

INTRODUCTION TO NETWORK ADMINISTRATION

XEROX

Network Administration Library

Changes are periodically made to this document. Changes, technical inaccuracies, and typographic errors will be corrected in subsequent editions.

The content of this booklet is based on the Services 10.0 Release.

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Purpose The *Introduction to Network Administration* booklet contains an overview of the 8000 Network System server and services software. This booklet contains an introduction to:

- Your tasks as a System Administrator
- The overall network functions and capabilities
- Server components and operation
- Available services

The booklet is designed to give you overall assistance with the installation, initialization, configuration, and maintenance of the 8000 Network Services. Details on any of the servers, services, or operations can be found in the corresponding booklet of the *Network Administration Library*.

Intended audience This publication is intended for System Administrators who are responsible for starting up and keeping the network running efficiently.

Before you read this booklet There are training courses available to assist you in your task as System Administrator. If you have been trained on the 8000 Network Services, this booklet will serve as a refresher and reference.

If you have not been trained on the 8000 Network Services, you should be able to understand the overview of the system as presented in this booklet. After reading this booklet, you should be able to continue to the step-by-step procedures outlined in the other booklets in this library.

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Table of contents

1. Introduction	1
About this booklet	1
Your duties as System Administrator	2
Overview of the Network Administration Library	6
2. About your network	9
Network workstations	11
System security	12
Services System Software	14
Distribution and interconnection of servers and network workstations	18
Xerox Network System communication	24
3. Network basic services	27
Services Software installation (Services System Software)	29
Clearinghouse Service	30
External Communication Service	39
Server Monitor Service	43
4. Network shared services	45
Internetwork Routing Service	46
File Service	51
Print Service	56
Mail Service	59
Interactive Terminal Service	64
850/860 Gateway Service	68
Remote Batch Service	70
Communication Monitoring Service	72
Boot Service	74
Glossary	75
Index	INDEX-1

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About this booklet

This booklet, *Introduction to Network Administration*, introduces the library of materials that assist you in the installation, initialization, configuration, maintenance, and troubleshooting of 8000 Network server and service software. The conceptual overviews of the services and the discussion of server components and normal operation are meant to prepare you for the step-by-step procedures provided in the other books in this *Network Administration Library*.

This booklet will also help you perform your first administration task, which is to fill out the forms located in Appendix A of each applicable booklet in the library. If you do not understand how to use the forms provided, you can get assistance from your Systems Analyst.

In addition, this booklet gives an overview of the rest of your system administration activities and explains which booklets provide specific, step-by-step procedures and task descriptions for the activities you will be performing.

This booklet contains the following sections:

- About your network
- Network basic services
- Network shared services

Your duties as System Administrator

Filling out relevant forms

In Appendix A of each applicable booklet in the Library, you will find forms to fill out before starting the installation, initialization, and configuration of your server and services software.

The values and names you enter into the forms are required by the software during your installation, initialization, and configuration activities. You may need to work with System Administrators at other sites to agree on the domain you will use and the placement of domain replicates. You will want to decide which services should reside on which servers and make sure that all servers are configured with the correct hardware needed to support the services you will install on them.

Here are the most significant facts and values you need to know:

- Your Ethernet network number(s)
- Your organization name and password
- Your domain name
- Your server names
- Your service names
- The services, if any, that will not be activated
- The size(s) you will establish for your Mail Service database(s)
- The size(s) you will establish for your Clearinghouse Service database(s)
- The number of users that can concurrently use the Interactive Terminal Service and the amount of workspace granted to each
- The ports that will be used by specific services and service options
- The phone number(s) of the remote Internetwork Routing Service(s) that will be connected with your Internetwork Routing Service
- The characteristics of each port
- The maximum number of remote executives allowed at each server

Installing, initializing, and configuring server and services software

After you have filled out the forms, you should review the *Server Operation and Maintenance* booklet in the *Network Basic Services* volume. It explains general operating techniques and discusses the Services Executive, which will be your primary network administration tool.

You will then work with your Systems Analyst to install the server and services software and respond to your server's first-time initialization prompts. The *Server Software Installation* booklet in the *Network Basic Services* volume provides step-by-step instructions to guide you through this activity.

Next, you will perform first-time initialization of each service that you installed. This involves naming the services, ensuring that they are able to register themselves with the Clearinghouse, and providing any additional initialization information they require. The first time a service is run, it prompts you for all of the initialization information it needs. These prompt-driven, first-time initialization dialogues are explained in detail in the service-specific booklets of the *Network Administration Library*.

Finally, after the services have been run for the first time, you will be configuring them. This configuration activity is different for each service.

Example

Configuring the Mail Service involves creating mailboxes for each user, specifying when the External Mail Gateway is to call other External Mail Gateways, and specifying what phone number it is to use.

Configuring the External Communication Service involves adding and defining ports for its use of terminal emulation, remote administration, the Interactive Terminal Service, or the Internetwork Routing Service.

Configuring the Clearinghouse Service requires adding users, adding user groups, replicating domains, and assigning domain administration privileges to one or more assistant System Administrators.

Configuring the File Service includes creating file drawers, setting access controls on file drawers, partitioning secondary removable or fixed disks, creating services volumes on them, registering these volumes as file services, and defining manual or automatic backup procedures. The *Server Operation and Maintenance* booklet and the service-specific booklets guide you in these activities.

Establishing naming conventions

During initialization and configuration tasks, you will be supplying names for all of the "objects" in your network community. Developing naming conventions that suit your organization is a creative and important activity. These names are the means by which people will access network resources. You should select names that are clear and unique and will be meaningful over the long term.

Although most servers and services can be renamed if necessary, you should minimize the renaming if possible. When you rename objects, new icons will have to be retrieved by your 6085/8010 workstation users and there may be some confusion in your network community.

Names should be easy to remember and easy to type. You can establish themes for each object type and start a naming tradition that will simplify the task of creating new names as the network community grows.

Example Your File Services can have college and university names, such as Yale or USC. Your Print Services can have planetary names, such as Jupiter or Pluto.

Summary

Your initial tasks as System Administrator are to:

- Install server and services software.
- Initialize each of the installed services for the first time.
- Configure each service.

Maintaining and troubleshooting your network

Once your network resources have been installed and configured, your maintenance tasks will fall into three major areas.

Carrying out your established backup routines

Procedures for backup of your server profile are described in the *Server Operation and Maintenance* booklet.

Procedures for backing up your primary and secondary (removable disk drive option only) services volumes are provided in the *File Service* booklet.

Procedures for replicating Clearinghouse domains and for backing up the Clearinghouse database (networks with one Clearinghouse service only) are provided in the *Clearinghouse Service* booklet.

Procedures for backing up your Mail Service database are described in the *Mail Service* booklet.

Procedures for backing up your Server Monitor Service log are provided in the *Server Monitor Service* booklet.

Reconfiguring your servers and services

As your network community grows and your resource needs change, you may need to move services to different servers, add users to Clearinghouse domains, install new services, and so forth. General maintenance procedures involving reconfiguration are described in the *Server Operation and*

Maintenance booklet. Specific procedures pertaining to each service are described in the service-specific booklets.

The *Server Software Installation* booklet, together with the upgrade kit that accompanies each software release, guide you in upgrading your servers to new versions of software.

Resolving problems and troubleshooting

General tips for responding to problems are provided in the *Server Operation and Maintenance* booklet. Detailed discussion of the recommended troubleshooting method is provided in the *Basic Troubleshooting of Network Services* booklet.

Overview of the Network Administration Library

The *Network Administration Library* was written both as a training resource and a reference tool. If you are a new System Administrator or an experienced one, you will find you can use this library to set up new networks, maintain existing networks, and keep abreast of the latest software release procedures.

The library consists of the following two volumes and their respective booklets:

- **Network Basic Services**

- Introduction to Network Administration*
- Server Software Installation*
- Server Operation and Maintenance*
- Basic Troubleshooting of Network Services*
- Clearinghouse Service*
- Server Monitor Service*
- External Communication Service*

- **Network Shared Services**

- File Service*
- Mail Service*
- Print Service*
- Interactive Terminal Service*
- Internetwork Routing Service*
- 850/860 Gateway Service*
- Remote Batch Service*
- Communication Monitoring Service*

Booklet organization

The contents of each booklet in the *Network Administration Library* are unique. However, all are similar in organization and structure. The following is a description of the elements used throughout the booklets within the *Network Administration Library*.

- Preface** The Preface in each booklet defines its intended audience, describes the purpose of the booklet, and provides a list of booklets that should be read before you start.
- Introduction** The Introduction in each booklet is devoted to providing a technical overview. The overview tells you the purpose of the service or function, and provides a brief description of what you can do with the service or function.
- Chapters** Each chapter begins with a description of the chapter subject. Chapter 2 in each booklet provides a list of commands (where applicable) that are required to perform the procedures described in the booklet.

The subsections are clearly shown with a major title and are followed by an overview of the subject. The overview may contain:

- A general description of the subject
- Preparatory information
- Alternatives and/or consequences of actions or procedures

Messages One chapter in each booklet (where relevant) is devoted entirely to the messages you may encounter while performing an operation. The messages are listed in alphabetical order. Each message is shown exactly as you would see it at your terminal and is followed by a description of what it means. If it is an error message, you are told how to recover.

Appendixes Each booklet contains any appendixes required to support the subject. Appendix A in each applicable booklet will always contain any forms that may be required for that service.

Glossary A glossary is supplied to define the unique terms used throughout the booklet. Each glossary is booklet-specific. A master glossary is provided at the end of this booklet.

Conventions

These writing conventions are used throughout the library:

Comment Comments are provided throughout each booklet. They are intended to provide helpful information that may make the task easier to perform, or provide a resource for additional information.

Note Notes are included to remind you of any conditional prerequisites.

CAUTION Cautions are placed immediately following any action that may be destructive. The caution describes the consequences of any deviation from the information. Whenever you encounter an action that has a caution before it, make sure you understand both the caution and the action before you perform the step.

Example Examples are provided where applicable. They appear as additional information to make your task easier.

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Your organization has a single Ethernet network or multiple interconnected Ethernet networks which form an internetwork. As System Administrator, you are responsible for maintaining all of the servers connected to your local Ethernet network and for supporting all of the people who use workstations at your site. If your Ethernet network is a part of an internetwork, System Administrators at other sites are responsible for the servers and workstations connected to their Ethernet networks.

You may be assisting those who use personal computers that are not physically connected to your Ethernet network. Remote, non-networked computers and terminals can be used by members of your organization who are traveling, working at home, or working in small branch offices. These non-networked devices can be connected to modems so that temporary, dial-up sessions can be established with some of the network services.

For the most part, the network services work on their own to integrate your office. Members of your organization benefit from a variety of shared resources and means of sharing information. Your job as a System Administrator includes installation, configuration, and day-to-day operation of the services which run on your servers.

Very small networks may have a single server which supports all installed services. Larger installations will have multiple servers, each running an appropriate complement of services.

The sections in this chapter cover these topics:

- **Network workstations** - Describes the types of workstations that can run on the network.
- **System security** - Explains terms and issues relevant to keeping your system secure and operative.
- **Services System Software** - Describes the software that provides the basic environment necessary to run your services.
- **Workstation distribution and interconnection** - Gives the basics for the interconnection of workstations on the 8000 Network System.

- **The server** - Describes the server, its hardware components, and server operation.
- **Network citizen communications** - Explains the conventions by which workstations and network citizens communicate.

Network workstations

Your network can contain any combination of these four types of workstations:

- The 6085/8010 ViewPoint Information Systems are the high-end workstations. These workstations provide multi-window, object-oriented application interfaces that allow you to switch easily among multiple tasks, including document preparation and illustration, electronic mailing, terminal emulation, remote network administration, electronic spreadsheets, and many other activities.
- The Xerox 6060 series of PCs and the 850/860 Information Processing System also support document preparation, electronic mailing, filing, printing, and terminal emulation.
- The 820-II is a CP/M-based microcomputer that can be used as a network workstation when it is connected to a Xerox Shared Interface Unit. Users of 820-II workstations can also benefit from electronic mail, electronic printing, shared filing, and other network capabilities.
- The IBM PC is a DOS-based microcomputer used as a network workstation when equipped with an Ethernet interface board which fits into an expansion slot in the IBM PC. Users of IBM PCs can also benefit from electronic mail, electronic printing, shared filing, and terminal emulation.
- DEC terminals (VT100, VT52) can be used for filing, printing and other tasks if the VAX has XNS/DEC VAX software configured and running.

Despite the fact that each type of workstation features different hardware, operating systems, and application software, users can share and exchange information very efficiently within and across geographical boundaries.

All networked workstations and all servers and services are compatible with Xerox Network System (XNS) layered protocols. Each network service plays an important role in extending the power of the individual computers used as workstations.

Not only can users of networked workstations accomplish tasks that are ordinarily impossible at personal computers, but they can share the results of their efforts with co-workers in other cities or on the other side of the globe.

System security

The server and the services it houses are valuable resources for your organization. For this reason, you need to conform to and enforce security conventions established by your organization. In addition to the physical precautions available, the server software provides limited software protection to reduce the risk of unauthorized access that could jeopardize the current configuration of your server or the integrity of the resident data.

Security is closely tied with understanding of the Clearinghouse Service and how it works. Please refer to the security description in the "Clearinghouse Service" section, as well as to the *Clearinghouse Service* booklet.

Terms applicable to system security

- System Administrator** As System Administrator, you administer network resources at a site, answer user questions, train assistant System Administrators, and install, configure, maintain, and troubleshoot the server and services software. Your Systems Analyst and the *Network Administration Library* will help you accomplish these activities.
- Domain Administrator** You are the Domain Administrator for each Clearinghouse domain you administer. This status allows you to issue Clearinghouse Service commands that introduce, modify, or delete Clearinghouse entries in the domain you administer. This status is required by each server before it will allow you to gain access to any commands that are restricted to System Administrators. It also allows you to enable System Administrator commands on servers registered in the domain to which you have access.
- Server security** You can maintain server security by restricting physical access to the server by locking it away. Server software also protects the server's current configuration by disallowing anyone other than a Domain Administrator from accessing the special System Administrator commands. This requires "authentication" of the user's identity and password by the Clearinghouse Service, and application of object-level access controls to a subset of authenticated users.
- Objects** Objects are logical (non-physical) or physical entities that are managed by the server or by the services it supports. File drawers, Clearinghouse domains, Clearinghouse domain entries, services volumes, and mailboxes are logical entities or objects. Printers, ports, disk drives, processors, and server terminals are physical objects. The logical objects are protected by software mechanisms and the physical objects are protected when physical access to them is restricted.

Object-level access controls

Object-level access controls allow a specified individual or group of individuals to have specified types of access to objects. The Clearinghouse Service, File Service, and External Communication Service are the services which implement access controls.

In some cases, object-level access controls can be used to delegate object privileges to a registered user. A file drawer containing sensitive documents can be restricted from access by users other than the one user who has ownership, and the System Administrator. The System Administrator can access any file in any file drawer local to the server using the **Set Remote Directory** and **Retrieve Remote File** commands.

Authentication

Before any user can gain access to a network workstation, server terminal, emulation port, or any service or resource that can be accessed from remote dial-in devices, he or she must be authenticated. Authentication occurs when the user logs on and provides the correct password. Passwords are encrypted and are authenticated by means of a special process. The software accepting the user's name and password interacts with the authentication capability in the Clearinghouse database to verify the user's identity.

Even after logging on, a user might be authenticated again if he or she attempts to manipulate or access an object that is restricted (not accessible to all authenticated users but to some subset of authenticated users).

Password suppression

Whenever passwords are entered at any workstation or server, they are "suppressed." This means that the characters that make up the password are not displayed on the screen. Special characters (usually asterisks) are displayed instead. Since passwords are crucial to network security mechanisms, they are suppressed when they are keyed in, and they are encrypted when network citizens need to use them for authentication purposes.

Passwords that are associated with network objects, such as user entries in the Clearinghouse database, are never displayed at any interface.

Note: Additional security considerations are discussed where applicable throughout this document.

Services System Software

Each server contains Services System Software, which is stored on the server's rigid disk during software installation. This software provides the basic environment necessary to run services. It supports installation, configuration, and the operation of multiple services concurrently on the 8000 server.

It also contains the communication software necessary to allow its supported services to access other services on the same or different servers. It provides the Services Executive that you and your co-workers interact with when you need to observe the current activity of the server; establish, change, or troubleshoot its current configuration, and so forth.

The Services System Software enforces a degree of security--only you and those assistants whom you appoint can gain access to the special executive commands needed to reconfigure or otherwise impact the server's performance.

The Pilot operating system

The basic server environment consists of Pilot--a multi-tasking operating system required for operation of an 8000 server. Pilot contains the communication modules necessary to receive and transmit information packets to and from the server, and its supported services, in accordance with the lower and middle levels of the Xerox Network System protocols.

Pilot is concerned with memory, file, and network communication management. In general terms, Pilot does these tasks:

- Allocates disk space to a service as needed and ensures a non-wasteful use of available disk space
- Supplies large programs and applications with needed memory
- Allows network services and workstation applications to use Xerox Standard protocols to receive and transmit information anywhere in the internet

Server software

The Server software is made up of the programs that function as an intermediate layer between the Pilot operating system and the various Network Services. These programs are required for the operation of all services and are shared among the network services for performance and convenience.

Services Executive

This portion of the Services System Software is used for installing, configuring, maintaining, and troubleshooting the server and services. It is the primary portion of the software with which you are concerned as System Administrator. The Services Executive coordinates your input to multiple services that may be running at the same time. When services are running, they output messages that are displayed by the Executive.

Restricted access

The Services Executive gives access to commands used for critical configuration and maintenance tasks. Access to the appropriate commands is granted depending on a user's qualifications. Registered users are granted limited access to the commands they need to view the current status of the server or the services it supports.

Registered users can also change objects that they "own". As the System Administrator for your site, you can establish, change, and maintain the server's configuration. These System Administrator commands allow extensive, but not necessarily exclusive, control over all resources associated with a given server.

Not all System Administrators can gain access to System Administrator commands at all servers in an internetwork. Each server requires that a logged-on user be "enabled" before allowing access to System Administrator commands. Not all logged-on users can successfully enable themselves. Rather, each server uses its own domain name, provided by the installing System Administrator during server initialization and saved permanently in the server profile, to determine whether or not the user qualifies as a Domain Administrator.

Domain administration

A Domain Administrator has domain administration privileges for the domain specified in the server name. The domain administration privileges are specified at the Clearinghouse Service through the **Change Domain Access** command which allows user names to be added to a Domain Administrator list.

Once you log on to a server and use the **Enable** command, the server verifies that you are the Domain Administrator for the domain of the server. If you are, you are granted access to all System Administrator commands.

The name of the server is established during first-time server initialization. The Domain Administrator list is established for the server's domain during Clearinghouse Service configuration. Naming the server is similar to installing a lock. Granting Domain Administrator status to a registered user is similar to giving a key to the server(s) registered in that domain.

Remote Executives

The Services System Software can support multiple concurrent executive interfaces to a single server. One *instance* of the executive is always provided at the server's local terminal. Additional remote instances, up to a maximum number established by you, can be accessed from the 6085/8010

workstation, or from dial-up asynchronous personal computers or terminals.

Interaction with the remote executive is identical to interaction with the local terminal. You are able to accomplish most of your administrative tasks at your desk or from an off-site location.

You can disallow remote executives altogether, or allow them only at the 6085/8010 workstation, depending on your organization's preference. Your co-workers can check on the status of their print jobs, or any other services they may need to access, without leaving their desks. The same security considerations that prevail at the local executive are enforced at the remote executive so that the same degree of server security is maintained.

Backstop Software

Automatic recovery from power failures and other problems which cause server failure is largely performed by the backstop software. It captures the state of the system prior to the failure, logs the errors that caused the failure, and then boots the system software. All of the active services running prior to the failure are loaded into memory and run with their previous configurations applied.

As System Administrator, you specify whether the services you install become "active." This means that they are added to the active services list, which is applied each time the server is booted by you or by the backstop software.

Services Options Control

After the server is booted, the system software determines which service options have been purchased for use on the server. If the server has not been configured for services at all, the Services Executive prompts the System Administrator to enter a configuration password obtained from the Xerox Software Control Center.

Once services options have been set, the System Software allows you to change the options using the server **Set Software Options** command. Each time you change the options currently set on a server, you must supply a new password which you obtain from the Xerox Software Control Center.

Multilingual Support Software

The Services System Software includes a mapping capability for supporting keyboard input and service message output in a number of languages. Each server is purchased with one of the language packages. Terminals are ordered with standard English keytops and English ASCII read-only memory (ROM), or with foreign language keytops and ROM sets. Message files are available for each language option. These files provide the appropriate translations of server and service messages.

The Services System Software supports mapping user input with the appropriate characters in the Xerox character set, so that any one of a number of foreign language server packages are available. Additionally, the Services System Software maps the error and message codes generated by the services to the appropriate phrase or prompt provided by the message file.

On-line Diagnostics

The system software includes a number of tests and status messages or commands for troubleshooting activities. These facilities include the communication interface unit test, dialer test, echo test, floppy disk drive test, RS-232C test, and Ethernet statistics display. These tests are accessed via the Test context of the Services Executive. Refer to the *Basic Troubleshooting of Network Services* booklet for instructions on the use of these on-line diagnostics.

Distribution and interconnection of servers and network workstations

The Xerox 8000 Network System provides a means for personal computers to be interconnected to servers--enhancing workstation capabilities without sacrificing the independence, reliability, and unique applications that personal computers offer. The expanded hardware and specialized software offered by the network services are optimally shared by all members of the organization accessing them from networked workstations or remote dial-in terminals and computers.

The distribution and interconnection of computers running different operating systems and supporting different specialties combines and surpasses the best characteristics of the standalone personal computer and the traditional centralized systems.

The 8000 server's central processing unit, memory, and other computing resources are completely independent from those of the workstations. There is no degradation of workstation performance during peak usage periods.

A problem at the server affects only the services that run there, leaving workstations unaffected when used for independent activities. Although centralized systems support printer sharing, centralized file storage, and electronic mailing; the central processing unit and other computing resources are shared among all users.

Servers and services are continuously available to process requests from workstations. Workstations prepare and send requests from users who have initiated activities that require action from one or more network services. As a user of a networked workstation or remote dial-in computer, you can initiate a sequence of network communications that are automatic and seemingly instantaneous.

Workstation users are able to take advantage of the many resources and information exchange capabilities offered by the services without memorizing complex pathways, command sequences, naming schemes, and procedures. This is primarily due to the automatic involvement of communications software resident on all networked servers and workstations.

Principal server hardware components

These are the principal hardware components:

8000 Processor

The processor is the unit that houses the computer and peripherals. Its components are:

- Eight-inch floppy disk drive located within the processor unit.

- One or more rigid disk drives (fixed disk or removable disk) that are either inside the processor unit or housed in accompanying boxes. The drive options are:
 1. The 10 Mb drive, which is contained within the processor unit.
 2. The 42 Mb drive, which is contained within the processor unit.
 3. The 80 Mb removable disk drive, housed in a separate, connected unit. Servers with this drive option are configured with up to four drives, referred to as multi-drive servers.
 4. The 300 Mb removable disk drive, housed in a separate, connected unit. Servers with this drive option are configured with up to four drives, referred to as multi-drive servers.

Note: The 29 Mb drive is still supported, even though it is no longer sold.

Server Terminal Connected to the server and used for direct interaction with server and services software via the Services Executive.

Print Engine May be connected to the server if it is to run the Print Service. There are two printing devices sold in the United States. They are:

1. Electronic Printer - The 8044 and the NS 8000 Laser CP.
2. Telecopier 495-1 facsimile printer

The Fuji Xerox Model-35 Electronic Printer and the Fuji Xerox XP-9 Electronic Printer can also be connected to the server. These models are not available in the United States.

Local RS-232C Port Option

This option must be present if your server is to support the Facsimile Print option or a service that communicates with remote devices via phone media.

When this option is used to drive the facsimile printer, a ribbon cable connects the RS-232C port on the server to the facsimile printer.

When the port is used for communications, it is connected to a modem. The modem, in turn, is connected to the phone jack directly or through an acoustic coupler, depending on the characteristics of the modem.

Additional hardware devices controlled by the server

Modem If your server is to support a communication service, a modem is used to connect it to the phone or phone jack and to transform the digital signals to the analog signals used over phone lines.

Communication Interface Unit

(CIU) If your server supports the Internetwork Routing Service and one or more of the External Communication Service options, it requires additional RS-232C and RS-366 ports. Refer to the section titled "A word about configuring servers and services."

These additional ports are available on the Xerox 873 Communication Interface Unit (CIU) or the Multiport Option Kit. This box is connected to a separate Ethernet transceiver but is logically a port extender for the server. Its ports are managed by the External Communication Service, which provides configuration commands that you use to establish the communication parameters of these additional ports.

Multiport Option Kit

The Multiport Option Kit is capable of concurrently controlling four RS-232C ports, a single RS-336 port for auto-dialing, and an Ethernet interface on an 8000 Network Services Processor.

The RS-232C ports can be configured individually to support Internetwork Routing, Clusternet, 3270 SDLC, and X.25.

The services volume

Before you install software on the rigid disk, you partition the disk into three storage areas. Then you install the Services System Software in two of these areas. The third, and largest, area is "initialized" automatically for you by the server software when the server is booted for the first time. The third storage area becomes the "primary services volume," which contains the Network's 8000 hierarchical file system.

Once the initialization process creates the file system, the services volume is ready to receive files of various types. The two major components of this volume are system files and the server profile, which are described in the following paragraphs. Refer to the *Server Software Installation* booklet for details.

System files

The system files portion contains a subdirectory called the "working directory," which you can manipulate using server file management commands such as **List Files**, **Show Files**, **Delete Files**, **Store Files**, and **Retrieve Files**. The actual services that you elect to install using the **Install Service** command, along with the server profile, are contained in this working directory.

The remaining portion of the system files area contains:

- The Clearinghouse and Mail Service databases, if you have installed and run these services
- The font files, if you have installed them in conjunction with the Print Service
- The scavenger log
- Other files generated by the server and services during normal operation

The components of the system files area that are not resident on the working directory are manipulated by using special server or service commands. These commands include **Install From Floppy** (the Print Service command used to install fonts), **Show Scavenger Log**, **Delete Scavenger Log**, and the Clearinghouse Service **Backup** command (used in single Clearinghouse installations to back up the Clearinghouse database).

Although the system files area is a part of the File System, which comprises the primary services volume, it is inaccessible to remote clients when you bring the primary volume on-line. In this way, its components are protected. All commands which result in changes to this restricted area are System Administrator commands, and are only available to those who are Domain Administrators for the server's domain.

Server profile

As System Administrator, one of your tasks is to supply important configuration values needed by the server and services software. Many of the values you enter in response to initialization and command prompts are stored in the server profile, so they can be applied each time the server is booted and its services are run. Some of the values in the profile are determined automatically by the server software and entered into the profile for you. Others are entered during your initialization and configuration activities.

Server operation

Immediately after a boot, a series of low-level (operating system) software actions occur as control of the server is passed to the server software. At this point, the Services Executive banner is displayed at the server terminal and a prompt appears requesting approval for normal server startup. The server is prepared to take one of two courses of actions, depending on how the boot was initiated.

- If the boot was initiated by the server recovery software, the server waits 60 seconds before it assumes a normal startup.
- If a user initiated the boot, the server waits indefinitely for the user to apply a non-normal startup.

The following describes the normal startup, in which the server initializes itself and runs services automatically after an automatic or manual boot.

1. The server opens the primary services volume on the rigid disk (drive 1 on multiple-drive servers).
2. The server determines the authorized services and service options from the software options control file. This file contains the options currently set for installation and operation on the server.

3. The server looks for the server profile and obtains the network number from it. If this network number does not match the number currently being exported by another server on the same Ethernet network, the initializing server modifies its profile with the number it has obtained from that server. It applies this new number for the duration of the boot.
4. The server obtains its name and description from the server profile.
5. The server verifies its name and description with the Clearinghouse domain specified in the name. If the domain is unavailable, the server reports this, and indicates that registration will be re-tried later on.

If the server succeeds in locating the Clearinghouse domain where it is registered, it checks to see if there is an accurate entry for it there.

Note: On rare occasions, the server might find that its entry in the Clearinghouse database is invalid. This is one of few occurrences that prevent the server from initializing itself without the presence of an administrator. If the server finds that the Clearinghouse entry is invalid, the server prompts the user to log on so that it can gain the appropriate access to the domain.

At this point, the user's domain administration privileges for that domain are verified with the Clearinghouse Service. If this operation succeeds, the server updates its registration. If this operation fails, the server reports that the currently logged on user must be a Domain Administrator and prompts for another log on.

6. The server checks the profile to determine how many concurrent executives it is to allow after initialization is complete.
7. The server prepares to load and run all the services in the active services list. If no services are listed as active, the server completes its initialization without running any services. If services are present in the active services list, they are loaded and run.
8. As a service is run for the first time after a boot, the service checks the server profile for its name and description (the Clearinghouse Service, Server Monitor Service, and File Service are the only services that do not do this) and then attempts to verify its name and description with the Clearinghouse domain. Additionally, the service applies other initialization and configuration information from the server profile, and prepares to operate.
9. Once a server has succeeded in completing its server and service initialization process, network clients can direct communications to it, and it can perform its intended operations. System Administrators and registered users can also initiate remote executive sessions, up to the maximum number of remote executives specified in the profile. Contexts for each of the services that have been

run are available at the Services Executive, in addition to the contexts for the server and service commands.

Automatic recovery from failure

If a functioning server quits operating due to a server failure, the backstop software takes over. This automatic recovery software records the error that caused the failure in the backstop log and initiates a reboot of the Services System Software.

If a disk or other hardware problem does not prevent the successful booting of the server, the entire process outlined above is repeated. In this way a fully configured server runs continuously until you need to perform maintenance, reconfiguration, or troubleshooting duties.

Restricting physical access

Appropriate precautions should be taken to lock away unused disk packs and to secure servers in areas where access by non-System Administrators is impossible or closely supervised.

These precautions are advisable since there are some procedures which can only be done through access to the Services Executive from the server terminal.

Example The **Copy Volume** command copies a mirror image of one removable drive onto another removable drive connected to the same server. Any user who knows how to boot the server and is familiar with the server's non-normal initialization process can do this. Other volume management commands may be used illegally as well.

Your disks may be stolen, or physical harm may be done to your disks and software if they are not safely stored, or if unauthorized people are allowed access to the system.

Xerox Network System communication

Xerox Network System (XNS) protocols specify the conventions and formats of inter-device communications. Servers and workstations that use these protocols are called "network citizens." The lower-level protocols are automatically applied by citizens when directing or receiving communications. These lower-level protocols specify the means by which information is addressed, packaged, and reliably transmitted between two citizens during brief virtual connections. Higher-level protocols specify the way in which citizens communicate to accomplish specialized activities.

Fundamental to the strength of the protocol architecture is the communication between citizens to accomplish a variety of specialized activities. Communication is not limited to supporting the transfer of data. Rather, it defines specific types of activities that are to be carried out by services on behalf of their clients.

Citizen communications

The term "client" refers to the workstation or the compatible service directing a request to a service on behalf of the user. Services are also clients of other services when multiple services are required to complete an operation.

The client/service relationships that characterize the 8000 Network System Services allow users to work independently and efficiently. The complexity of uniting any number of computers located in the same or different sites, is supported by the automatic service-to-service and client-to-service communication. The 8000 Network Services, and the architecture that defines the conventions by which workstations and services communicate, form the backbone of this integration.

Communication between network citizens

The client/service interactions characterize the 8000 Network System. Workstations, compatibility services that act as gateways to the network, and services themselves can all be clients. Often, a single remote communication session initiated by a user and carried out by the workstation or compatibility service can result in numerous, automatic client-service interactions, all of which are carried on behind the scenes.

Here is an example:

1. A 6085 workstation user creates a document and decides to send it to several co-workers with 6085 workstations. To do this, the user interacts with the 6085 application interface to address the message. In this case the addressee is a user group. The user then initiates the mailing operation.

2. Next, the user agent software prepares and directs a transmission to the Mail Service. This transmission is composed of many information packets, which are received by the Mail Service.
3. The Mail Service checks the address field of the message and finds the names of the intended recipients.
4. Since the message is addressed to a user group, the Mail Service contacts the Clearinghouse Service to find out who belongs to the user group.
5. The Mail Service places a copy of the message in each user's mailbox.
6. If all of the users in the group do not have local mailboxes, the Mail Service posts copies of the mail message to the proper Mail Services for each user.
7. A recipient of the message can log on to a networked workstation or to a network Gateway Service to receive mail. The user agent software at the recipient's workstation or at the Gateway Service verifies the recipient's password and identity with the Clearinghouse Service, and then retrieves the user's new mail from the Mail Service that contains his or her mailbox.

In this example, the sender's workstation (communication software) is the client of the Mail Service. The workstation becomes a client of the Clearinghouse Service when it needs to enumerate the members of the user group.

Recipient workstations or compatibility services become clients of the Clearinghouse Service when they need to authenticate a recipient's credentials at logon. They then become clients of the Mail Service when they retrieve the logged on user's new mail. This client/service relationship is characteristic of 8000 Network System distributed communications. The sender is uninvolved in any of the complex interactions that occur so that the message can be received by all members of the user group.

Compatibility services

The XNS does not "lock out" non-Xerox products. Your co-workers may use other types of computing devices that are not directly compatible with the Xerox Network System protocols.

The Xerox Network System is designed to integrate information from non-citizen computing resources so that an organization is not forced to make a trade-off between Xerox network architecture and other systems that provide applications and programming environments.

To support this commitment to the open network, Xerox has developed a family of compatibility services that act as gateways between the network and non-networked mainframe and personal computers.

The compatibility services that support integration between devices built by Xerox or by other vendors perform terminal emulation, document transfer, or network access functions so that information originating on non-networked devices can be moved to and from the Xerox Network System.

In the following chapters concerned with the 8000 Network System services, you will be reading about:

- The Remote Batch and 850/860 Gateway Services, which support document transfer between networked and non-networked devices
- The Interactive Terminal Service, which provides access to the network to users of non-networked personal computers
- The External Communication Service, which supports IBM 3270 BSC and SNA, standard asynchronous, and VT-100 emulation sessions between networked workstations and non-networked hosts.

3. Network basic services

This section addresses the basic 8000 Network System Services that you may have in your electronic office. These services are found at every Ethernet network site:

- Server Software Installation (Services System Software)
- Clearinghouse Service
- External Communication Service
- Server Monitor Service

Other services offering specialized communication or terminal emulation capabilities are described in the next chapter.

For each service described in this chapter, you will find:

- A description of the service and what it is used for
- A description of how the service works
- A survey of the service features
- A description of the service dependencies (if any)
- A list of any co-residency requirements for the service
- An evaluation of any security considerations
- A summary of your tasks as a System Administrator

A word about configuring servers and services

Your Systems Analyst and others at your site have already planned which services will run on your server(s). When planning your network or internetwork configuration, your Systems Analyst considered the following:

- Placement of Clearinghouse services and replication of domains
- Placement of Mail services
- Placement of multiple services on a single server

- Co-residency requirements for the External Communication Service and the Internetwork Routing Service
- Co-residency limitations due to local port dependencies
- Inter-service dependencies

Interservice dependencies: some considerations

When a service cannot do a particular job without the help of another one, it is said that the service has a "dependency" on the other service. Most interservice dependencies require that a service of a certain type be resident on a server in the network, or on a connected network.

For example, the Mail, Server Monitor, Remote Batch, and Interactive Terminal Services have dependencies on the File Service. These dependencies require that the File Service be present somewhere in the internetwork.

As a rule, the interservice dependencies are better satisfied if the service that a particular service is dependent on is resident on the same Ethernet network. Although co-residency on the same Ethernet network is rarely a requirement, it is often beneficial, as performance and reliability are improved when this happens.

Services Software Installation (Services System Software)

Installation of your services software on a new server is the first step you need to take as a System Administrator. Installation is a step-by-step procedure, aided by server and software prompts.

For full installation instructions for your services software, please refer to the *Server Software Installation* booklet. There you will find the necessary forms you need to fill out. You will also need the included set of diskettes for proper installation of the software.

Clearinghouse Service

The Clearinghouse Service (CHS) keeps track of information about users, the network services, and other resources that they utilize in a network community. The CHS provides a public directory of these network elements that is useful to its clients. All network citizens (workstations and servers) use the Clearinghouse Service to locate needed resources. The entire collection of information stored in the CHS is called a Clearinghouse database.

The database holds such information as a printer's network number and room location, or a user's password and Mail Service name. The Clearinghouse database is composed of an organization containing one or more domains. All objects (printers, users, services) are registered in a domain with domains registered in an organization.

There is at least one Clearinghouse Service for each domain, and its database contains the information associated with objects in that domain. The Domain Administrator is responsible for maintaining the registered entries in one domain.

As the System Administrator for your site, you are responsible for assigning names to all of these entities and registering these names with the Clearinghouse.

Note: Some objects, such as services, automatically register and verify themselves and associated resources in the database when the services begin operation. The automatic registration and verification occurs each time the service is restarted. Other objects, such as users, are not registered automatically with the Clearinghouse, but must be manually registered by you. Detailed instructions on how to register these objects are provided in the *Clearinghouse Service* booklet of the library.

The lookup services provided by the Clearinghouse

The Clearinghouse stores the address of each usable resource, and links the resource to a user-assigned (mnemonic) name. When users want to use the resource, they can simply use the user-assigned name. The user's workstation will interact with the Clearinghouse to determine the correct address for the desired resource.

All network entities can have mnemonic names, so your co-workers do not have to type complex pathnames or command sequences to access a resource. This ability of the workstation or service to look up information in the Clearinghouse database by name and receive corresponding information such as the network address, is like the service provided by the "white pages" in the telephone book.

Other distributed systems often require that users themselves know the address or pathname of a remote object and that they supply it before they can access the needed resources. In the 8000 Network System, users need only to provide the name of the resource they need, or the name of the person they sending mail to. The workstation then determines the

address of the network entity automatically by communicating with the CHS. The process of routing a request to a resource or sending mail to a co-worker is handled automatically by the communications architecture.

The Clearinghouse Service also offers a lookup service that is similar to that provided by the "yellow pages." Users who are not sure of the exact name of a co-worker, or of a resource they need to use, can request a listing of Clearinghouse Service objects of a certain type.

Once users learn the name of the person or object that they want to communicate with, they can direct their workstation to communicate with the remote entity. Users do not need to memorize naming schemes, keep paper copies of system directories, or become involved with the complexity of routing communications.

Clearinghouse system growth

The Clearinghouse System (CHS) is fundamental to the overall ability of the 8000 Network System to grow incrementally and smoothly without becoming any more complex for the people who depend on it. Like the Xerox Network System architecture as a whole, the Clearinghouse Service is designed to support the smallest single server installation and to grow larger as appropriate.

A company can start with a single Clearinghouse Service and can add more Clearinghouse Services as more workstations and servers are added to the Ethernet network. When multiple Clearinghouse Services coexist in a single network or internetwork, they automatically interact to bring each other up-to-date about the location of network resources. By coexisting in a network community, they form a unified Clearinghouse System. The interaction and automatic updates between Clearinghouse Services form a distributed database that works at all times to maintain an accurate accounting of all elements in the network community.

The hierarchical structure of objects in the CHS can be naturally applied to your company as it grows and changes shape. As your company adds new buildings within the same geographic area, the new users and resources that are added to the network community can be registered in the original domain.

As branch offices are created in remote locales (other cities or other states), new domains can be created for each new region. System Administrators can be appointed to manage the resources at each site within the new domains.

Generally, all domains belong to a single organization. However, in larger companies, multiple organizations can be created to cluster the people and resources that are contained within distinct divisions. The natural groupings of people and resources in each division can be reflected by creating multiple domains within the additional organizations.

Naming conventions

In order to accommodate companies and other organizations of all sizes, the CHS requires that all network entities have three-part or "fully-qualified," names. This three-part naming scheme reflects the hierarchical nature of the Clearinghouse database. It consists of the local name of an object or person, a domain name, and an organization name.

In the smallest network configuration, all people and objects are registered in a single domain as part of a single organization. An example of a fully-qualified name of a user would be Janet C. Jones:Bayhill:Xerox.

The name of the object (the first component) can be in distinguished form, such as the user Janet C. Jones in the above example. A distinguished name of a user typically consists of a First name, Middle initial, and Last name. Aliases can also be used for object names.

The domain name (Bayhill) represents a geographical grouping (such as a building). All objects within a domain have the same domain name. Local names must be unique within the domain.

The organization name (Xerox) is traditionally a company's name or equivalent. It is typically given to the entire network community--those elements that can communicate with each other on the same network, or on another network in the internetwork system owned and managed by a particular corporation. Very large internets may have more than one organization name.

Adopt a strategy that promises the greatest stability when naming domains and organizations and determining when to add new domains and organizations.

Note: If your company structure changes frequently, you should not name domains and organizations after department or division names. Rather, select regional names that are likely to be valid for the long term.

You want to decide on a naming and domain propagation strategy that minimizes the need to re-register whole groups of resources and users into new domains. However, when changes in the geographical location of your organization do make this necessary, you will be able to adjust to the new composition of the organization without having to take down all resources in all regions. Only those regions that are affected need be inconvenienced and only as long as required to create the new domain and re-register the appropriate resources.

Aliases

Because the use of distinguished names can be inconvenient, aliases can be used to simplify the process. Unlike network resources, users within a network community can have one or more aliases to simplify typing when they log on or send and receive mail. "Walter C. McKay" is an example of a distinguished user name that would be entered into the

Clearinghouse Service. Associated with this distinguished name are aliases such as "WMcKay," "WalterM," or "McKay."

Example Walter is a member of a small network community that has a single Clearinghouse domain. He can send mail to others in his company by providing their distinguished names or aliases in the "To" field of the message, and his own distinguished name or alias in the "From" field of the message. As Walter's organization grows and new domains are created, he can continue to use his aliases or distinguished name in the "From" field and the distinguished names or aliases in "To" field as long as he is sending mail to co-workers within his domain. When he is sending mail to co-workers in different domains or different organizations, he must specify the different domain and/or organization name.

No two users in a single domain can have the same distinguished names or aliases. Servers, services, and other resources must also have unique names within a domain. The Clearinghouse System prevents you from assigning the same name or alias to two people or objects.

Adding domains

Adding domains as a company grows prevents the job of System Administrator from becoming unmanageable. As branch offices are added in remote locations, or as new departments are formed in the local office, it is easy to create new domains that serve these separate sites. When new domains are added, their respective System Administrators need only worry about specifying unique names for the resources and objects within their domains. The three-part name hierarchy simplifies the System Administrator's job and supports the natural clustering of users and resources within larger network communities.

Example Your organization could decide to have a single domain serve an entire internetwork or multiple, interconnected Ethernet networks. Or, a single, large Ethernet network can have multiple domains. A single Clearinghouse Service can have one or more domains and a domain can be replicated at any number of other Clearinghouse Services. This freedom from imposed or limited configurations allows you and your company to devise a strategy that is most natural and efficient.

Clearinghouse naming guidelines

Here are some guidelines to keep in mind when naming a Clearinghouse:

- Names can be typed in uppercase, lowercase, or mixed case letters.
- Names can contain spaces.
- The first part of the fully-qualified name, or distinguished name, can be 40 characters long. The domain name can be a maximum of 20 characters long. The organization name can be a maximum of 20 characters long.

- Asterisks, colons, and control characters are illegal in names.
- The CHS will not allow duplicate names for objects of the same or different type if they are to be registered in the same domain.

Even though you may be starting out with a small network community, avoid the tendency to use first names as distinguished names or aliases. Since all distinguished names and aliases must be unique, it is not a good idea to register the name Susan or Bill for the person who just happens to be the first in your domain to have that name. This would invite future problems with name ambiguity, just as would the name "Printer" when applied to a printer.

Take special care when selecting domain and organization names since they must be meaningful for the lifetime of the internetwork community. Avoid naming domains for sub-parts of the organization, such as "Accounting" or "Finance." Also avoid acronyms corresponding to current organizational structures. For this reason, we suggest applying geographically significant names to domains.

The possibility of future interconnection of internetworks, or of mail exchange between separate internetworks, necessitates that all 8000 Network sites establish unique organization names. Organization names must be approved by the Xerox Software Control Center so that they are guaranteed to be unique.

Keeping the domains up-to-date

The Clearinghouse Service automatically propagates update information to other clearinghouses.

When an internetwork has multiple Clearinghouse services serving multiple domains, clients do not need to know which Clearinghouse Service to contact. Users never need to be concerned with the complexity inherent with thousands of network objects distributed over a large geographical area. The Clearinghouse System maintains an up-to-date domain and organization map at each Clearinghouse Service.

Domain propagation

Any update to a domain portion of the Clearinghouse database propagates to all other Clearinghouse Services serving that domain. Update propagation may take from 24 hours to two weeks, depending on the extent of the update and size of the network.

Organization propagation

Updates to an organizational portion of any CHS propagate to all of the Clearinghouse Services that serve the organization.

Global propagation Data changes in the global section of any Clearinghouse in an internetwork are propagated to all of the Clearinghouse Services in the internetwork.

A Clearinghouse request can be answered by any CHS. If a request specifies an object or person in a domain that the responding Clearinghouse Service does not have, that Clearinghouse Service checks its domain/organization map to find which Clearinghouse Service(s) has the requested domain. The client is then directed to the Clearinghouse Service(s) that can answer the request.

Domain replication

Replicate your domain to other Clearinghouse services to increase the efficiency, accessibility, and reliability of your Clearinghouse System. Domain replication ensures that the contents of a domain are not temporarily off-line if a server fails. In the rare occurrence of total loss of a domain due to a disk failure, the replica is still on-line and actively responding to requests. When domains are replicated, the Clearinghouse system responds more efficiently to requests, since more Clearinghouse services are available to directly fulfill them.

When you need to add a user or object to a domain that is replicated, you can enter the update at one of your servers. The Clearinghouse Service automatically updates all other replicates on your local network and at remote sites. Moreover, when you replicate domains created at remote Ethernet networks to your local Clearinghouse Service, you need not concern yourself with maintenance of those domains. The updates that remote System Administrators make to their own domains automatically propagate to your copy, so that all clients of all domains are served reliably and efficiently.

As System Administrator, you need to understand replication, participate in decisions about when and where to replicate domains, and cooperate with other System Administrators when this activity needs to be done.

Placement of Clearinghouse Services

Your Clearinghouse domain(s) should be replicated for optimum reliability, accessibility, and efficiency. If your configuration has only one server and your network is not interconnected with others, you have only a single Clearinghouse Service. In this case, replication is not possible. However, you can use the Clearinghouse backup operation to make a copy of the database.

If your site has multiple servers, or if your Ethernet network is interconnected with other Ethernet networks, you should consider where the replicates of each domain database should be placed.

Although a single CHS could serve an entire internetwork, reliability, accessibility, and efficiency are much higher when multiple Clearinghouse Services are installed, and domains are strategically replicated.

If your Ethernet network contains multiple servers, we strongly recommend that the Clearinghouse Service be installed on two of the servers. Each domain database should be replicated at least once.

For example, if your organization has only one Ethernet network and multiple servers, you should install two Clearinghouse Services and replicate your domain to the second Clearinghouse Service.

Depending on the size and nature of your organization, you may want to have more than one domain per Ethernet network. Each CHS can maintain one or more domain databases. If your Ethernet network is interconnected with others, you should replicate your local domain(s) to one or more Clearinghouse Services on other Ethernet networks. Conversely, you should strategically replicate one or more of the remote domains to your local Clearinghouse Service.

Replication of domain databases makes them optimally accessible to the clients that reference them most frequently. It also ensures that the contents of the database are not temporarily inaccessible or permanently lost due to hardware malfunction or damage.

Clearinghouse Service dependencies

Since the services on your network depend on the Clearinghouse Service to make their location known to all possible clients, all services are dependent on the Clearinghouse Service.

A Clearinghouse Service runs on any server with adequate free disk space and processor resources. There are no special peripherals or non-standard hardware configurations required. However, there are certain service interdependencies, depending on the configuration of your network.

- | | |
|------------------------------|---|
| File Service | For small installations where domain replication is not possible, a File Service is used to manually back up and restore the Clearinghouse database. |
| Mail Service | The Clearinghouse depends on the Mail Service for update propagation when the two are co-resident. The Clearinghouse must verify that the Mail Service is always running and propagating any updates. You should be alert to Clearinghouse messages indicating that a Mail Service is not started. Prompt action can minimize any effects to the local and remote Clearinghouse database. |
| Communication | For multiple network internets, the Clearinghouse depends on the Internetwork Routing Service (and indirectly, the External Communication Service) to communicate through the internet. Clearinghouse updates are transmitted by the Mail Service. |
| Clearinghouse Service | For multiple server networks, domain replication is used to protect the database. The proper arrangement of the replicated database among several Clearinghouse Services must be determined. |

Clearinghouse Service limitations

For best performance, don't put a Remote Batch Service on the same server with highly-active services such as the Clearinghouse and Mail Service. The Remote Batch Service cannot run on a server with a Multiport configuration.

Security--restricted access to Clearinghouse Service data

The CHS is the registry for all users and their passwords. Its contents are largely protected from manipulation by all users other than those designated as Domain Administrators. The Domain Administrator has general control over the creation and modification of Clearinghouse objects. If necessary, access to specific Clearinghouse objects can be granted to appropriate users who are not Domain Administrators.

However, certain server and services operations, such as self-registration or modification of existing entries, cannot be done unless the logged on user is a Domain Administrator.

Authentication and encryption of passwords

Besides helping one network entity find another, the Clearinghouse Service is a key contributor to network security. When someone needs to access a network resource that is protected from general use, the software authenticates the user's identity and directs the request to the remote resource. If access to the needed resource is controlled (a limited set of the users can access it), the service controlling the resource can verify that the user is on the access list for that resource and is allowed the specific kind of access being requested.

All communication that occurs between the Clearinghouse Service and other network citizens, for the purpose of authenticating a user's identity and access privileges, is handled with the user's and the network citizens' identities and encrypted passwords. Thus, a degree of network security is enforced, unless the logged on user is a Domain Administrator.

Object-level access controls

The Clearinghouse Service, along with the File Service and External Communication Service, controls valuable resources that can be protected by object-level access controls. When you set up file drawers, you specify access privileges to the enclosed information. Clearinghouse Service authentication is required before users can access these objects. The set of users accessing a specific resource can be limited or unlimited, as determined by your organization.

You are responsible for creating (and removing) user groups managed by the Clearinghouse Service. However, they are solely administered by the user(s) who "own" or administer them.

Example The commands necessary to modify the membership in a user group are available to registered users who are logged on to a server running a Clearinghouse Service. These users can enter these commands to specify a group name which they administer. They can then add or remove members to and from the group, or they can change the access controls on that group.

In this way, users can assume the ability to modify a user group. This ability can run even to the exclusion of the System Administrator.

Object-level access controls demonstrate how the system can be administered so that users can benefit from privacy, security, and the exclusive rights to change selected objects.

System Administrator duties

As System Administrator, your Clearinghouse Service duties are primarily to control the operation of the 8000 Network and the devices attached to it.

You should assign names to all users and groups, and register those names with the Clearinghouse. Recall that most other objects are registered automatically by the various services as they begin operation.

External Communication Service

The External Communication Service (ECS) is one of several services that supports information exchange between your workstations, computers, or devices that are not directly compatible with them. The ECS is designed to allow information exchange between computing resources spanning geographic boundaries, operating system, hardware incompatibilities, and specialized applications.

The External Communication Service, when combined with terminal emulation software at the workstation, allows users of network workstations to interact with popular mainframe computers through a process called terminal emulation.

The ECS contains several terminal emulation options, each capable of interpreting a certain kind of non-Xerox protocol. It lets information flow between your networked workstation, and computers made by other manufacturers.

The External Communications Service can be connected via a 873 Communication Interface Unit, the servers single port, or to the Multiport Option Kit (which increases the port access from one to four).

IBM 3270 BSC and SNA protocols

When the ECS is used to communicate with IBM and IBM equivalent mainframes, it emulates the IBM 3276 Cluster Controller. In standard IBM configurations, a cluster controller is connected to a maximum of eight 3278 display stations. The eight display stations are connected to the cluster controller by eight dedicated coaxial cables.

In the Xerox 8000 Network, an External Communication Service is configured to support up to eight workstations that are performing emulation. Unlike the real cluster controller, the External Communication Service is not physically connected to the workstations that emulate 3278-2 and 3278-5 terminals. Rather, any workstation with 3278-2 or 3278-5 emulation capability can be a client of any External Communication Service on the internetwork.

Workstations access the ECS over the internetwork with the assistance of the Clearinghouse Service to locate the External Communication Service and its emulation ports. The Internetwork Routing Service can also be accessed if the workstation and External Communication Service are on different networks. This maximizes the use of the leased or switched line to the IBM host.

There are two types of IBM 3270 protocols that External Communication Service options can support: IBM 3270 BSC and IBM 3270 SNA. The 3270 BSC option must use the local server computer's RS-232C port as the connection to a leased line. The 3270 SNA option can be configured to use either the local port, Multiport Option Kit, or an 873 CIU (Communication Interface Unit).

When using the local port, the phone line to the host communication controller can be manually switched, auto-dialed, or leased. Connections to the host communication controller from the 873 CIU must be leased. The SNA option can support more than one physical line to more than one mainframe.

The *External Communication Service* booklet contains instructions for configuring the External Communication Service so that it is ready to initiate and maintain emulation sessions between networked workstations and remote hosts.

Asynchronous communication protocol

The External Communication Service is also capable of supporting emulation sessions to remote hosts by ASCII communication protocols. The workstation emulates a VT-100 or standard teletypewriter-type terminal to let the user interact with a remote host.

You should configure the External Communication Service so that it uses either the local port, or the 873 Communication Interface Unit as the modem connection. The modem is connected to the phone used to dial-up the remote device. The remote device must communicate with VT-100 or standard ASCII terminals using asynchronous communication protocols.

This feature allows interactive information exchange with hosts from many vendors, such as Digital Equipment Corporation, Data General, Hewlett Packard, and Honeywell.

Incoming calls

The Asynchronous Communication Protocol option supports incoming asynchronous calls from personal computers running communication programs, or from standard teletypewriter-type terminals.

Those using the Interactive Terminal Service to send or receive mail messages, or to store and retrieve files to and from network File Services call in through one of the External Communication Service's incoming ports. The External Communication Service greets each caller and allows him or her to select a particular Interactive Terminal Service. As an option, you can configure External Communication Service incoming ports so that they automatically connect callers to the local Interactive Terminal Service.

The Asynchronous Communication Protocol option allows System Administrators to call in from remote, non-networked personal computers or standard teletypewriter-type terminals. If your organization elects to allow remote administration via dial-up connections, you should configure your External Communication Service to greet callers.

External Communication Service support

The External Communication Service greets each caller and allows him or her to choose a connection with an Interactive Terminal Service or with any Services Executive. If the caller selects the Services Executive option, the External Communication Service directs him or her to the specified server. The commands available to remote System Administrators are limited by the privileges assigned to them.

All 873 CIU ports The External Communication Service also manages all 873 CIU (communication interface unit) ports. Once an 873 CIU has been assigned to a particular External Communication Service, the ECS makes the 873 CIU ports available to the Internetwork Routing Service or ITS, provided they have not been assigned to an emulation option or to an incoming asynchronous line.

Example If your server is to support an Internetwork Routing Service and your organization wishes to use an 873 CIU for one or more circuits, you will be installing the External Communication Service, assigning a communication interface unit to it, and then configuring the External Communication Service ports by interacting with the Internetwork Routing Service.

The Greeter You can set up the External Communication Service to connect callers directly to a local Interactive Terminal Service, or to respond to callers with the External Communication Service's Greeter.

The Greeter is an interface that allows callers to select which type of interactive session they want. Currently, the options include Services Executive (for remote system administration) and Interactive Terminal Service sessions. After they select the type of session, the Greeter allows them to specify the necessary server.

For security reasons, you may want to limit the ports that are answered by the Greeter. You may want to keep the phone number unlisted (to keep the port for your use only), and then configure other incoming teletypewriter-type ports for direct connection with a local Interactive Terminal Service.

Co-residency requirements

The External Communication Service and the Internetwork Routing Service must co-exist on the same server when the Internetwork Routing Service is to use one or more 873 CIU ports for one or more of its circuits.

The External Communication Service requires the use of the server's RS-232C port, as do the 850/860 Gateway Service, the IBM 3270 BSC Communication Protocol, the Facsimile Print Service, the External Mail Gateway option, and the Remote Batch Service.

No two of these services can run at the same time on the same server.

Note: If the ECS is to support 3270 BSC emulation, no other services should be run on that same server. However, you may have no alternative but to assign additional services or

additional ECS functions to the same server (for example, the control of a CIU). In this case, the services should be low-demand in nature, such as a lightly-used File Service.

Dependencies

Remote Network Administration

The Remote Network Administration capability and the Interactive Terminal Service are dependent on the External Communication Service. To support these dial-up activities, the External Communication Service answers calls that come in to one or more of its ports.

Security

The ECS controls valuable resources that can be protected by object-level access controls. When you configure External Communication Service ports for use in terminal emulation sessions, you can designate which users can access which ports. Clearinghouse authentication is required before users can access them. The set of users accessing a specific resource can be limited or unlimited. As System Administrator, you create these entities and you rename them, but the administration is solely up to the user or "owner."

Server Monitor Service (SMS)

The Server Monitor Service watches one or more of the servers on your Ethernet network or internetwork to detect server failures and to keep a history of uptime and downtime. The Service maintains a database of information which includes the configuration of the target servers being monitored, the frequency with which a given server should be polled, and lists of interested users. The lists are used to send messages periodically to interested users if a server's availability changes.

You can choose to run the SMS on one server and then configure it to watch other servers on your network and on interconnected Ethernet networks.

The Server Monitor Service will automatically monitor the servers you specify at any interval that you establish. The Server Monitor Service also interacts spontaneously with the monitored service. Spontaneous interaction is initiated by the service being monitored.

The SMS connects with a server to determine if it is operative. If it is, the Server Monitor Service logs this fact, along with the total number of hours the server has been running without a failure. If the server is not operative, the Server Monitor Service can notify you or other specified users via the Mail Service.

The SMS adds all the information that it obtains about a server's condition in an event log, which you can look at when necessary. At regular intervals, you can back up this event log to a File Service and then reset it. By storing these logs on a File Service, you can provide your Systems Analyst and other interested parties with valuable information about your servers' performance and reliability.

Refer to the *Server Monitor Service* booklet for information and procedures associated with this service.

Server Monitor Service dependencies

- | | |
|---------------------|--|
| File Service | Activity logs and configuration files are backed up to a File Service. These logs will be useful to you and your Systems Analyst as you perform maintenance tasks. Backups should be directed to a File Service on the same Ethernet network, but preferably not on the same server. |
| Mail Service | The Server Monitor Service depends on the Mail Service to notify you of server restarts or Internetwork Routing Service failures. |

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4. Network shared services

This section addresses the optional 8000 Network System Services that you may have in your electronic office. These services can be installed in addition to the basic services described in Chapter 3:

- Internetwork Routing Service
- File Service
- Print Service
- Mail Service
- Interactive Terminal Service
- 850/860 Gateway Service
- Remote Batch Service
- Communication Monitoring Service
- Boot Service

For each service described in this chapter, you will find:

- A description of the service and what it is used for
- A description of how the service works
- A survey of the service features
- A description of the service dependencies (if any)
- A list of any co-residency requirements for the service
- An evaluation of any security considerations
- A summary of your tasks as a System Administrator

Internetwork Routing Service

The Internetwork Routing Service (IRS) can link local area networks into a single internet. The IRS allows the sharing of information and the computing of resources beyond the geographical boundaries of a single local area network.

The IRS enables dispersed networks to be interconnected, thereby allowing users to access other network services.

For example, a user may access a file drawer located on a file service in another city, or may use a printer located in another building. Dispersed network services are accessible from any workstation on the internet, or from a remote workstation when the Clusternet option is used.

The Internetwork Routing Service is essential to all configurations with multiple, interconnected Ethernet networks. When two Ethernet networks are connected, the IRS must be installed and configured at each Ethernet network site.

The Internetwork Routing Service can be connected via these three port options:

- The local single port on the server
- The Multiport Option Kit
- The ports provided by the Xerox 873 Communication Interface Unit

Whenever a workstation user accesses a resource that is not connected to his or her local network, the workstation must direct the communication to the Internetwork Routing Service. The service is configured to route transmissions to the network that contains the needed resource. A single Internetwork Routing Service can be configured to route and receive information packets to multiple Internetwork Routing Services. A web of interconnected networks can be created with virtually no limit to its size.

The Internetwork Routing Service has the routing map for workstations. The Clearinghouse Service has the information as to where the resources are residing on another network.

When IRS connections are added, the reliability of an internet is increased. Multiple connections provide alternate routes between networks in the event of a failure. Refer to the *Internetwork Routing Service* booklet for further information.

Configuration

The Internetwork Routing Service supports all internetwork communication automatically, without any user involvement. As System Administrator, you are involved in the initial configuration of the Internetwork Routing Service to ensure that it is connected to a modem and an appropriate phone medium.

The configuration of an internet is flexible. Connections can be determined by the needs of a network rather than on a rigid predetermined design. Connections are made using one or a combination of these three available circuit types:

- Dedicated circuits
- Switched circuits
- Virtual circuits (X.25)

Dedicated circuits

Dedicated circuits are set up by leasing a phone line which permanently interconnects two (and only two) points, with an Internetwork Routing Service at both points.

The throughput and quality of this type of transmission is superior to that of switched circuits.

Switched circuits

Switched circuits are set up by manually or automatically dialing a public telephone number. Switched circuits are not permanently allocated to a single pair of Internetwork Routing Services.

Multiple pairs of services can use a single switched circuit, but at different times.

Virtual switched circuits

Virtual switched circuits are set up by purchasing a service from a Public Data Network that uses the X.25 recommendations. Virtual switched circuits provide the benefits of both dedicated and switched circuits.

You can use the X.25 public data networks as an alternative means of communication when leased phone lines are not as economical. X.25 interconnection offers the advantages of dial-up connection and the reliability and quality of a leased line connection. X.25 is an international standard that defines how packets are transmitted over public packet-switching networks.

Each port that is configured to support X.25 is able to switch packets to up to eight other Internetwork Routing Services using the same circuit at the same time. The port must be a local single port, to connect with the modem and the X.25 entry point, or a Multiport Option board. CIUs are not supported. When you need to change your Internetwork Routing Service links, you do not need to lease a different line. Instead, you can change or add new X.25 virtual circuits to new IRS endpoints.

All three types of circuits can be configured to autostart. This means that the Internetwork Routing Service will attempt to establish the connection automatically each time it is restarted. The exception is the autodialed switched circuit. This circuit cannot be autostarted since the Service must prompt the user to select the phone number that is to be dialed.

Note: Switched autodialed circuits are only to be used as backup replacements when a dedicated line fails.

Each service to service connection that is established should be left operational 24 hours a day so that the Clearinghouse Services can remain consistent, and the other distributed elements of the system can operate efficiently.

If you rely on switched autodial circuits, no circuit will be reestablished after a server failure. The continuous interconnection will be broken, and the Clearinghouse Services may become inconsistent.

Routing tables

Any time a communication is destined for a remote Ethernet network, the IRS consults its routing table (or map) to determine which route is the shortest (contains the least intermediate Internetwork Routing Services).

In small internetworks, every IRS can be connected via phone media to Internetwork Routing Services at all other Ethernet networks. Or, an intermediate Internetwork Routing Service can forward information packets to a remote Ethernet network. Frequent and automatic broadcasts are sent across the Ethernet network by each Internetwork Routing Service. These broadcasts inform all interested citizens, including other Internetwork Routing Services, of the current internetwork routes. This map is used by the other Internetwork Routing Services to update their own maps, and by the workstations to direct IRS transmissions. A new Internetwork Routing Service will be automatically reflected in the routing maps of other Internetwork Routing Services in the internet.

Clusternet option

The IRS can support dial-up sessions with remote workstations that are compatible with Xerox Network System protocols. Users can work at home, or in regional offices, using remote workstations as standalone computers. The remote workstations are transformed into network citizens by dialing up clusternet ports. Clusternet-connected workstations can use the same benefits normally provided to a 6085/8010 that is directly connected to the Ethernet network.

Event reporting

The IRS can be configured to automatically report changes or failures in its leased and switched circuits to the Server Monitor Service. You can establish this option by using the appropriate Server Monitor Service commands. This feature can help you maintain a continuous interconnection between the Internetwork Routing Services in multi-Ethernet configurations.

Dependencies

All users and networked devices in an internetwork community are dependent on the IRS. Each Ethernet network that is a part of an internetwork must have at least one IRS. The Service is set up by you to connect with other Internetwork Routing Services via dedicated, switched, or X.25 media. These connections should remain running all the time for internetwork communication.

Merging two separate networks by linking two IRSs together puts a heavy burden on all Clearinghouses in both networks. The globally distributed portion of each Clearinghouse database must be updated during the merger. Consult with your Xerox representative before you attempt such a merger.

Installation guidelines

An Internetwork Routing Service must be installed on each network that is communicating with another network.

Maximum A maximum of 15 Internetwork Routing Services are allowed between any two devices to communicate with each other. The IRS will always choose the shortest route if more than one route is available to reach the ultimate destination.

Leased lines Leased telephone lines should be used between Internetwork Routing Service links. Leased lines are permanent connections, which offer higher reliability and wider bandwidth communication than direct dial lines. Each leased line is physically configured by the telephone company to connect two points. It cannot be switched to connect to alternate IRS destinations. (Use the X.25 Communication Protocol if circuit switching is required.)

Dial-up Dial-up connections between Internetwork Routing Services are normally used only as a backup means of interconnection when a leased line or X.25 circuit has temporarily failed. Once a dial-up Internetwork Routing Service communication link is established, it should be re-established approximately every 48 hours in order to maintain accurate Clearinghouse information on both networks. (Use the External Mail Gateway as a viable alternative to a transient or non-continuous internetwork link.)

Connections The Internetwork Routing Service can use an RS-232C port on the 8000 server, the 873 Communication Interface Unit (CIU), or one or more of the four RS-232C ports on the Multiport Option Kit on the 8000 server.

Co-residency requirements

External Communication Service

When the IRS uses an RS-232C port on the 873 CIU, the External Communication Service must be co-resident with it on the same server.

When the Internetwork Routing Service uses an RS-232C port on the Multiport Option Kit on an 8000 server, the External Communication Service must be co-resident with it on the same server.

File Service

The File Service provides an efficient means of consolidating and sharing documents produced at any networked workstation or non-networked personal computer. Since your network is composed of many distributed and interconnected workstations, it is important to establish this convenient means for centralizing and sharing data files.

User access to shared files is easy and efficient on the 8000 Network. The network affords fast communication, the IRS provides automatic routing, and the File Service provides the organization.

Most work is done independently on networked workstations or dial-up personal computers. Users can make the documents available to others by copying them to an FS where it is stored and made accessible to others. Networked workstations, dial-up workstations, and PCs use the Interactive Terminal Service, provided the user has access to the files. Security access controls can be applied at the File Service so that stored files are only accessible to designated users.

The FS does not require that documents be in any particular internal format. It serves as a viable repository for documents created on all networked workstations and non-networked personal computers. Format conversion software is available on some networked workstations and at the Interactive Terminal Service to transform documents with foreign formats into formats that can be displayed on the retrieving networked workstation or dial-up personal computer.

File drawer hierarchy and limits

Files in the File Service are organized hierarchically. A major directory (file drawer) at the top of the file organization lists all the folders and files at the next level. These folders and files, in turn, can contain additional layers of subdirectories or documents. There is no limit to the number of directory levels.

The hierarchy takes shape as users access the file drawer and add folders and documents to it. A feature of the filing system employed by the File Service is the ability of clients to store and retrieve whole hierarchies of documents and directories in one operation.

For example, at your 6085/8010 workstation, you might create a folder called "Reports." This folder might contain subdirectories named with the months of the year. Within each subdirectory titled by month, there might be sub-subdirectories titled by types of reports, such as "Progress Reports" or "New Hire Adjustment." Finally, within these sub-subdirectories, you might store any number of actual documents.

This entire hierarchy of files can be created at a workstation and then copied to the File Service in one operation. Alternatively, the hierarchy can be created piece by piece and stored at the File Service.

Remember that there is no limit to the number of folders that can descend from a single file drawer. There is, however, an optional limit on the file drawer size and the total amount of storage space available on the File Service. As System Administrator, you must decide whether drawers will have size limits or will be allowed to grow as large as needed by their users.

File drawer access

You create and name file drawers when you configure your File Service for use. Each file drawer has an owner registered in the Clearinghouse. Additionally, file drawers can be configured to allow different kinds of access to designated users.

You or the owner establishes access rights for other users to each file drawer. The user may decide later to allow access to others. The user may then add names to the drawer's access list. Limited or full access can be given to individuals, user groups, or both.

Example

The owner of a file drawer might be a publications manager. All of the people who report to this manager can be given access to copy documents or folders to and from the file drawer. To simplify access controls at the file drawer, you can create a user group in the Clearinghouse Service with all members of the publications group. Then access to the file drawer needs only to be by the name of the user group registered in the Clearinghouse Service.

File service clients

The File Service has many different clients:

- **Workstations** access the File Service on behalf of users who need to store and retrieve files.
- The **Clearinghouse Service**, **Server Monitor Service**, **Server Profile**, and **Mail Service** are clients of the File Service when they need to store backup copies of their databases.
- The **Interactive Terminal Service** is a client of the File Service when its dial-in user needs to store or retrieve files to and from the File Service.
- The **Remote Batch Service** is a client of the File Service when it retrieves jobs that users store there for it and when it retrieves or stores jobs for users.

Clients of the File Service can step through the hierarchy level by level, or they can access a folder or file by providing the pathname specified for that object.

As System Administrator, you will be a client of the File Service when you store periodic status reports, statistics logs, server profiles, and other kinds of files. Sometimes you will access the File Service from the Services Executive and sometimes from networked workstations. You will be supplying pathnames to some of the services you maintain, so that those

services can back up data files or logs to the file drawer of your choice.

Backup policy

Since the File Service is a large and centralized storage facility for all kinds of network clients, it is important that you develop a regular backup routine as a part of your System Administrator responsibilities.

You can back up the contents of a FS either to floppy disks or to another File Service. When you use a File Service as the destination for your backup, you can configure the backup utility so that it automatically starts and completes backup operations at specified intervals. You should establish a backup cycle that ensures a monthly or semi-monthly full backup of all files. You can make incremental backups within the cycle of only those files that have changed since the last backup operation.

One of the hardware options that is efficiently utilized by the File Service is the large 80 or 300 Mb removable disk drives. Removable disk packs are particularly convenient. You can use them for backup and then take them off-line, replacing them with a disk pack used by clients of the File Service. In this way a single disk drive can serve as a File Service by day and as a backup medium by night.

Additionally, servers configured with removable disk drives and running the File Service can support up to four separate file systems managed by the File Service. These file systems are viewed by the network clients as four distinct File Services. Since each File Service volume is registered in the Clearinghouse Service by name, you can move disk packs from server to server, if necessary. The new location update to the Clearinghouse Service is done automatically when the disk pack is brought on-line.

Object-level access controls

The File Server controls valuable resources that can be protected by object-level access controls. When you set up file drawers, you specify access privileges for the enclosed information. File drawers managed by the File Service are created and removed by you, but are managed by the users or "owners."

Clearinghouse authentication is required before users can access file drawers. The set of users accessing a resource can be limited or unlimited.

Example

Users who log on to a server running the File Service can gain access to the **Change File Drawer** command. This command allows them to change the access controls on file drawers for which they have been given the "change access" privilege.

This example of object-level access controls demonstrates how the system can be administered so that users can benefit from a degree of privacy and security, with exclusive rights to change some objects.

File Service dependencies

Many services have dependencies on the File Service:

Remote Batch Service

Users of networked workstations must direct Remote Batch Service jobs to a File Service. In turn, the Remote Batch Service must direct completed jobs to a File Service. You configure the Remote Batch Service to use a particular File Service drawer for all jobs destined for a particular external partner.

If the Remote Batch Service is to communicate with multiple partners, you must create multiple input drawers. You must also create multiple output drawers if the Remote Batch Service is to receive completed jobs from multiple partners. The Remote Batch Service can be directed to drawers at a File Service that resides on the same server, a different server on the same Ethernet network; or a server on a different, but interconnected, Ethernet network.

Interactive Terminal Service

The Interactive Terminal Service accesses any File Service on the same or different Ethernet network on behalf of its dial-up user. The Interactive Terminal Service must be able to access one or more File Services or one or more Mail Services in order to support its clients. The user determines which File or Mail Service the Interactive Terminal Service will access.

Mail Service

The Mail Service automatically backs up its database to a File Service that you specify. If your configuration has only one server, the Mail Service can back up its database to a File Service that is co-resident with it. It is preferable that the File Service be on the same Ethernet network, but not on the same server for optimum performance and reliability.

Services System Software

The server profile file contains important information used by the Services System Software and all of the services resident on a server. This file is accessible to you by means of the commands that allow you to manipulate files in your server's working directory. You should back up this file each time you make significant changes to it. If possible, this file should be copied to a File Service that is resident on the same Ethernet network but not on the same server.

Server Monitor Service

The Server Monitor Service contains a command that allows you to back up its activity log. This log will be useful to you and your Systems Analyst as you perform maintenance tasks. If possible, this backup should be directed to a File Service on the same Ethernet network, but not on the same server.

Clearinghouse Service

The Clearinghouse Service has a **Backup** command, which is useful if there is only one Clearinghouse Service on your network and if your network is not connected to any other networks. When an installation has only one Clearinghouse Service, there can be no replication of domains. Instead, you use the Clearinghouse **Backup** command to back up the Clearinghouse database to a File Service co-resident with it. The database is then backed up automatically when you perform your regular File Service backup.

File Service

The automatic backup facility of the File Service can be used in configurations with multiple File Services. One or more File Service databases is automatically backed up to other File Services at defined intervals.

Note: If possible, the database backup should be directed to a different server so it will not be lost if the server housing the original database or log should fail.

Print Service

The Print Service (PS) makes its attached facsimile (telecopier) or electronic printer accessible to users of all networked workstations on an internetwork. All networked workstations contain conversion software that transforms their respective document types into Interpress format masters. Once converted, a document can be transmitted across internetwork links to the Print Service, which receives, queues, and processes the Interpress master, and then directs the printer during the printing process.

The 8000 Network, the PS, the 6085/8010 workstation, the Interpress standard, and the printing standard combine to produce high quality documents that can include complex graphics, multilingual text, and multiple font styles. The features of the combined system are:

- The precision of the Interpress standard, which can represent with exactness any image that can be applied to paper.
- The ability of the Print Service to drive multiple types of printing devices, process Interpress masters, queue job requests, and accept specification of job parameters such as page size, number of copies, and offset stacking.
- The high resolution (300 dots per inch) of the electronic printing device and the facsimile device (200 dots per inch), and their ability to support a wide variety of font styles at these resolutions.
- The use of the Xerox character set, in which characters from all languages can be represented in a single address space.
- The current availability of a wide variety of fonts, including Japanese fonts (Xerox XC1K Modern and Xerox XC1K Classic), Xerox Math Classic, Xerox Modern and Xerox Classic, and others, which you can easily install at the Print Service.
- The exceptional document preparation capabilities of the 6085/8010 workstation. These include integrated graphics, multilingual text, italics, boldface, underlining, charts, tables, spreadsheets, proportional spacing, concurrent display and editing of up to six document windows at one time, and exact page-by-page format and character properties on a high-resolution bit-mapped display.

Formatting Print Service

Although the Formatting Print Service does not have a printer directly attached, it performs similarly to a print service that does.

The Formatting Print Service software increases the level of compatibility between 6085 Professional Computer Systems, 8010 Information Systems, and 9700/8700 printers anywhere on the internet.

The Formatting Print Service creates a secondary Interpress master containing pixel arrays from vector graphics into the proper format for accurate processing and printing on an 9700/8700 printer. The converted master is then forwarded by the Print Service to the target 9700/8700 printer for printing.

Printing can be accomplished on either letter or legal size paper using fonts structured on a 300-dots-per-inch scale. Images composed of detailed graphic illustrations, equations, and/or text can be sent to the Formatting Print Service producing fine detail in the quality of the printed document.

Formatting Print Services limitations

These limitations apply:

- The Service runs on an 8000 server with a minimum of 512 Kb memory.
- No other print service can co-reside on the same server with the 8000 Formatting Print Service.
- The Service can be associated with only one target printer at a time.
- The Print Service is incompatible with the Multiport option.

NS 8000 Laser CP Print Service

The NS 8000 Laser CP Print Service allows a number of workstation users to share an NS 8000 Laser CP Printer or an NS 8000 Laser CP Printer/Copier anywhere on the internetwork.

The Service includes Terminal and 12-point Modern fonts. Additional fonts may be purchased with the NS 8000 Laser CP Print Service, and must be installed on the same server.

Limitations

These are the limitations:

- The current print queue limit is thirty-nine documents, or the remaining space on the disk.
 - If you add the NS 8000 Laser CP Print Service to a server with any other service already on it, then the server must have at least 768 Kb of memory and at least 42 Mb of disk storage.
 - If the NS 8000 Laser CP Print Service is installed on a server, then no other print service can be on that server.
 - The Print Service is incompatible with the Multiport option.
-

Facsimile Print Service

This service allows a number of workstation users to share a Telecopier 495-1 facsimile printer that is on the network. The Service can send a document to up to ten other facsimile devices by auto-dial telephone lines.

The Telecopier 495-1 is a thermal transfer printing device that can serve as a local printer or a transmission device to other facsimile units for remote printing worldwide.

Limitations

These are the limitations:

- Terminal and 12-point Modern fonts are included with this service.
- Additional 200 DPI printer fonts may be installed on the same server.
- The Telecopier 495-1 is connected to the server's local RS-232C port. This precludes the use of this port for any communications applications.
- The current print queue limit is thirty-nine documents, or the remaining space on the disk.
- If you add the Facsimile Print Service to a server with any other service already on it, then the server must have at least 768 Kb of memory and at least 42 Mb of disk storage.
- If the Facsimile Print Service is installed on a server, then no other print service can be on that server.
- The Print Service is incompatible with the Multiport option.

Co-residency requirements

The asynchronous terminal emulation, IBM 3270 BSC terminal emulation, IBM 3270 SNA terminal emulation, Interactive Terminal Service, 850/860 Gateway Service, and Remote Batch Service may not perform well when they are co-resident with the Print Service. This is because the Print Service requires much of the server's central processing unit power and tends to not relinquish the central processing unit as often as is needed to sustain a real-time communication session.

For this reason, you should consider how extensively the communication options and printing capability will be used. If both are to be used fairly frequently and might often be required to be active at the same time, we recommend that the communication activities be resident on a different server.

Mail Service

The Mail Service (MS) allows users to send messages and documents quickly to each other within and across geographical boundaries.

You can give each member of your organization who has been registered in the Clearinghouse Service a mailbox at a Mail Service. Once a user has a mailbox, he or she can post messages from any networked workstation, or by dialing into the Interactive Terminal Service or 850/860 Gateway Service. Like the Clearinghouse Service, the Mail Service is designed to support all sizes of installations. As your network community grows, you can add additional Mail Services to other servers on the same or interconnected Ethernet networks.

A mail message can be a brief note or a long document. Mail notes can be attached to documents using a cover sheet, or sent separately. They can be sent to a single individual, several people, or to all members of a user group registered in the Clearinghouse Service. The recipients of a mail message can be in any domain and organization in your internetwork. If your organization has purchased the External Mail Gateway option, recipients can be users in remote Xerox Network System internetworks.

When a user creates a mail message and initiates a mailing activity, his or her workstation or Gateway Service directs the message to the Mail Service. If multiple Mail Services exist in a single network or internetwork, any Mail Service can respond to a request to post a message.

The MS checks with the Clearinghouse Service to determine the members of a user group. It places a copy of the message in appropriate local mailboxes, and then posts messages for delivery to other Mail Services that contain the mailboxes of other users. In this way, the Mail Services cooperate to form a Mail System that can forward mail within and across geographical boundaries. Refer to the *Mail Service* booklet for further information.

Recipients

A recipient of a mail message can log on to any networked workstation or dial up any networked Interactive Terminal Service or Clusterport, or 850/860 Gateway Service. Once the credentials of the recipient have been checked with the Clearinghouse Service, the user agent software retrieves the new mail from the mailbox.

Example

A member of an organization with a nationwide internetwork has a mailbox at a Mail Service in Los Angeles. When the member travels to the East Coast, he or she can retrieve mail by logging on to a workstation at the East Coast office.

The member can also use a non-networked personal computer to dial up the Interactive Terminal Service or Clusterport to retrieve the new mail. In this way, users are not

ted to workstations or localities when they want to send or receive mail.

Information exchange

The lookup service provided by the Clearinghouse Service, the automatic routing of information packets provided by the Internetwork Routing Service, and the forwarding capability of the Mail Service combine to provide a convenient way for all members of an organization to exchange information.

Users can send messages with pathnames (reference pointers) to objects on the File Service, so that all recipients are informed of the availability and location of a new document. As System Administrator, you can send messages to all users in a domain, informing them of the latest additions to the network community.

The Mail System supports all types and sizes of communications. Documents created at the 6085/8010 workstation and containing complex graphics can be transmitted to remote locations, retrieved by users at the remote site, and printed at the Print Service in minutes. In this way, members of your organization can effectively "hand" each other finished documents without having to rely on standard physical transportation systems.

Like the File Service, the Mail Service can carry documents of all formats to serve different types of workstations and remote personal computers. As is the case with File Service clients, Mail Service clients can use workstation conversion software to convert incoming mail from a foreign format to one which can be displayed and edited at the receiving workstation.

External Mail Gateway

Mail Services configured with the External Mail Gateway option can be set up to dial External Mail Gateways on different internetworks at regular intervals. The calling gateway can transmit messages which it has posted for delivery to the remote network community.

In this way, two separate internetworks can exchange information when necessary, without full integration by Internetwork Routing Service leased or switched circuits. Full internetwork integration is more costly and is less desirable when two companies or distinct divisions within a company only have an occasional need to exchange information and do not need to share other network resources.

Placement of Mail Services

If your organization has purchased multiple Mail Services, your planning should include decisions about which servers should contain these Services. Your task is to ensure that all users of the Mail Service community can easily and reliably access a "post office" to send and receive electronic mail.

Like the Clearinghouse System, the Mail System is designed to serve a small single-server community. It is also designed to increase incrementally as your user community grows. When you add a Mail Service, you should establish mailboxes for users who normally work in close proximity to that Mail Service.

When you have more than one Mail Service in your internetwork, any Mail Service can respond to a request to post outgoing mail. This means that the Mail System as a whole can respond more quickly when many users are posting mail at the same time. Furthermore, if one Mail Service is inoperative, any Mail Service can respond to a request to post outgoing mail. As is the case with the Clearinghouse Service, placement of additional services increases the overall reliability, performance, and accessibility of the Mail System.

Co-residency limitations

The External Mail Gateway option requires the use of the server's RS-232C port, as do the 850/860 Gateway Service, the IBM 3270 BSC Communication Protocol, the Facsimile Print Service, and the Remote Batch Service.

No two of these services can run at the same time on the same server. If you need to combine these services on a single server, you must use the Multipoint Option Board.

You cannot use the External Mail Gateway to connect two sites that have ever been connected by a dial-up link. The dial-up link connection causes the two networks to be automatically and irrevocably linked.

Mail Service dependencies

The Mail Service depends on these services:

Clearinghouse

Each time that a user or a service makes a change to a Clearinghouse database, the Clearinghouse System makes sure that the change propagates to all other replicates of that database, regardless of their location. If a Clearinghouse Service is co-resident on the same server as a Mail Service, it uses that Mail Service as its "post office" for database update messages.

Since the purchase and installation of the Mail Service are optional, the Clearinghouse Service is able to exist without a Mail Service. It does this by creating and maintaining its own "invisible" Mail Service so that it can send and receive database update messages.

Due to the fundamental dependency of the Clearinghouse Service on the Mail Service, the two services are designed to be efficient when they are co-resident. If your organization has purchased a Mail Service, we recommend that you install the Mail Service on the same server as the Clearinghouse Service (except for large internets of 50 to 60 Clearinghouses). This minimizes the redundancy of Mail Service activities that would take place automatically if you installed it on a different server.

File Service The Mail Service depends on the File Service for backup and restore functions. The Mail Service can be automatically backed up to a File Service according to a set schedule.

External Mail Gateway The External Mail Gateway must be installed on the same server as the Mail Service.

850/860 Gateway Service The Mail Service is the only means by which the Gateway Service can move information between the external, non-networked 850/860 Information Processing System and the network.

Additionally, a mail clerk must be designated to receive the mail messages posted by the 850/860 Gateway Service. The mail clerk forwards the messages to the appropriate recipient(s).

Interactive Terminal Service The Interactive Terminal Service can access either the Mail or the File Service on behalf of an external, non-networked personal computer. Either the Mail Service or the File Service, or both, must be accessible to the Interactive Terminal Service.

Interactive Terminal Service

The Interactive Terminal Service (ITS) allows remote users of Teletypewriter-like terminals and computers to exchange information over telephone lines with users of internet workstations. The Interactive Terminal Service provides a network access and application gateway. The software supplies an interactive user interface for specifying network mailing, printing, and filing operations.

The ITS also supports printing through an interactive user interface that allows the user to specify a document on a file service or remote personal computer. The document formats currently supported are:

- Xerox Interpress
- Xerox Memorywriter format
- ASCII text files
- 860 files

Documents can be sent to the File Service for access to the network printers, or directly to the printer without using the File Service for intermediate storage. The Interactive Terminal Service can also be used to direct documents to a networked facsimile printer. Refer to the *Interactive Terminal Service* booklet for further information.

Configuration

Since the remote device is not a network citizen, the Interactive Terminal Service becomes an agent for the device and operates with other services as a network citizen.

Nearly all personal computers and standard asynchronous terminals feature communication ports that conform to the RS-232C communication standard. These ports can be connected via serial cables to modems, which are plugged into phone jacks, or attached to hand sets by means of acoustic couplers.

After a terminal or personal computer is so configured, communication software enables it to establish a manually or auto-dialed connection to a remote computing device that is similarly configured. This standard means of information exchange results in the asynchronous transmission of ASCII characters between the two endpoints.

The Interactive Terminal Service runs on the same or different server. The External Communication Service must be configured to receive incoming asynchronous calls. Users of asynchronous terminals or personal computers running communication software, dial the External Communication Service port and interact with the Greeter, unless the port is set to automatically connect to the ITS.

User interface

The user can request a session with the Interactive Terminal Service via the Greeter. If multiple Interactive Terminal Services are running on the internetwork, the caller can supply the fully-qualified name of any one of them. If the caller is not sure of the fully-qualified name, he or she can ask the Greeter to list all Interactive Terminal Services in a given domain, or in the entire internetwork.

Once connected to the Interactive Terminal Service, the remote user logs on and can then perform mailing, filing, and printing operations using the Interactive Terminal Service. The mailing commands allow the user to create and send, or retrieve and read mail messages. These messages may be sent from users located anywhere in the world, using networked workstations, dial-up personal computers, or teletypewriter terminals.

Conversion options

To enhance the ability of all members of the mail community to exchange mail notes and documents, the Interactive Terminal Service provides conversion options for mail messages. When a user transmits or receives a message, he or she can choose to have it converted to plain text or 860 format, so that it can be readily displayed on the destination device. If the device is a 6085/8010 workstation, plain text mail notes can be read directly in the 6085/8010 mail note field. Longer 860 documents can be converted to 8000 document format at the workstation.

Filing

The Interactive Terminal Service supports filing through a combination of interactive commands and reliable file transfer commands. The interactive commands allow the user to look through the file systems managed by the File Service and perform such remote manipulations as copying and deleting with files and directories on the File Service.

The user indicates the remote directory to be accessed, either by specifying a pathname or by repeated listing of directory hierarchies. Once a filing object is identified by a working directory and a filename, the user can utilize file transfers to store or retrieve files of any type. This extends the storage capacity of the users personal computer and allows the free exchange of files and documents between personal computers.

Interactive Terminal Service filing offers interactive viewing and composition of text files. In the text composition and file transfer modes, the Interactive Terminal Service offers conversion of documents to 860 or plain text format. Once a document is in 860 format, it can be read on 820-II or 860 workstations (networked or remote), and can be converted by 6085/8010 ViewPoint workstations to 8000 document format.

Remote use The Interactive Terminal Service supports document exchange between remote personal computers and the File Service via the industry standard XModem protocol. Users of remote personal computers can use their own word processing or spreadsheet software to create files of any format type. These files can be transmitted from remote computers to the Interactive Terminal Service and stored in their original formats on the File Service. Later, the same or a different user can retrieve a file from a remote computer or from a networked workstation.

The storage and retrieval operations that the Interactive Terminal Service supports by using the XModem protocol provide an open network. The output of multi-vendor computing devices can flow freely into and out of the 8000 Network System.

User profile

The Interactive Terminal Service maintains a User Profile on the File Service. A profile contains default parameters previously established by the user and which the Service automatically applies. The profile allows the Interactive Terminal Service to return the user to the directory path, terminal options, and Print Service values established at the last log off.

As the System Administrator, you create the User Profile file drawer in the Home File Service of the user. Detailed instructions are provided in the *Interactive Terminal Service* booklet in this library.

Multilingual interfaces

The Interactive Terminal Service can work with a number of message file options. Its executive messages and commands can be entered and displayed in Swedish, French, German, Italian, Spanish, and English.

Interactive Terminal Service dependencies

The ITS accesses any Mail or File Service on the same or different Ethernet network on behalf of its dial-up user. Either the Mail Service or the File Service, or both, must be accessible to the Interactive Terminal Service.

These are the dependencies:

Asynchronous Protocol

The Interactive Terminal Service requires Asynchronous Communication Protocol somewhere on the network.

The Interactive Terminal Service can share the use of a port with the Asynchronous Communication Protocol. However, the port cannot be used for an Interactive Terminal Session and a TTY emulation session at the same time.

If the Interactive Terminal Service is sharing a port with the Asynchronous Communication Protocol, use a modem specified for that protocol.

File, Mail, and Print Service

File, Mail, and Print Services must be running on the network or internetwork to provide responses to the file, mail, or print operations initiated by the user.

Limitations

Maximum users

One ITS can support a maximum of eight users at the same time.

If the Service needs to support eight users consistently, then the server should be dedicated to the Service.

If the Interactive Terminal Service is used heavily (high-speed transmissions, long messages, large distribution lists, etc.), then the number of users one server can support simultaneously is reduced to six. Server performance can be improved by adding more memory.

Co-residency requirements

The ITS may not perform well when it is co-resident with the Print Service. This is because the Print Service requires much of the server's central processing unit power and may not relinquish the central processing unit as often as is needed to sustain a real-time communication session.

For this reason, you should consider how extensively the communication options and printing capability will be used. If both are to be used fairly frequently and might often be active at the same time, we recommend that the communication activities be resident on a server other than the Print Service.

850/860 Gateway Service

The 850/860 Gateway Service (GWS) allows users of non-networked communicating 850 and 860 workstations to exchange information over telephone lines with users on the internet.

850/860 Information Processing Systems can be used as networked workstations, remote workstations behaving like networked workstations (860 only), or as standalone workstations with communication abilities.

The 850/860 Gateway Service receives incoming calls from standalone 850 or 860 word processing systems, transforms files created by the remote user into mail messages, and directs them to the Mail Service. The direct recipient of these incoming 850/860 messages is a designated "mail clerk." He or she assists the remote senders of these messages by addressing them to their intended recipients and re-mailing them.

Since 860 documents can be read directly at the 820-II and 860 networked workstations and can be converted to 8000 document format by the 6085/8010 workstation, they can be directed to any member of the network community. The recipients can also be dial-in users of Interactive Terminal Service mail.

The GWS communicates with the remote 860 in a reliable, packetized protocol. This ensures that 860 documents, complete with tables and other 860 formatting features, can arrive at the network intact. From there they can be printed on electronic printers or stored in File Services for access by co-workers.

The 850/860 Gateway Service provides another alternative for extension of your network community to remote non-networked offices or employee residences. All users can effectively integrate their work efforts. Refer to the *850/860 Gateway Service* booklet for more information about this service.

Co-residency requirements

Your server and server software are designed so that multiple services can run simultaneously on a single server. There are some services that cannot run simultaneously on the same server. The External Mail Gateway option, the 850/860 Gateway Service, the IBM 3270 BSC Communication Protocol, the Facsimile Print Service, and the Remote Batch Service all require use of the server's RS-232C port.

The 850/860 Gateway Service may not perform well if it is co-resident with the Print Service.

Inter-service dependencies

The 850/860 Gateway Service is absolutely dependent on the Mail Service. The Mail Service is the only means that the Gateway Service has of moving information between the external, non-networked 850/860 Information Processing System and the network.

Additionally, a mail clerk must be designated to receive the mail messages posted by the 850/860 Gateway Service. The mail clerk, a designated network user, forwards the messages to the appropriate recipient(s).

Remote Batch Service

The Remote Batch Service (RBS) lets users of the Xerox 8000 Network exchange documents and transfer files with devices that implement or emulate the IBM 2770, 2780, and 3780 BSC protocols used by IBM remote batch terminals.

The Remote Batch Service can perform three types of tasks:

- It can translate between document formats during the interchange of documents, providing compatibility between the Xerox Network System environment and a remote device.
- It can act as a third-party transfer agent and send and receive documents in formats which it does not understand.
- It can transmit Xerox Network System files and folders of files to a mainframe computer for storing and archiving without any loss of structure or information.

In addition to the Remote Batch Service, three other entities are involved in the process of document interchange and file transfer: the workstation, the File Service, and the partner.

The user prepares and submits tasks to the Remote Batch Service at the workstation. A task consists of a folder containing an instruction document (to guide the Remote Batch Service in converting and transmitting the data) and the actual data (documents, files, and folders). If the task is going to a data processing partner, the folder must also include job control documents. The task folder is placed in an input file drawer on the File Service. Each partner is assigned its own file drawer, which the Remote Batch Service periodically polls for tasks.

The task remains in the input file drawer until the Remote Batch Service copies it from the file drawer. It then interprets the instruction files, converts the format (if necessary), and transmits the data to the partner via telephone lines using 2770, 2780, or 3780 BSC protocols.

If the partner is a mainframe, execution of the task may generate output, which is then sent back to the Remote Batch Service. The Remote Batch Service converts the format, if necessary, and places the data in an output file drawer on the File Service where it can be retrieved.

Although one Remote Batch Service can support multiple communication partners, it can only communicate with one partner at a time.

Co-residency requirements

The Remote Batch Service may not perform well if it is co-resident with the Print Service. Refer to the "Print Service" section in this chapter for details.

The Remote Batch Service cannot run on a server with a Multiport configuration.

For best performance, do not put a Remote Batch Service on the same server with highly-active services such as the Clearinghouse and Mail Service. The Remote Batch Service cannot run on a server with a Multiport configuration.

Remote Batch Service dependencies

Users of networked workstations must direct Remote Batch Service jobs to a File Service. In turn, the Remote Batch Service must direct completed jobs to a File Service. You configure the RBS to use a particular File Service drawer for all jobs destined for a particular external partner. If the Remote Batch Service is to communicate with multiple partners, you must create multiple input drawers.

You must also create multiple output drawers if the Remote Batch Service is to receive completed jobs from multiple partners. The Remote Batch Service can be directed to drawers at a File Service that resides on the same server, a different server on the same Ethernet network; or a server on a different, but interconnected, Ethernet network.

Communication Monitoring Service

The Communication Monitoring Service (CMS) provides protocol monitoring at various levels of SNA, X.25, and RS-232C. Options which can be monitored by the Communication Monitoring Service include:

- External Communication Service, (Asynchronous TTY, 3270 BSC, 3270 SNA Emulations)
- Interactive Terminal Service
- Remote Batch Service
- Gateway Service
- Mail Service
- Mail Gateway Service
- Internetwork Routing Service using the X.25 option

The results of the monitored activity can be displayed at the terminal in HEX, OCTAL, ASCII, or EBCIDIC. IBM oriented sites may prefer to have the data displayed in HEX or EBCIDIC, while non-IBM sites will probably prefer ASCII or OCTAL. As the System Administrator, you will determine how you want the data displayed.

Note: With the exception of HEX, these formats can only be used at the RS-232C level of monitoring.

Monitored data is automatically collected and stored in a temporary log file in the local file system or server. As the System Administrator, you have the option of displaying the data at your terminal or manually storing the information in a designated file drawer. Or you may opt to use the auto logging feature described in the *Communications Monitoring Service* booklet.

The monitored data serves as a prime resource for solving your communications problems which result from incorrect configurations of software-settable parameters. It can provide clues that may help you resolve problems yourself or the data can assist your Systems Analyst.

Protocol selection

The type of monitoring selected depends upon the type and level of the communication service you want to monitor.

RS-232C RS-232C monitoring can be used to monitor any service that uses the RS-232C port, excluding the Internetwork Routing Service. At this level, monitoring is similar to that of a line monitor. All of the information passing through the port is captured in an uninterpreted form.

X.25 or SNA Higher level monitoring can be performed with X.25 or SNA types of monitoring. X.25 monitoring is performed at the HDLC level, while SNA is done at SDLC and Path Control levels.

Dependencies

The communication service being monitored must be co-resident with the Communication Monitoring Service.

RS-232C ports The CMS monitors Xerox Communication Services that require RS-232C ports via the port of the local server, 873 CIU, or the Multiport Options Board.

Services System Software The CMS depends on Services System Software utilities for the executive software used to communicate with you. The server profile provided by the Services System Software is also used to record the monitored parameters.

File Service The File Service is used by the CMS to store log files during automatic logging. We recommend that the File Service not be co-resident with the Communication Monitoring Service.

Limitations

Only one RS-232C port at a time can be monitored by the Communications Monitoring Service.

The Communication Monitoring Service can monitor only one protocol at a time. Protocols that can be monitored include RS-232C, SNA, X.25, BSC.

If multiple instances of the ECS 3270/SNA controller software are running on a single server, only RS-232C level monitoring may be performed.

Boot Service

The Boot Service (BS) enables Xerox 8000 processors to be booted over the Ethernet network. It is an independent, separately-loadable services software package which provides the basic etherbooting functions to a network.

Before a system on a network can be used, it must have all its application-level software installed. In order to do this, the processor must boot an installation utility. Xerox 6085/8010 workstations can be booted from floppy disks, rigid disks, and over the network.

When you boot over the network, Xerox 8000 processors broadcast a request for a specific utility boot file. The Boot Service constantly monitors the network to respond to such requests.

Upon receiving an Etherboot request, the Boot Service retrieves the specified utility boot file from its local database and dispatches it to the requesting remote processor.

The Boot Service can also be configured to store other utility boot files such as diagnostics, which can be invoked over the network. Boot Service can co-reside with any other service and on any configuration of servers. Refer to the *Boot Service* booklet for more information.

Boot Service requirements

These are Boot Service requirements:

- Before the Boot Service can be installed, the server must be running Services System Software 10.0.
- Six floppy disks are required to install the Boot Service for the first time. The floppies contain database boot files and their configuration profile.

Limitations

Boot Service can only support processors on the same Ethernet network. For interconnected networks, each network requires its own Boot Service. However, there are no restrictions on the number of Boot Services for a single network.

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- Access list** A list of users and/or groups of users who are granted access to specific services.
- Active** An operational state of the Remote Batch Service which is entered when the service determines that all configuration information is available and validated.
- American Standard Code for Information Interchange** (*ASCII*) A digital code set which represents each character of the standard typewriter keyboard as a 7-bit digital code. It is used for information interchange among data processing systems, data communication systems, and associated equipment.
- Analog transmission** Transmission of data in which the information content is modulated by a continuously varying signal or tone. Ordinary voice-grade telephone lines carry analog transmission.
- Anti-entropy** An operation run by the Clearinghouse (late at night during non-peak hours) to verify the validity of its database. It serves the same function as the **Compare Database** command, except that it is done automatically.
- Archive** A mode of file transfer used by the Remote Batch Service. Archive format data will most likely be sent to and received from a mainframe rather than a word processor.
- Asynchronous** Transmission of data in which time intervals between transmission are unequal. Transmission is sent a character at a time and is controlled by start and stop elements at the beginning and end of each character.
- Asynchronous Communication Protocol** Optional software running with the External Communication Service (ECS) that allows compatible information exchange between workstations using emulation software and a TTY-oriented host.
- Auto-logging** A process that automatically copies the local log file to a File Service. Auto-logging is enabled in the monitoring profile and started with the **Start Logging** command.
- Backup cycle** A period of time expressed as a number of days. A complete snapshot of a File Service volume is made over the backup cycle. A complete backup consists of the backup data created during the period of time known as the backup cycle. Backup media must be saved for the duration of a cycle. After the number of days in the cycle have passed, floppy disks may be reused and obsolete backup data can be deleted from the backup File Services volumes. The length of the backup cycle affects the usage of the backup media, backup execution time, and the size of a single backup increment.

- Backup file drawer** A file drawer created on the backup File Service for the backup data (volume backup only). Before running backup to a rigid disk, each backup File Service in the backup volume group must have a backup file drawer created on the rigid disk. The backup file drawers on File Service volumes of the same backup volume group must all have the same name, and the backup user must be given full access privileges to the file drawers.
- Backup frequency** The number of days between each backup. Each time backup is executed, a backup increment is created. For a File Service that has a constant level of usage, if backup is run more often, then each backup increment is smaller and takes less space on the backup media (fewer floppy disks if backing up to a floppy).
- Backup increment** A partial snapshot of the volume that is produced during a single execution of the backup software. The set of increments produced during a given cycle period constitutes a complete snapshot of the volume.
- Backup increments log** A backup record on the source volume about each backup increment. The log includes which backup volume was actually used and the start time for the increment. This information is later used to locate increments, delete obsolete increments, or browse through increments. This information is located in the systemfiles directory, which is contained in the backup increments log.
- When restoring a volume, it is necessary to restore the backup increments log before restoring the rest of the volume's contents so that the restore process knows where to retrieve the backup data for the volume. It should be done using the **Restore Container** command.
- Backup index** A special file containing a list of files backed up in a given increment. The contents of a backup index are displayed using the **Show Backup Index** command.
- Backup medium** Used for storing backup data. The user has a choice of the type of medium for each File Service volume when setting backup parameters. The choices are floppy disk or rigid disk (another File Service volume). A rigid disk can be remote (another server on the network) or local (another File Service volume on the same multi-drive server).
- Backup parameters** The System Administrator-specified set of variables that configure the backup process. These include the medium to be used (floppy disk or rigid disk), duration of a backup cycle, frequency of backup, start and stop times, and others, depending on the backup medium.
- Backup start time** Time of day when you want backup to begin automatically (applies only to rigid disk backup).
- Backup user/password** The name and password of the user whose identity is to be used for backup (rigid disk backup only). These may directly correspond to the System Administrator, or to a "backup user" specifically created for this purpose. The backup user's identity is used to access the local or remote File Service during volume backup. The backup user must also have full access to the backup file drawer on the local or remote service used for backup.

- Backup Volume Group** A group of File Service volumes used for backup. The group name, entered in the Clearinghouse database, is used by backup to locate an accessible backup volume. Every time backup is started, the volumes from the group are examined in alphabetical order. The first available volume from the group is used to store the backup data. The backup user needs to supply this parameter only in the case of backup to a rigid disk (another File Service).
- Banner page** A page produced by the Print Service containing information about the associated print request. Also referred to as the **Break page**.
- Baud rate** The speed at which a computer transfers data (in bits per second). Any two communicating terminals must be set to the same baud rates.
- Binary Synchronous Communication** (**BSC**) A data link control procedure developed by IBM. A variation of synchronous data transmission that includes specific control characters and procedures for controlling the establishment of a valid connection. Also referred to as bisync or bisynchronous.
- Bit** A unit of data which can have the value of 0 or 1. These units are combined into 8-bit bytes; each byte equals one character.
- Bit synchronous** Optional software on the External Communication Service that supports information exchange between compatible workstations and a TTY-oriented host.
- Boot** Activating the software on a server or workstation by pressing the hardware "boot button" (B RESET on the processor maintenance panel).
- Boot Service** The service that provides the facility for booting software on a server or workstation through the network.
- Break page** See **Banner page**.
- Byte synchronous** A form of synchronous transmission in which a sequence of successive 8-bit characters are handled and transmitted as a unit. The byte synchronous protocol is available only through the 8000 port configuration.
- Clearinghouse** (**CHS**) A service that provides the naming facility for the other services and workstations on the internet. The Clearinghouse maintains a system-wide directory function that allows all the system components to locate needed resources and other registered objects.
- Clearinghouse database** The database is organized by domains, which consist of 200-300 users resident in the same geographical location. A domain can reside in multiple Clearinghouses, and each Clearinghouse can hold multiple domains. (See **Domain** for more information.)
- The specialized database held by the Clearinghouse Service, that serves as a global directory for the entire internetwork.

Clearinghouse Service	(CHS) A lookup directory service that maintains a database of all users, services, and servers in a network. The Clearinghouse Service cooperates to provide a single unified database system among other Clearinghouse Services.
Clearinghouse system	The portion of each Clearinghouse Service database intended to be identical to that of all other Clearinghouse Services existing within the same internet. It contains the names of all Clearinghouse Services and the addresses of the servers that house them, the minimum information that any two database instances must have in common.
Clusternet router	An option of the Internetwork Routing Service that allows remote workstations to access each other and internetwork services via voice-grade dialed phone lines.
Clusternetwork	A collection of one or more communication circuits. It is assigned a network number which allows remote workstations access to the rest of the internetwork.
Communication Interface Unit	(CIU) The 873 Communication Interface Unit is an optional RS-232C port extender that supports up to eight additional ports. The CIU attaches directly to the network, and can be configured for either asynchronous or bit synchronous communication (TTY, 3270 SNA, or IRS-to-IRS phone communications).
Communication Monitoring Service	(CMS) Supports the diagnosis of communication problems which arise when configuring and operating Xerox communication services.
Complexity	A qualified measure of the difficulty of printing a single page or entire document, as applied to the image defined in an Interpress master. Several factors enter into the determination of complexity, including the number of characters and fonts (families, sizes, and orientations) referenced; the number of graphic operations; the levels allowing the overlaying of objects on a page used in producing the image; and the density of the image.
Connection window	The parameters which control the hours of operation of the Remote Batch Service with respect to a particular communication partner.
Consultative Committee for International Telephone and Telegraph	(CCITT) An international group responsible for communication standards.
Current log file	The working log file to which captured data is written during logging. If logging is stopped, the current log file is the working log file to which data was last written. When logging is started again, the other working log file will become the current log file. The current log file is said to be active during logging and not active if logging is stopped.
Database	The permanent stored data.
Decomposing	Interpreting the information in the Interpress document and referencing the fonts. Sometimes rotation, scaling, or conversion of fonts is done during this phase. Also referred to as Formatting .

- Dedicated line** A type of communication circuit, such as a leased line, that remains connected and does not have to be dialed. Often used for internetwork links and mainframe connections for 3270 emulation.
- Digital transmission** Transmission of data in the form of on/off electronic pulses representing digits. Business devices generally transmit digital signals.
- Distributed processing** Refers to network resources that can be shared between many users, including users at remote sites.
- Distribution list** A list of recipients for electronic mail, represented by a user group registered in the Clearinghouse.
- Domain** A logical grouping (usually geographical) of registered objects in the Clearinghouse database. Domains serve as units of name, scope, administrative responsibility, and replicated database configuration. The data maintained for a particular domain includes the list of administrators of that domain, plus the names and relevant information about all objects that are registered in the domain.
- Domain Administrator** The System Administrator-assigned access privileges to control the changes to entries within a given domain.
- Note:** Only the Organization Administrator can create a domain.
- 850/860 Gateway Service** (**GWS**) Allows non-networked 850 and 860 Information Processing Systems to exchange information (using the Mail Service) with other workstations on the network.
- Electronic printer** A method of transferring a digital image to the printing medium (usually plain paper). Xerographic laser printers produce pulses of light which are cast onto an electrically charged photoreceptor. These pulses are controlled by the digital image of the desired output. Just as in a xerographic copier, wherever the light strikes the photoreceptor, the electrical charge is neutralized. The photoreceptor is then passed through toner which is attached to the electrically charged areas. The resulting image is transferred to and fused onto the medium to produce the output copy. Also referred to as a **Laser printer**.
- Emulation** The process by which workstations communicate like other terminals. It provides access to other host systems in a way familiar to the host system.
- Epoch** The point in time after which only new and changed files must be backed up incrementally. Refer to the "Backing up the File Service volume using the **Copy Volume** command" procedure in the *File Service* booklet for a description of how this epoch feature can be used in conjunction with the **Copy Volume** command.
- Etherbooting** The process of booting software over the Ethernet.
- Ethernet** A high-speed local area network developed by Xerox that carries information to workstations and servers attached to the network.
- Event recipient** A Server Monitored Service that is registered with a monitored server to receive event information about that server.

- Executive** A program that supports interactive, text-based access to server functions. (The software that allows the user to observe the current activity of a server, or change its current configuration.) The "local executive" is provided at the server terminal. ViewPoint Remote System Administration provides users with a remote executive interface.
- Extended Binary Coded Decimal Interchange Code** (**EBCDIC**) An eight-bit code used for data communication.
- External Communication Service** (**ECS**) Maintains and initiates emulation sessions between network workstations and various terminals. The ECS emulates three kinds of terminals: 3270 BSC and 3270 SNA synchronous terminals, and standard asynchronous-type terminals. The servers and workstations are enabled by having the different emulation software installed on them.
- External Mail Gateway** An optional feature of the Mail Service which enables mail exchange between two Xerox mail systems residing in separate networks.
- Facsimile** (**FAX**) A system of communications in which a document, photograph, map, or other fixed graphic material is scanned. The information is converted into signal waves for transmission by wire or radio to a facsimile receiver at a remote point. Then the image is scanned at the transmitter, reconstructed at the receiving station, and duplicated onto paper.
- File Service** (**FS**) A service installed on the server that allows the sharing of files produced at any networked or non-networked workstation. The information is stored in a hierarchy of file drawers and folders. There is a limit to the size of the file drawer as established by the System Administrator, but there are no limits to the number of file folders within the size of the file drawer. The File Service is also used to back up the Clearinghouse, Server Monitor, and Mail services.
- Floppy disk** A flexible, removable magnetic disk used for data storage and loading software onto the workstation and server.
- Font** Typographical design applied to a collection of letters and graphic symbols that share certain characteristics such as style, weight, and stress.
- Font rotation** The rotation of fonts to the required angle for printing a document.
- Font substitution** The use of another font in the place of the specified (and presumably unavailable) font. For the Print Service, the default substitution font is from the Modern family.
- Foreign internetwork** A Xerox internetwork that is separate from your internetwork.
- Foreign mail domain** A domain in a foreign internetwork that is accessed via the External Mail Gateway option of the Mail Service.
- Foreign mail gateway** A Gateway Mail Service in a foreign internetwork which can be contacted by a Gateway Mail Service in the local internetwork for exchanging mail between mail systems.

Formatting	Interpreting the information in the Interpress master and referencing the fonts. Sometimes rotation, scaling, or conversion of fonts is done during this phase. It may also indicate special formatting done by the Formatting Print Service. Also referred to as Decomposing .
Formatting Print Service	A service that provides printing of detailed graphics, equations and/or text on Xerox production printers. It converts Interpress masters containing Interpress vector graphics into the proper format for accurate printing on a 9700/8700 printer.
Forward queue	Contains mail that is being forwarded to another Mail Service.
Forwarder	The part of the Print Service which causes the transfer of the interleaved Interpress master to the target Print Service.
Forwarding	The passing of a message from one Mail Service to another to deliver it to the mailbox of its intended recipient.
Full-duplex	A circuit or protocol that permits transmission of a signal in two directions simultaneously.
Gateways	Services that transform communication protocols and information formats between systems with differing architectures.
Gateway Mail Service	Provides a non-networked 850/860 workstation with access to the network through a modem and phone line.
Gateway queue	Present if the Mail Service is a Mail Gateway. It contains messages awaiting the start of a calling interval so that mail can be forwarded to intended recipients mailboxes in a foreign domain.
Genesis Mode	A state that a server enters when the Clearinghouse is unable to authenticate the user to enable System Administrator capabilities and server initialization when stopped at Interrupt 3. In this case, the user is enabled to access the limited set of System Administrator commands, necessary for making a Clearinghouse domain available. Genesis Mode occurs during the installation of the first server on a network, and on single-server networks after a non-normal server startup and interrupt points 2 or 3 have been taken.
Half-duplex	A circuit or a protocol that permits the transmission of a signal in two directions, but not at the same time.
High-Level Data Link Control	(HDLC) A set of procedures specified by the International Organization for Standardization (IOS) for link access across the DTE/DCE interface. The functional layer within the X.25 protocol that controls the flow of data on a communication line.
Host	Any mainframe computer that is accessed by users. The host can be either an IBM 3270 BSC or 3270 SNA for use on the network.
Host element	See System element .
Idle	An operational state of the Remote Batch Service, entered when the service attempts to start, but not all configuration information is available or validated.

Image gaps	The blank strips running horizontally across a page of an 8040 Series printout, or vertically across a page of an NS 8000 Laser CP printout. This happens when image generation is unable to keep up with the speed of the printer while attempting to print extremely complex images/graphics.
Inbound Mail Gateway	A Gateway Mail Service which handles incoming mail from foreign internetworks for a selected set of domains in its own internetwork.
Initializing	A process that occurs each time services are run for the first time after the server has been booted. The initialization procedure includes the determination of the service name, and configuration information specific to that service.
Input queue	Contains mail that was either posted to a local Mail Service, or forwarded from another Mail Service.
Interactive Terminal Service	(ITS) Provides access to Mail, Print, and File services for non-networked users of TTY-like terminal or personal computers emulating teletypewriters. The remote user communicates with the ITS through a modem and phone, and is validated through the Clearinghouse Service.
Interleaved Interpress master	An Interpress master which contains text elements and pixel arrays. It refers to the converted master produced by the Print Service when it is configured as a Formatting Print Service.
Internetwork	A composite of interconnected networks in which network resources are shared. Any network can have multiple connections to other networks. (See Internetwork Routing Service for more information.)
Internetwork Routing Service	(IRS) Enables all users on a network to access all services (Mail, File, Print) and to communicate with users on other networks. Up to 15 IRSs can be linked together. Any change to an IRS is automatically broadcast throughout the internet.
Interpress	A Xerox standard which defines the digital representation of files that are printed via the Print Service.
Interpress master	See Master .
Interpreted	A mode of file transfer used by the Remote Batch Service for interchanging documents. The Remote Batch Service translates documents from a format that it understands (Xerox 860) to a format more commonly understood by non-Xerox systems (EBCDIC DP or EBCDIC WP) before sending a document. It applies the reverse translation upon receiving a document.
Interrupt points	Allow the user to change a value that the server applies during initialization. They are available after a non-normal server startup. During initialization, the possible interrupt points are: <ul style="list-style-type: none">• Interrupt before opening primary volume• Interrupt before processing profile• Interrupt before running services

- Refer to the "Non-normal server startup" section in the *Server Operation and Maintenance* booklet for further information.
- Laser printer** A method of transferring a digital image to the printing medium (usually plain paper). Xerographic laser printers produce pulses of light which are cast onto an electrically charged photoreceptor. These pulses are controlled by the digital image of the desired output. Just as in a xerographic copier, wherever the light strikes the photoreceptor, the electrical charge is neutralized. The photoreceptor is then passed through toner which is attracted to the electrically charged areas. The resulting image is transferred to and fused onto the medium to produce the output copy. Also referred to as an **Electronic Printer**.
- Local log file** A copy of the last full working log file stored in the working directory of the server where the Communications Monitoring Service resides. The local log file is overwritten each time a working log file is copied to it.
- Logical Unit** (**LU**) A Network Addressable Unit within SNA through which an end-user process can access the network.
- Logoff** The process of stopping a session on a computer system.
- Logon** The process of starting a session on a computer system.
- Mail Service** (**MS**) The Mail Service is directly accessible to all networked workstations, and to any non-networked device that can dial-up the appropriate compatibility service. There are two compatibility services: 850/860 Gateway and the Interactive Terminal Service. The Clearinghouse provides address information and distribution lists for mail delivery. The Internetwork Routing Service routes messages to other networks.
- Mail Service database** The permanent data stored by the Mail Service on the server disk, including mailboxes, their contents, and messages queued for forwarding and delivery.
- Mail system** The global system made up of all the Mail Services in an internetwork. The Mail Services cooperate to provide a single, unified mail transport system.
- Mailbox** The repository in which mail resides while awaiting delivery to a client.
- Main memory** Usually the fastest storage device of a computer and the one from which instructions are executed.
- Marker** A term describing the part of the Print Service that causes the transfer of the image to the medium, as in placing marks on the paper. It is also referred to as the imaging subsystem.
- Master** A file written according to the Xerox Interpress standard. It precisely describes the desired appearance of a page that has been completely composed by some other process. It is the Interpress master which, when executed by an Interpress printer, produces a printed image.
- Medium** The material to which the print engine transfers the image. For the 8040 Series printer and the NS 8000 Laser CP, the medium

- is plain paper. For the Telecopier 495-1, the medium is a continuous role of thermal recording paper.
- Modem** A device which converts digital information to an analog signal suitable for sending over analog phone lines. It also converts the analog signal from phone lines into digital information.
- Modem emulator** A device which enables local communication between devices without converting digital signals to analog signals.
- Monitored server** A server whose availability is monitored by the Server Monitor Service.
- Monitoring profile** The set of parameters that describes the monitoring and logging to be performed. The monitoring profile is stored in the Communications Monitoring Service section of the server's profile.
- Monitoring server** A server that is running the Server Monitor Service.
- Multiport option** The multiport option extends the local port to four ports. It can be configured for bit-synchronous communications (IRS, Clusternet, 3270 SNA, External Mail Gateway, and X.25).
- Network** The physical and logical connection of system elements. A network allows information exchange between workstations and servers.
- Network architecture** The philosophy and organizational concept for enabling devices at multiple locations to communicate over common carrier transmission facilities. The network architecture specifies the processors, workstations, and terminals, and defines the protocols and software which must be used to accomplish accurate data communications.
- Non-transparent** A mode of transmission in BSC protocol. The data is not permitted to have certain values, so that these values may be used to control the data transmission. Used to transmit textual information.
- Oracle** A Relational Data Base Management System that runs on a wide range of VAX processors. It can be accessed by any user on the network through the VT100 window.
- Organization** A high-level logical grouping of domains in the Clearinghouse database (usually corresponding to an entire company or equivalent). Most internetworks contain only a single organization. For each organization which it serves, a Clearinghouse Service maintains the following data: the list of administrators for that organization, the list of all domains contained by the organization, and the names of all Clearinghouse Services that serve each of these domains.
- Organization Administrator** The individuals or groups that are granted administrative access to the organization. The task consists of adding and deleting persons to and from the Organization Administrator's list; creating the first instance of a new domain; deleting the last instance of an obsolete domain, and deleting the last instance of the only domain in a given organization.

Outbound Mail Gateway	A Gateway Mail Service which handles outgoing mail from its own internetwork for a selected set of domains in a foreign internetwork.
Packet	A collection of data to be transmitted. Packets typically contain routing and error-correction information. Large amounts of data are often broken into smaller packets for transmission.
Packet Switched Data Network	(PSDN) A network accessed through the X.25 protocol which is implemented by the IRS. Telenet, Tymnet, and Japan's DDX are all examples of PSDNs.
Paper path	The mechanical route of the paper media through a print engine. A paper path fault indicates a problem in that route, such as a paper jam.
Parity	A bit used to check the accuracy of data transmission.
Partner	A particular device (mainframe/word processor) with which the Remote Batch Service communicates.
Password	A required code in addition to a user's name or number that allows logon.
Path control	The functional layer within SNA that controls the routing of messages.
Pathnames	The means for specifying the route to objects that are nested within other objects.
Pending queue	A list of messages waiting to be forwarded to intended recipients.
Physical Unit	(PU) A Network Addressable Unit within SNA that provides network administrative services for its node.
Pica	A unit of measurement equaling 12 points, or approximately 1/6 inch.
Pilot	The operating system used on 8000 servers and the 8010 Star Information System.
Pitch	As applied to printing, it is a unit of measure applied to fonts which describes the number of characters per inch. A 10 pitch font means 10 characters per inch. Fixed pitch is a font property, meaning that all of the similarly-sized characters in that font have the same width.
Pixel	A small discrete element, a group of which constitutes an image. The 8040 Series printer and the NS 8000 Laser CP print 300 pixels per inch. The Telecopier 495-1 prints 200 pixels per inch.
Point	As applied to printing, it is a unit of measure. One point is approximately 1/72 inch. Points are most often applied in describing the height or size of a set of characters within a font.
Print device	The device that transfers the image to the medium. Also referred to as a Print engine .

Print engine	See Print device .
Print Service	(PS) Provides the resource for obtaining printed output of documents for clients accessing the network.
Printing option	Determines how the printed documents are produced by the Print Service. Each instance of the PS is configured to provide one printing option. Printing options are the 8040 Series Electronic Printer, the NS 8000 Laser CP Electronic Printer, the Telecopier 495-1, and the Formatting Print Service.
Profile file	The mechanism used to record configuration information. It is in fact the server profile file, but information specific to the Remote Batch Service may only be manipulated by Remote Batch Service commands.
Protocol	The formal set of conventions governing the format of data and controlling information exchange between two communicating devices.
Queuing	The process of accepting and storing documents by the Print Service. Also referred to as Spooling .
Reboot	Restarts the software loaded on the system element by pressing the "boot button" (B RESET on the processor maintenance panel).
Remote access	Communication with a data processing facility through a data link.
Remote Batch Service	(RBS) Provides document interchange with devices and systems which implement IBM Binary Synchronous (BSC) data transmission protocols (2770, 2780, and 3780).
Remote log file	A copy of the local log file stored in a File Service by auto-logging. A remote log file has the same name as the local log file plus an appended time stamp that ensures a unique name for each remote log file.
Remote workstation	A workstation attached to an internet using RS-232C protocol and leased or manually-dialed lines.
Replication	Each domain in the database is stored on two or more servers, improving reliability, availability, and efficiency of access.
Resolution	The spots per inch (spi) that a printer is capable of producing when rendering an image. The resolution is 300 spi for the 8040 Series and the NS 8000 Laser CP. For the Telecopier 495-1, resolution is 200 spi. In general, the finer the resolution (the more spi), the better the quality of the printed image.
Rigid disk	A hard disk medium used as the main storage device for software and data on the workstations and servers.
RS-232C port	The physical interface between some network citizens and the data communication equipment (usually a modem).
Scan conversion	A term referring to the complete digitization of an image. A scan-converted image consists entirely of binary ones and zeros, with each digit representing a pixel.

Scan direction	The description, in relationship to the medium, of the way the spots which make up the image are transferred to the medium. The fast scan direction is the orientation of the scan lines which are fed directly to the electro-mechanical imaging system. The slow scan direction is the direction that the fast scan lines move across the medium.
Scavenging	A process invoked by the Scavenge command. It can also appear as a prompt after the system determines a file inconsistency. Scavenging repairs the filing system after a system failure by determining the cause of the problem and the area where it occurred. The problems are reported in the Scavenger log.
Self-registration	A feature where each service registers itself (and any other resources it may control) in the Clearinghouse database.
Server	A processor on which one or more services can run.
Server Monitor Service	(SMS) Watches a group of servers from one location, monitors their availability, and reports problems to the System Administrator via mail messages.
Server profile	The data file used to retain information such as names and assignments after the initialization and configuration of servers and services is complete. This way, the user does not have to specify the information each time the server is booted.
Service	Software that performs a specific function which runs on a server.
Services Executive	The software that allows the user to observe the current activity of a server, or change its current configuration. (See Executive for more information.)
Services System Software	Provides an environment in which one or more of the Xerox 8000 Network System services can operate.
Shared Interface Unit	(SIU) Allows remote workstations to access the Ethernet and services by passing packets between the Ethernet and a phone line connected to the workstation. The SIU is directly attached to the Ethernet. The synchronous point-to-point protocol is used by the SIU ports. Workstations can be directly attached to the SIU's ports or can use dial-up or leased line modems. The Xerox 820-II and 16/8 computers can be attached to an SIU. Each SIU has two RS-232C ports and is not expandable.
Spooling	See Queuing .
Started	An operational state of the Remote Batch Service in which some resources are in use. The availability of commands depends on what configuration information has been specified and whether there is a logged-on user with System Administrator privileges. This state is further qualified as either active or idle.
Stopped	An operational state of the Remote Batch Service in which no resources are in use and only the Start command is available.
Switched line	The phone line connection where points of termination can be changed through dialing. It allows the sharing of resources and switching from one resource to another.

Switched Virtual Circuit	(SVC) In this document, switched virtual circuits refer to those supported by X.25 networks. These circuits give the illusion of providing point-to-point connections, though they share the physical link to the X.25 networks. SVCs are set up at call establishment time. They are used for applications that would normally use dial-up and dial-out lines on non-X.25 networks.
Synchronous	An efficient encoding of data suitable for high-speed block-oriented data transmission using equal time elements.
Synchronous Data Link Control	(SDLC) An IBM communications line discipline or protocol associated with SNA.
System Administrator	A user with specific network privileges, responsible for setting up and maintaining the network services.
System element	Devices which have been assigned 48-bit IDs. System elements are capable of implementing the full range of NS protocols and can be both the source and destination of packets. Servers, 8000 workstations, 860s, 820s and PCs are all considered system elements. Also referred to as Host element .
System Network Architecture	(SNA) The logical structure, formats, and protocols of operation sequences for transmitting information units through the communication system. Developed by IBM for distributed processing networks. Used by SDLC.
Target Print Service	The Print Service to which a Formatting Print Service sends the documents.
Task	A unit of work to be performed by the Remote Batch Service.
2770, 2780, 3780 terminals	The family of IBM Remote Batch Terminals with which the Remote Batch Service communicates.
• Test patterns	Interpress masters stored on the Print Service and printed to aid in troubleshooting the service, and judging and adjusting the print quality. Some print engines with noticeable tolerances in their paper path need an alignment pattern to aid in the adjustment of digital timing to coincide with the paper path.
3270 Communication Protocol	Optional software running with the External Communication Service that supports compatible information exchange between workstations, with 3270 emulation software and an IBM host.
Transmission	The sending of data to one or more locations or recipients.
Transparent transmission	A mode of transmission in BSC protocol where the data is permitted to have any value. Used to transmit non-textual information.
Uninterpreted	A mode of file transfer used by the Remote Batch Service for interchanging documents. Uninterpreted data will most likely be processed by a consumer other than the RBS and thus should not be altered by RBS. It is the consumer rather than the Remote Batch Service who is expected to understand the format of the data. Uninterpreted data will most likely be

- processed by a consumer which is a word processor rather than a mainframe.
- Update propagation** An automatic activity initiated by a Clearinghouse Service when it receives an update to its database that is then sent to other Clearinghouse Services. Any update to a:
- Domain portion of the database must eventually propagate to all other Clearinghouse Services that serve that particular domain.
 - Particular organization portion of the database must eventually propagate to all other Clearinghouse Services which serve that particular organization.
 - Global portion of the database must eventually propagate to all other Clearinghouse Services.
- Virtual memory** A mechanism (hardware and software) that provides the illusion of a large memory by combining a small memory with a large disk. This technique permits the user to treat secondary storage as an extension of main memory, thus giving the virtual appearance of a larger main memory.
- Virtual terminal circuits** Allow interactions to occur between various network citizens for applications that require Asynchronous ASCII communication.
- Working directory** The directory in the file system of the server where files can be stored for access by the Network Administrator.
- Working log file** An array of log entries in virtual memory which contains data captured from the communication line being monitored. There are two working log files.
- XC 80** A network based on the Xerox Network System architecture that offers a complete range of Print, File, Mail, and Communication services. Cabling alternatives include: standard or thin coaxial cable, and AstraNet, which uses fiber optic or twisted pair cable.
- Xerox Network Services/DEC VAX** (**XNS/DEC VAX**) Software that runs on a VAX computer that allows VAX users access to network services, and networked workstations access to a networked VAX system.
- Xerox Network System** (**XNS**) A combination of hardware and software that unites specialized devices into a network where the capabilities of a variety of workstations are enhanced by distributed services.
- XModem protocol** An asynchronous communication protocol developed to facilitate file transfers between personal computers. It has been implemented for use in a variety of personal computers as well as mainframe computers. The XModem protocol demands eight data bits, no parity, and one stop bit.
- X.25 Circuits** An international standard protocol that defines an interface between data terminal equipment and data circuit terminating equipment (DCE) for terminals operating in the packet mode on public data networks. The X.25 link between an Internetwork Routing Service and a public data network is an RS-232C leased line supplied by the network vendor. X.25 is

structured to allow the multiplexing of many virtual circuits over a single physical link.

A

access 12–16, 22–23, 30, 53–54, 62, 67
 authentication 13
 file drawer 52
 filing 64
 network 26, 46, 63
 object-level 13, 37–38, 42, 53
 restricted 15, 37
 shared files 51
 to ECS 39
 acoustic coupler 19, 63
 activity logs 43, 54
 Adding domains 33
 addressee 24
 administration 11–12, 15, 22, 40, 42
 aliases 32–33
 analog signals 19
 application-level software 73
 archiving 69
 ASCII 16, 40, 63, 71
 asterisks 13, 34
 Asynchronous Communication Protocol 40–41, 65–66
 computers 16, 63
 emulation sessions 26, 58
 TTY 71–72
 authentication 13, 42, 53
 authentication and encryption of passwords 37
 auto-dial circuits 20, 40, 48, 58, 63

B

backstop log 23
 Backstop Software 16, 22
Backup command 20
 backup 4, 35, 43, 49, 61
 file drawer 53
 bandwidth communication 49
 boldface 56
 boot 16, 20–21, 23, 73
 Boot Service 16, 20–21, 23, 73
 limitations 73
 requirements 73

C

caller 40–41, 64
Change Domain Access command 15
Change File Drawer command 53
 circuits
 dedicated 47
 switched 47

virtual switched 47
 citizen communications 24
 Classic font 56
 Clearinghouse Service 12–13, 15, 20–22, 25, 27, 30, 42, 46, 48–49, 52–53, 55, 59–61
 dependencies 36
 domain replication 35
 keeping domains up-to-date 34–35
 limitations 37
 lookup services 30–31
 naming 32–34
 object-level access 37–38
 placement of 35–36
 security 37
 System Administrator duties 33
 system growth 31
 client 21–22, 24–25, 34–36, 39, 51–54, 60
 client-service interactions 24–25
 cluster controller 39–40
 Clusternet option 20, 46, 48
 Clusterport 59
 coaxial cables 39
 codes messages and error 17
 colons 34
COMMANDS
 Backup 20
 Change Domain Access 15
 Change File Drawer 53
 Copy Volume 23
 Delete Files 20
 Delete Scavenger Log 20
 Enable 15
 Install From Floppy 20
 Install Service 20
 List Files 20
 Retrieve Files 20
 Retrieve Remote File 13
 Set Remote Directory 73
 Set Software Options 16
 Show Files 20
 Show Scavenger Log 20
 Store Files 20
 Communication Interface Unit 19–20, 39–41, 47, 49–50, 72
 Communications Monitoring Service overview 71
 dependencies 72
 limitations 72
 protocol selection 71–72
 compatibility services 25–26

- configuration 9, 12, 14–16, 20–22, 27, 32, 46, 54, 55, 71
 - BS 73
 - CHS 35–36, 39
 - CMS 43
 - IRS 46–47
 - ITS 63
- configuring server and service 15, 19, 27–28, 40–41
- conversion software 51, 56, 60, 64
- Copy Volume** command 23
- co-residency requirements 41, 45, 50, 58, 61, 66–67, 69
- CP/M 11, 19, 57
- credentials 25, 59

- D**
- database 13, 21–22, 30–32, 34–36, 43, 52, 54–55, 61, 73
- dedicated circuits 47
- default parameters 65
- Delete Files** command 20
- Delete Scavenger Log** command 20
- dependencies interservice 2728, 36, 42–43, 45, 49, 54, 57–58, 61, 65, 68, 70, 72–73
- diagnostics 17, 73
- dial-in users 13, 18, 52, 67
- dial-up connections 9, 16, 40, 42, 47–49, 51, 54, 64–65
- dialer test 17
- digital signals 19, 40
- directory 20, 30–31, 51, 54, 64–65
- disk 12, 14, 23, 35–36, 57–58
 - floppy 17–20, 53, 73
 - rigid 14, 18, 53
- diskettes 29
- document 11, 13, 24, 26, 56–60, 63–65, 67, 69
- Domain Administrator 12, 15, 21–22, 30–37, 59–60, 64
- domain 12, 27, 30–36, 55, 77
 - keeping up-to-date 34–35
 - replication 35
- DOS-based microcomputer 11
- downtime 43
- DPI 58

- E**
- EBCDIC 71
- emulation 11, 13, 26–27, 39–42, 58, 65, 71–72
- Enable** command 15
- encryption 13, 37
- Etherboot 73
- Ethernet 9, 11, 17, 20–21, 27–28, 31, 33, 35–36, 43, 46, 48–49, 54, 59, 65, 70, 73
- External Communication Service 19–20, 39
 - asynchronous communication protocols 40
 - co-residency 41
 - dependencies 42
 - overview 39

- IBM 3270 BSC and SNA protocols 39–40
 - security 42
 - support 41

- F**
- facsimile printer 19, 41, 56, 58, 61, 63, 67
- filename 64
- file drawer 51–52
- files 16, 20–21, 40, 43, 51–54, 63–65, 67, 69, 72–73
- filing 11, 51
- floppy disk 17–18, 20, 53, 73
- folder 51–52, 69
- fonts 20, 56–58
- form 9
- format 24, 51, 56–57, 60, 63–65, 67, 69
- Formatting Print Service 56–57, 67
- File Service overview 51
 - file drawer hierarchy 51–52
 - file drawer access 52
 - clients 52–53
 - backup policy 53
 - object-level access controls 53
 - dependencies 54
- Fuji Xerox Printer 19
- fully-qualified names 32–33, 64

- G**
- global propagation 35
- graphics 56–57, 60
- Greeter 41, 63–64
- Gateway Service 68
 - co-residency 68
 - dependencies 69

- H**
- hardware 18–20, 39–40
- HDLC 71
- Hewlett Packard 40
- HEX 71
- hierarchy 33, 51–52
- high-end workstation 11
- Honeywell 40
- host 26, 40

- I**
- IBM PC 11
- IBM 3270 BSC SNA protocols 11, 26, 39, 41, 58, 61, 67, 69, 71–72
- identity 37
- incremental backup 53
- Information Processing System 850/860 11
- initialization server and software 15, 20–23
- installation
 - guidelines 49
 - server 9, 21, 31, 36, 55, 59, 61, 73
 - software 14, 29
- Install From Floppy** command 20
- Install Services** command 20

- Interactive Terminal Service 26, 28, 40–42, 45, 51–52, 54, 58–59, 71–72
 configuration 63
 coresidency 66
 dependencies 65–66
 filing 64–65
 limitations 66
 multilingual interfaces 65
 overview 63
 user interface 64
 user profile 65
- internet 14, 32, 36, 46–48, 56, 61, 63, 67
- Interpress 56–57, 63
- Internetwork Routing Service 9, 15, 19–20, 27–28, 31–36, 39, 41, 43, 56–57, 59–61, 64, 66, 71–72
 Clusternet option 48
 configuration 46–48
 co-residency 50
 dependencies 49
 event reporting 49
 installation guidelines 49
 overview 46
 routing tables 48
- Interservice dependencies 28
- italics 56
- K**
- Keeping domains up-to-date 34
- keyboard 16
- keytops 16
- L**
- layered protocol 11
- leased lines 39–40, 47, 49, 60
- List Files** command 20
- local name 32
- logon 22, 25
- lookup services 30–31, 60
- low-level software action 21
- M**
- mailbox 25, 59
- mailboxes 12, 25, 59, 61
- mailing 11, 18, 24, 59, 63–64
- Mail Service 59
 co-residency 61
 dependencies 61–62
 External Mail Gateway 60
 information exchange 60
 placement of 60–61
 recipients 59–60
- mainframe 25, 39–40, 69
- Memorywriter 63
- microcomputer 11
- mnemonic 30
- modem 19, 40, 46–47, 63, 66
- modules 14
- multi-drive server 19
- multi-Ethernet configuration 49
- multi-tasking operating systems 14
- multi-vendor devices 65
- multi-window interfaces 11
- Multilingual Support Software 16–17, 56, 65
- multiport option kit 20, 39, 46–47, 49–50, 61, 72
- N**
- naming conventions 4, 30, 32–33
- naming guidelines 33–34
- network 9, 11, 18, 25–26, 33, 35–36, 39–40, 43, 46–49, 51–52, 54–56, 59, 63–65, 67, 70, 73
- non-citizen resources 25
- non-continuous link 49
- non-IBM sites 71
- non-networked devices 9, 25–26, 40, 51, 59, 62, 67–68
- non-normal startup 21, 23
- non-Xerox product 25, 39
- normal startup 21–22
- NS 8000 Laser CP Print Service 57
- O**
- objects 12, 32
- object-level access controls 13, 37–38, 42, 53–54
- OCTAL 71
- off-line 35, 53
- on-line 17, 35, 53
- option 16, 19–20, 39–41, 46–50, 59–61, 67, 71–72
- P**
- packet-switching 47
- page-by-page 56
- parameters 20, 56, 65, 71–72
- password 13, 16, 25, 30
- pathname 30, 52, 60, 64
- PC 11
- phone jack 19, 63
- Pilot 14
- Placement of Clearinghouse Service 35
- printer 12, 30, 56, 63, 67
- Print Service 56
 Facsimile Print Service 58
 Formatting Print Service 56–57
 NS 8000 Laser CP 57
 co-residency 58
- processor 12, 18–20, 36, 73
- prompts 16, 21–22, 29
- propagation 32
 domain 34
 global 35
 organization 34
- protocol 11, 14, 24–25, 39–41, 48, 49, 61, 65–67, 69, 71–72
- Q**
- queue 56–58

- R**
- read-only memory (ROM) 16
 - real-time 58, 66
 - reboot 23
 - recipient 25, 59, 62, 67–68
 - reconfiguration 14, 23
 - recovery 16, 22–23
 - registration 22, 30, 37
 - reliability 18, 28, 35, 43, 46–47, 49, 54, 61
 - remote network administration 11
 - Remote Batch Service 26, 28, 41, 45, 52, 54, 58, 61, 67, 70
 - co-residency 69
 - dependencies 70
 - Remote Executive 15–16
 - replica 35–6, 61
 - replication 27, 35–36, 55
 - resolution 56
 - restricted access 15
 - Retrieve Files** command 20
 - Retrieve Remote File** command 13
 - rigid disk 18
 - ROM 16
 - routing tables 48
 - RS-336 port 20
 - RS-366 port 19
 - RS-232C port 17, 19–20, 39, 41, 49–50, 58, 61, 63, 67, 71–72
- S**
- scavenger log 20
 - SDLC 20, 71
 - security 42
 - self-registration 37
 - semi-monthly backup 53
 - sender 25, 67
 - server
 - configuration 27–28
 - distribution 18–23
 - hardware 18–20
 - initialization 20–23
 - installation 9, 21, 31, 36, 55, 59, 61, 73
 - maintenance 15, 23, 43, 54
 - multidrive 19
 - operation 21–23
 - profile 15, 21, 52, 54, 65, 72–73, 85
 - recovery from failure 23
 - restricting physical access 23
 - security 12
 - software 14
 - server software install 27, 29
 - terminal 19
 - Server Monitor Service 22, 27–28, 43, 49, 52, 54, 71–72
 - overview 43
 - dependencies 43
 - Services Executive 12, 15–17, 19, 21–23, 41–42, 52, 65, 72
 - domain administration 15
 - restricted access 15
 - Services Options Control 16
 - Services System Software 14–17, 29
 - services volume 20–21
 - service-to-service communication 24
 - sessions 9, 22, 26, 40, 42, 48
 - Set Remote Directory** command 13
 - Set Software Options** command 16
 - Show Files** command 20
 - Show Scavenger Log** command 20
 - SNA 26, 39–40, 58, 71–72
 - Software Control Center 16
 - software 9, 11–23, 25, 27, 29, 34, 37, 39, 51, 54, 56, 59–60, 63, 65, 67
 - software-settable parameters 71
 - spreadsheet 11, 65
 - standalone workstations 18, 48, 67
 - startup 21
 - Store Files** command 20
 - sub-subdirectories 51
 - subdirectories 20, 51
 - switched circuits 47
 - System Administrator 9, 12–13, 15–16, 21–22, 27, 29–30, 31, 33, 35, 37–38, 40–42, 45–46, 52–53, 60, 65, 71
 - Systems Analyst 12, 27, 43, 54, 71
 - system files 20–21
 - system security 12–13
- T**
- TC 495-1 facsimile printer 19
 - telecopier 56, 58
 - teletypewriter 40, 42, 63, 64
 - transceiver 20
 - transmission 25, 46–48, 58, 63
 - troubleshooting 5, 12, 14, 15, 17, 23
 - TTY 65, 71–72
- U**
- uptime 43
 - users 11–13, 15, 18, 22, 24–26, 30–34, 37–39, 42–43, 46, 48–49, 51–54, 56–61, 63–67, 69–70
 - utilities 72
- V**
- vector graphics 57
 - vendors 26, 40
 - verification 30
 - ViewPoint 11, 64
 - virtual switched circuits 47
 - VT-100 26, 40
- W**
- workstation 9, 13–14, 16, 24–25, 30–31, 39–40, 46, 51–52, 54, 56–60, 64–65, 67, 69, 70–73
 - interconnection 18–23
 - types 11

X**X.25 20-47****XC1K font 56****Xerox 6060 11****XModem 65****XNS 11, 14,****communication 24-26****XP-9 electronic printer 19**

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