 +     .40	
4.8	\$320+ Mileage same as 2.4KB/sec	\$158.00

Enclosure 3

9.6	\$563.00 + Mileage same as 2.4 & 4.8KB/sec	\$158.00
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56KB	\$1300.00 + <u>Mileage</u>	\$361.00
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1	\$255.00
2-15	\$9.00
16-25	\$7.50
26-100	\$5.60
101-1000	\$3.30
1000+	\$2.00

REQUIRED FORMAT FOR ARPANET SERVICE

- a. 6 March 1978 (Date request submitted).
- b. 1200 baud, full period, full duplex unconditioned circuit (Type of service desired).
- c. Start (Type of request, may be a start, disconnect, or change).
- d. 6 May 1978 (Date service desired).
- e. Program Designator Code (This is a code required by Defense Commercial Communications Office (DECCO) indicating who will be billed for the service. If the sponsoring agency does not have a PDC, DCA will provide one upon request. See enclosure 5).
- f. Mr. William Jones (703) 123-4567 (Name and telephone number of contact at service point 1).
- Mr. John Smith (312) 123-4567 (Name and telephone number of contact at service point 2).
- g. Room 12, Building 418 University of Rochester 203 Smith Avenue Rochester, New York 12345 (Specific location where service is desired at service point 1).
- Rome Air Development Center, Room #, Building #, Griffiss AFB, New York 12345 (Specific location where service is desired at service point 2).
- h. This paragraph will include any clarifying remarks deemed necessary to ensure full understanding of the service desired to include type of terminal or host. This paragraph will also include the information required by paragraphs 6c(2) and 6c(3).

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## PROGRAM DESIGNATOR CODES

1. General. Program Designator Codes (PDC's) are an integral part of the basic Electronic Data Processing (EDP) system used by DECCO in the performance of its assigned functions. It is specifically to identify the funding activity responsible for reimbursing DECCO for the cost of leased service, backbone, and overhead charges as appropriate.

2. Purpose. The purpose of the PDC is to permit positive and rapid identification of each procurement by system, network, circuit, user, or other category, and specifically relate the procurement to the Departments, Agencies, and Offices (DAO) or Other U.S. Government Agencies (OGA) that is responsible for providing reimbursement to DECCO. Accordingly, the assignment of PDC's is based on the DAO, OGA and DCA management and administrative requirements.

3. Responsibility.

a. DECCO will establish PDC's in coordination with DCA and the DAO's and OGA's. The number of designations should be held to a minimum.

b. PDC's will be included in all TSR's/TSO's, for communications services to be procured by DECCO. Listings of these codes will be published periodically and distributed by DECCO to all TCO's that deal with DECCO.

c. Requests for PDC changes will also be forwarded to the Commander, DECCO, ATTN: Code D650, Scott AFB, IL 62225. All requests for PDC changes will be reviewed and processed as expeditiously as possible. PDC changes will be made effective with the billing period of the applicable carrier. When a PDC change involves a transfer of funding responsibility from one DAO or OGA to another, and requires retroactive changes, DECCO will process an appropriate accounting transaction for the retroactive period. Change requests should be held to a minimum.

4. PDC Citation. Since the responsibility for reimbursing DECCO for the cost of leased service is determined from the PDC, TCO's should not cite the PDC of a different DAO or OGA. When a TCO does cite a PDC that will involve the payment of funds by a different DAO or OGA, a complete explanation will be furnished in the remarks line of the TSR and an information copy sent to the funding activity.

Enclosure 5

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ARPANET SPONSORS

Director  
Defense Advanced Research Projects Agency  
1400 Wilson Blvd.  
Arlington, VA 22209  
Contact: Mr. William Carlson Phone: (202) 694-5037

Headquarters AFSC/ADCT  
Andrews AFB, MD 20334  
Contact: Capt. Art Lundquist Phone: (301) 981-3137

NASA, Headquarters  
Code TN  
Washington, D.C. 20546  
Contact: Mr. Harold G. Kimball Phone: (202) 755-2480

Director  
National Security Agency  
ATTN: V-2  
Ft. Meade, MD 20755  
Contact: Mr. George Hicken Phone: (301) 688-6385

Naval Ship Research and Development  
Code 1802  
Department of the Navy  
Bethesda, MD 20034  
Contact: Mr. I. Larry Avrunin Phone: (202) 227-1492

National Bureau of Standards  
Room B-218, Building 225  
Route 70-S, and Quince Road  
Gaithersburg, MD 20760  
Contact: Mr. Thomas Pyke Phone: (301) 921-3436

Department of the Army  
U.S. Army Communications Command  
C-E Services Division  
Stop C-110  
Ft. Belvoir, VA 22060  
Contact: Mr. Gilbert Fariss Phone: (703) 664-5661

Department of Commerce  
Office of Telecommunications  
325 South Broadway  
Boulder, CO 80302  
Contact: Mr. Judd A. Payne Phone: (303) 499-1000 ext. 3200

Enclosure 6

Division of Basic Energy Sciences  
Mail Stop J-309  
Department of Energy  
Washington, D.C. 20545  
Contact: Mr. Ed Jacques Phone: (202) 353-3675

Defense Communications Engineering Center  
ATTN: Code R820  
1860 Wiehle Avenue  
Reston, VA 22090  
Contact: Lt Dennis Biby Phone: (703) 437-2272

WWMCCS ADP Directorate  
Command and Control Technical Center/C400  
Reston, VA 22090  
Contact: Mr. John Thomas Phone: (703) 437-2329

Department of Air Force  
Headquarters Rome Air  
Development Center  
ISCP  
Griffiss AFB, New York 13441  
Contact: Mr. Thomas Lawrence Phone: VON 587-7746

Air Force Data Systems Design  
Center DMT  
Gunter AFS, AL 36114  
Contact: Capt. Robert James Phone: (205) 279-4171

Air Force Global Weather Central  
ATTN: DO  
Offutt AFB, NE  
Contact: Mr. Glen Boire Phone: (402) 294-5984

- Provides Network Information Services

NIC/QUERY - Most of the information contained in the Resource Handbook is maintained online in the directory <NETINFO> at SRI-KL. This information may be viewed through the NIC/QUERY program. The query program is geared toward novice or casual users and is available to all by connecting to host SRI-KL and typing the word "nic" followed by a carriage return.

In addition the Network Information Center maintains the following online reference files for the ARPANET:

THE OFFICIAL ARPANET HOSTNAMES FILE, <NETINFO> HOSTS.TXT - This file contains the official list of host names and host addresses for hosts attached to the ARPANET. It consists of host name, decimal host address, type of host (i.e., SERVER, USER, TIP), and host nickname, if any. It is accessible to any network user for reference, and is mainly used to update local host name recognition tables. The reference file meets the criteria outlined in RFC 608.

THE OFFICIAL ARPANET LIAISON FILE, <NETINFO> LIAISON.TXT - This file contains name, U.S. mail address, network mail address, phone, and host affiliation for each network Liaison.

THE LIAISON NETWORK MAILBOX FILE, <NETINFO> LIAISON-SNDMSG.TXT - This file contains network mail addresses for all network Liaison formatted for online group distribution of messages via SNDMSG.

THE OFFICIAL ARPANET NETWORK SPONSORS FILE, <NETINFO> NET-SPONSORS.TXT - Contains the name, U.S. mail address, network mail address, phone, and host affiliation for each network Sponsor.

REQUEST FOR COMMENTS (RFCs), <NETINFO> RFCnnn.TXT (where "nnn" is the RFC Number) - Current Network Working Group (NWG) papers, known as RFCs, are kept online in the directory <NETINFO> at SRI-KL (66 dec). These are maintained by the Coordinator of the NWG, currently Jon Postel, and are announced to ARPANET users via an online distribution list. Each RFC remains online for at least a month to give users a chance to obtain copies. Individuals wishing to be added to the RFC notification list should contact Jon Postel (POSTEL@ISIB).

- Provides General Reference Service

## ARPANET NETWORK INFORMATION CENTER (NIC)

### WHERE THE NIC IS

The ARPANET Network Information Center is located at SRI International, 333 Ravenswood Avenue, Menlo Park, California, 94025. NIC online files and NIC/Query (see below) are available on host SRI-KL (66 dec). Network mail may be addressed to FEINLER@SRI-KL. The NIC is funded by DCA.

### WHAT THE NIC DOES

- Collects Network Information

The NIC has collected and disseminated information about the ARPANET since 1970. Information is provided to the NIC by the Network Technical Liaison, the Network Control Center at Bolt, Beranek, and Newman (BBN), the Defense Communications Agency (DCA), the ARPANET Sponsors, and other interested individuals. A Technical Liaison is appointed for each host on the ARPANET. This person is responsible for providing information to the NIC about the people and resources available at his/her host, and serves as an information contact for network users seeking information about that host.

- Publishes and Distributes Documents

The Network Information Center edits and publishes the following documents:

The ARPANET DIRECTORY - A directory of users and hosts on the ARPANET. It gives the names, network and U.S. Mail addresses, phone number, and host affiliation of ARPANET users, as well as summary tables of host information.

THE ARPANET PROTOCOL HANDBOOK - A collection of the currently accepted network protocols.

THE ARPANET RESOURCE HANDBOOK - A compendium of the resources available on the ARPANET.

NICNOTES - Informal newsnotes distributed online by the NIC to the Liaison and other interested people. NICNOTES are primarily concerned with announcement of changes of host names and host addresses on the ARPANET.

- Provides Network Information Services

NIC/QUERY - Most of the information contained in the Resource Handbook is maintained online in the directory <NETINFO> at SRI-KL. This information may be viewed through the NIC/QUERY program. The query program is geared toward novice or casual users and is available to all by connecting to host SRI-KL and typing the word "nic" followed by a carriage return.

In addition the Network Information Center maintains the following online reference files for the ARPANET:

THE OFFICIAL ARPANET HOSTNAMES FILE, <NETINFO> HOSTS. TXT - This file contains the official list of host names and host addresses for hosts attached to the ARPANET. It consists of host name, decimal host address, type of host (i.e., SERVER, USER, TIP), and host nickname, if any. It is accessible to any network user for reference, and is mainly used to update local host name recognition tables. The reference file meets the criteria outlined in RFC 608.

THE OFFICIAL ARPANET LIAISON FILE, <NETINFO> LIAISON. TXT - This file contains name, U.S. mail address, network mail address, phone, and host affiliation for each network Liaison.

THE LIAISON NETWORK MAILBOX FILE, <NETINFO> LIAISON-SNDMSG. TXT - This file contains network mail addresses for all network Liaison formatted for online group distribution of messages via SNDMSG.

THE OFFICIAL ARPANET NETWORK SPONSORS FILE, <NETINFO> NET-SPONSORS.TXT - Contains the name, U.S. mail address, network mail address, phone, and host affiliation for each network Sponsor.

REQUEST FOR COMMENTS (RFCs), <NETINFO> RFCnnn.TXT (where "nnn" is the RFC Number) - Current Network Working Group (NWG) papers, known as RFCs, are kept online in the directory <NETINFO> at SRI-KL (66 dec). These are maintained by the Coordinator of the NWG, currently Jon Postel, and are announced to ARPANET users via an online distribution list. Each RFC remains online for at least a month to give users a chance to obtain copies. Individuals wishing to be added to the RFC notification list should contact Jon Postel (POSTEL@ISIB).

- Provides General Reference Service

## HARDCOPY DOCUMENT DISTRIBUTION

Telephone, online, and U.S. Mail requests for information are handled by the NIC.

The NIC maintains files of many hardcopy documents pertaining to the ARPANET. Although the NIC (since 9/74) does not officially distribute hardcopy documents (other than the Handbooks and Directory mentioned above) to network users, it will attempt to honor Interlibrary Loan requests for items in the NIC collection that are not available in the open literature.

These services are provided to the extent that funds and staff permit and are not guaranteed.

- Builds and Maintains Data Bases

The NIC maintains these programs and data bases:

Resource Information Data Base and NIC/Query program.  
Identification Data Base and Identification Program.  
MEMLIST, a program that produces membership lists for groups and orgs.

Document formatting programs for production of the hardcopy documents.

## PERSONNEL AND COMPUTER RESOURCES

The NIC uses SRI International's NLS system and has a 2.5% pie-slice on the SRI-KL host.

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