NS-ARPA/1000

Technical Data

**Product Number
91790A/R**

Network Services and ARPA Services for the HP 1000 (NS-ARPA/1000) provide multivendor networking to HP 1000 customers. NS-ARPA/1000 combines the high-level networking protocols of NS, backward compatibility with DS/1000-IV, and the industry-standard, multivendor networking services of ARPA.

NS-ARPA/1000 provides unparalleled connectivity between the HP 1000 A-Series processors, HP 3000, HP 9000, HP Vectra, IBM PC, DEC VAX, Sun, and other computers. The product is intended for a variety of networking applications, such as process-to-process communication, file transfer, virtual terminal, and

DS-compatible services. For those applications requiring only basic multivendor applications (file transfer and virtual terminal), customers should consider ARPA/1000 (P/N 98170A/R).

Features and Benefits

NS-ARPA/1000 runs on HP 1000 A-Series computers, and provides the user with several key benefits:

- High-speed, high-reliability communication from an HP 1000 A-Series computer to an HP 1000 F-Series, or to machines from several vendors including HP, DEC, Sun, and IBM. The result is easier and more cost-effective integration and implementation of distributed systems.
- An underlying transport mechanism based on industry-standard and de facto protocols. Such a basis increases connectivity and system integration possibilities.

Figure 1

NS, DS, and ARPA Networking
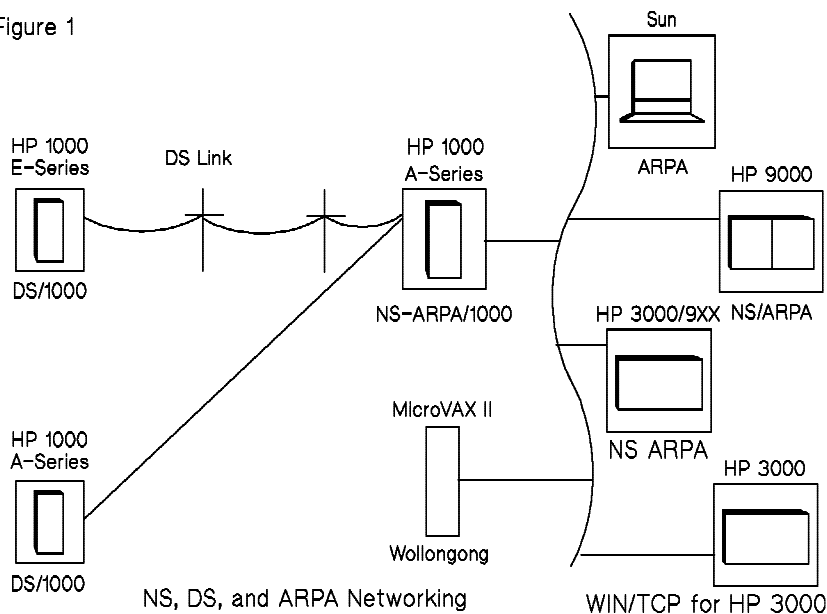
The NS-ARPA/1000 transport mechanism is based on the following:
- Transmission Control Protocol (TCP) (MIL-STD 1778)
- Internet Protocol (IP) (MIL-STD 1777)
- Address Resolution Protocol (ARP) (RFC-826)
- IEEE 802.3 CSMA/CD Media Access Control
- Ethernet

• When communicating with another computer, NS-ARPA/1000 automatically determines which protocol (Ethernet or IEEE 802.3) the other machine uses and adapts accordingly. NS-ARPA/1000 can therefore communicate with Ethernet and 802.3 machines simultaneously over the same or different LANs. If the HP 1000 is connected to two or more LANs, NS-ARPA/1000 will provide IP routing between them.

• Several diagnostic tools which can be used to monitor the network, gather statistics, test remote nodes, and diagnose problems in both HP and multivendor environments.

These tools include:
- Connection verification to other systems running TCP/IP: PING
- Link-level connectivity verification across the LAN:NM
- A menu-driven utility to display network status and resource utilization: NSINF
- Tracing and Logging (for troubleshooting and network planning)

NS-ARPA/1000
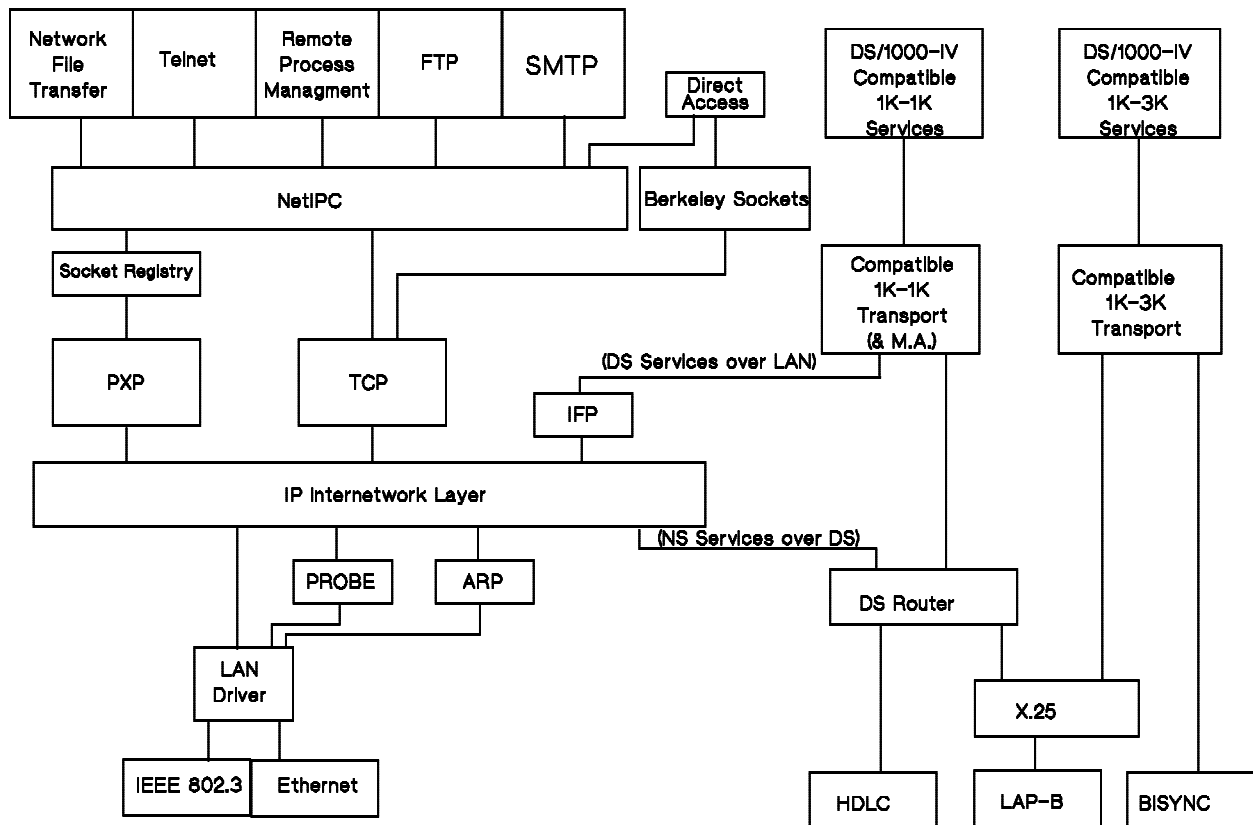
Functional Description

NS-ARPA/1000 functionality is the result of combining the facilities of NS Services, DS/1000-IV Backward Compatible Service (and its transport), and ARPA Services, with industry-standard and de facto transport protocols. Figure 2 shows the internal structure of the NS-ARPA/1000 product.

NS-ARPA/1000 Services

The services provided by NS-ARPA/1000 allows users to share information among computers supporting either DS, NS, or ARPA Services. Those services available on the HP 1000 System are Network InterProcess Communication, Remote Process Management, Network File Transfer, TELNET Virtual Terminal, File Transfer Protocol, and a variety of DS/1000-IV Backward Compatible Services. Table 1 shows which services are available over which links. Not all services operate on all links or on all systems.

Berkeley InterProcess Communication (BSD IPC) Application Program Interface.

NS-ARPA/1000 includes 4.3 BSD IPC developed by University of California at Berkeley (UCB). BSD offers a programmable interface to TCP/IP for multivendor connectivity to the systems with BSD IPC.

Network InterProcess Communication (NetIPC)

NetIPC provides direct programmatic access to the TCP/IP transport layers. This allows processes on different nodes to share data and send or receive messages. It consists of programmatic calls that can be used to identify and communicate with remote processes. Because the relationship between NetIPC processes is peer-to-peer rather than master-slave, its processes are more independent and flexible than DS/1000-IV Compatible Services' Program-to-Program (PTOP) communication. NetIPC also provides synchronous and asynchronous communication where PTOP only provides synchronous communication. The benefit of asynchronous communication is that a response is not needed before the next message is sent.

Network File Transfer (NFT)

NFT lets users copy files between any two NS nodes on a network. Files can be copied interactively or programmatically. Refer to the technical documentation for details of what features are available between different computer systems. NFT includes features for copying remote files, groups of files, or a variety of file types, translating file attributes, and accessing remote accounts.

Remote Process Management (RPM)

RPM consists of a set of programmatic calls for initiating and terminating remote processes. These calls will generally be used in conjunction with the NetIPC calls, allowing an entire distributed application to be controlled from a single system. Created processes may be independent (continue executing when the creation process terminates) or dependent (terminates when the creating process terminates).

File Transfer Protocol (FTP)

FTP, based on RFC 959, offers a family of commands for performing file and directory operations over the network. A user can transfer ASCII or binary files to or from a remote machine, append, rename, and delete files, list, change, make, and remove directories, check status, and toggle switches to change the environment. An on-line help facility explains the function and syntax of each command. Further information on FTP, including a list of commands, is available in the ARPA/1000 data sheet.

TELNET Virtual Terminal

TELNET is an interactive network virtual terminal service based on MIL-STD 1782. It allows the user, via his or her terminal and local computer, to access another computer anywhere on the network, as though the user's terminal were directly attached to it. The remote computer can be running an operating system other than RTE. With Rev 5.24 and later, a TELNET user on the local system can run a block mode application on a remote HP 1000 system as long as the local terminal or terminal emulator can handle block mode I/O. Further information on TELNET is available in the ARPA/1000 data sheet.

DS/1000-IV Backward Compatible Services on the HP 1000

DS/1000-IV Backward Compatible Services have been included in NS-ARPA/1000 to provide complete backward compatibility with DS/1000-IV. DS Services available include:
- Remote File Access (RFA)
- Distributed Executive (DEXEC)
- Remote 3000 Access (RMOTE)
- Remote Attach (REMAT)
- Program-to-Program Communication (PTOP)
- Remote Database Access (RDBA), part of IMAGE/1000 Service
- DS Transparency
- Remote System Download
- Remote Virtual Control Panel (VCP)

The DS/1000-IV Backward Compatible Services of NS-ARPA/1000 are the same as those offered by the DS/1000-IV product. Further information on DS/1000-IV and associated services is available in the DS/1000-IV data sheet.

NS-ARPA/1000 Transport Protocols

The NS-ARPA/1000 transport is based on the Defense Advanced Research Project Agency (DARPA) Transmission Control Protocol (TCP) and Internet Protocol (IP) standards.

TCP provides end-to-end reliable, connection-oriented services with flow control and multiplexing of connections. TCP also provides mechanisms for detecting duplicate, lost, or out-of-sequence packets.

IP allows network designers to implement large networks by interconnecting a series of smaller networks. IP then routes messages between the networks and performs any message segmentation and reassembly required. Segmentation and reassembly may be needed if a message must be routed through a network with different packet size restrictions than the source and/or destination network.

Link Interfaces

Use of NS-ARPA/1000 on the HP 1000 A-Series computer family requires one of the following link interfaces (see ordering section for product numbers):

HDLC Direct Connect Interface

The HDLC direct connect interface allows HP 1000 A-Series computers to communicate via the widely accepted, full-duplex High Level Data Link Control protocol. HDLC interfaces provide efficient communication particularly suited for applications requiring communication to one or two other processors with low computer overhead.

HDLC Modem Connect Interface

The HDLC modem connect interface allows HP 1000 A-Series computers to communicate via the HDLC protocol over synchronous, full-duplex modems. The HDLC modem connect interface supports dynamic rerouting around down nodes.

LAN/1000 Link Interface

The LAN/1000 link interface allows HP 1000 A-Series computers to communicate over an IEEE 802.3 or Ethernet LAN. The LAN/1000 Link allows an A-Series computer to communicate with other A-Series computers, as well as HP 3000, HP 9000, HP Vectra PC, DEC VAX, Sun, and other computers.

LAP-B Modem Interface

The LAP-B modem interface allows HP 1000 A-Series computers to communicate using the physical interface (X.25 bis, level 1) and the frame interface (LAP-B, level 2) of the CCITT X.25 recommendation.

Connectivity to Other Computers

ARPA Services and transports have been implemented on a wider variety of machines than any other modern protocol suite. Most hardware vendors and many independent software vendors have ARPA implementations. NS-ARPA/1000 is expected to communicate with most of these. HP has selected a small number of these machines for rigorous testing. Those that interoperate well with NS-ARPA/1000 are certified and supported by HP. The testing program is continually being expanded, and customers are advised to contact their HP Representative for the most recent list of supported machines. Table 1 shows which services are currently supported over which links. Not all services operate on all links or on all systems.

Table 1: Functionality from NS-ARPA/1000 to:

Product	User Services	Link Type
NS-ARPA/1000	FTP,TELNET,NFT,RPM,NetIPC, DS/1000-IV Services[1], BSD IPC	802.3/Ethernet, HDLC,LAP-B[2]
DS/1000-IV	DS/1000-IV Services	HDLC, LAP-B[2]
ARPA/1000	FTP,TELNET	802.3/Ethernet
NS3000/V	NFT,NetIPC DS/1000-3000 Services	802.3 LAP-B[3]
NS3000/iX	NFT,NetIPC, BSD IPC	802.3
DS/3000	DS/1000-3000 Services	LAP-B[3]
NS/9000 & LAN/9000	NFT,NetIPC, BSD IPC	802.3/Ethernet
ARPA/9000 & LAN/9000	FTP,TELNET,NetIPC BSD IPC	802.3/Ethernet
NS for the DEC VAX	NFT,TELNET	802.3/Ethernet
OfficeShare-NS Vectra PC	NFT,NetIPC,TELNET	802.3/Ethernet
ARPA/Vectra PC	FTP,TELNET	802.3/Ethernet
Sun 3.X/4.0	FTP,TELNET, BSD IPC	802.3/Ethernet

Notes:
1. Remote Control Panel and Forced Cold Load are only available over HDLC to DS/1000-IV nodes.
2. X.25 can only be used as a Router/1000 link, not X.25 gateway.
3. DS/3000 X.25 Link only.

Product Requirements

Required Hardware
- An HP 1000 A-Series computer
- A minimum of 1.5 Mbytes of main memory
- One of the following data communication link products:
  - LAN/1000 Link (P/N 12076A)
  - HDLC Direct Connect Interface (P/N 12044A)
  - HDLC Modem Connect Interface (P/N 12007A/B)
  - BSC Modem Connect Interface (P/N 12073A)
  - LAP-B Modem Interface (P/N 12075A)

Software Requirements
- RTE-A, current version
- VC+ (CDS and MultiUser) installed
- A maximum of six pages of system common memory may be used with NS-ARPA/1000

Backward Compatibility with DS/1000-IV

NS-ARPA/1000 is backward compatible with DS/1000-IV running on other HP 1000 computers. All communication between A-Series computers running NS-ARPA/1000 and nodes running DS/1000-IV must utilize the DS/1000-IV Backward Compatible Services and HDLC or LAP-B Link interfaces.

Related Considerations
NS-ARPA/1000 requires that Code and Data Separation (CDS) and MultiUser options, which are part of VC+, be installed. Users purchasing an "R" copy of NS-ARPA/1000 for network nodes on which no software development is done can purchase the "E" copy of VC+, which is more economical than the "A" or "R" versions.

Application programs utilizing NFT, NetIPC, or RPM intrinsics must be compiled with the Code and Data Separation (CDS) option turned on.

When NS-ARPA/1000 is installed, RTE-A may only be configured ("genned") with a maximum of six pages of System Common. Therefore, user programs may not require more than six pages of labeled and unlabeled common, regardless of whether or not they utilize NS-ARPA/1000 services and features.

Direct Driver Access (DDA) to the LAN/1000 Link card is supported with restrictions when NS-ARPA/1000 is active.

Installation

Customer Responsibility
Customers purchasing NS-ARPA/1000 must assume the following responsibilities. HP can provide expert assistance in all areas, but this is not part of the 91790A/R product.

- Install approriate LAN facilities (cables, repeaters, connectors, etc.) and establish link-level communications between the HP 1000 and other machines on the network.
- One person in the customer's organization must be designated the Network Manager. This person will assume responsibility for configuration and generation of the customer's systems, and will serve as a focal point for Hewlett-Packard's support of the network.
- NS-ARPA/1000 is a customer-installed product unless it is ordered with an HP 1000 system.
- Hewlett-Packard strongly recommends that the customer purchase Account Management Support (AMS) or Response Center Support (RMS) for NS-ARPA/1000 and related hardware and software products.

Ordering Information

The first copy of NS-ARPA/1000 must be 91790A. One processor option and one media option must be specified. Additional licenses for use of NS-ARPA/1000 should be ordered as 91790R. Only a processor feature code should be specified, as the "R" copy does not include media or documentation. The "A" copy must always be ordered for (or upgraded to) the most powerful HP 1000 System using NS-ARPA/1000.

Prior to ordering NS-ARPA/1000, the proposed network configuration must be approved by a qualified HP technical representative. An ACN number is required to complete the NS-ARPA/1000 order. The NS-ARPA/1000 options are outlined below.

91790A	NS-ARPA/1000 Right-to-Use
91790R	NS-ARPA/1000 Right-to-Copy
022	CS/80 Cartridge Tape Media
051	1600 bpi, 9-track Magnetic Tape Media
AAH	DAT Tape Media
400	Use in A400 computer
401	Update to latest version, A400
600	Use in A600 computer
601	Update to latest version, A600
890	Use in A900 computer
891	Update to latest version, A900
894	Upgrade from A400 to A900

896	Upgrade from A600 to A900
990	Use in A990 computer
991	Update to latest version, A990
994	Upgrade from A400 to A990
996	Upgrade from A600 to A990
998	Upgrade from A900 to A990

Upgrade credits are only applicable when purchasing a license for NS-ARPA/1000 on a larger HP 1000 system.

Documentation

Included with the 91790A are the following manuals:

Note: 91790R does not include manuals.

91790-90020 NS-ARPA/1000 User/Programmer Reference Manual
91790-90030 NS-ARPA/1000 Generation & Initialization Reference Manual
91790-90031 NS-ARPA/1000 Maintenance and Principles of Operation Reference Manual
91790-90040 NS-ARPA/1000 Quick Reference Guide
91790-90045 NS-ARPA/1000 Error Message & Recovery Manual
91790-90050 NS-ARPA/1000 DS/1000-IV Services Reference Manual
5958-8523 NS Message Formats Reference Manual
5958-8563 NS Cross System NFT Reference Manual
91790-90060 NS ARPA/1000 BSD IPC Reference Manual