OS/390

Infoprint Server User's Guide

IBM

Infoprint Server User's Guide

Second Edition (December 1999)

This edition applies to OS/390 Version 2 Release 8 Modification Level 0, Program Number 5647-A01, and to all subsequent releases and modifications until otherwise indicated in new editions or technical newsletters. Be sure to use the correct edition for the level of the product.

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About This Publication

This publication describes how to print jobs using the following products:
- Infoprint® Server for OS/390® Version 2 Release 8 (5647-A01), hereafter called Infoprint Server
- Infoprint Server Transforms for OS/390 Version 1 Release 1 (5697-F51), a separate IBM® licensed product, hereafter called Infoprint Server Transforms

With these products, you can perform the following tasks:
- Submit jobs to Infoprint Server for OS/390 from the following operating systems:
  - OS/390 UNIX® System Services
  - OS/390, using the Job Control Language (JCL)
  - OS/390, using Virtual Telecommunications Access Method (VTAM®) applications
  - Windows® 95, 98, NT, or 2000
  - The following remote systems with Transmission Control Protocol/Internet Protocol (TCP/IP) installed:
    - Windows 3.1
    - Advanced Interactive Executive (AIX®)
    - IBM Operating System/2® (OS/2®)
    - OS/390
    - Virtual Machine (VM)
    - Application System/400® (AS/400®)
  - Any client of a Novell NetWare 3.x, 4.x, or 5.x server that is connected to OS/390 by OS/390® LANRES
- Query printer names, printer locations, or print job status
- Cancel print jobs
- Transform print jobs to the Advanced Function Presentation (AFP™) data stream using OS/390 UNIX System Services

Who Should Use This Publication

This publication is intended for anyone who prints jobs using Infoprint Server for OS/390.

How This Publication is Organized

This publication is divided into the following parts:
- **Part 1. Introduction**
  - "Chapter 1. Introduction" on page 3 gives an overview of Infoprint Server.
- **Part 2. Printing from OS/390 UNIX System Services**
  - "Chapter 2. Printing from OS/390 UNIX System Services Using Infoprint Server Commands" on page 21 describes the commands that are used to perform the following tasks:
    - Submit jobs to Infoprint Server from OS/390 UNIX System Services
    - Query jobs and printers

- Cancel jobs
- Transform jobs to the AFP data stream
  - "Chapter 3. Using Job Attributes" on page 53 lists the Infoprint Server attributes that describe jobs and the documents in them and explains how to use these attributes.
- **Part 3. Printing Batch Jobs from OS/390**
  - "Chapter 4. Printing Batch Jobs from OS/390 Using the AOPPRINT JCL Procedure" on page 73 describes a simple and powerful JCL procedure for submitting batch jobs to Infoprint Server from OS/390.
  - "Chapter 5. Printing Batch Jobs from OS/390 Using IP PrintWay" on page 77 describes an older method of using JCL to submit batch jobs to the IP PrintWay™ component of Infoprint Server from OS/390.
- **Part 4. Printing from VTAM Applications**
  - "Chapter 6. Printing from VTAM Applications" on page 95 describes concepts that users of VTAM applications, such as Customer Information Control System (CICS®) or Information Management System (IMS™), must understand to use Infoprint Server.
- **Part 5. Printing from Remote Systems**
  - "Chapter 7. Printing from Windows" on page 103 describes how to install print programs on Windows 95, Windows 98, Windows NT®, or Windows 2000 and how to submit jobs to Infoprint Server from a Windows workstation.
  - "Chapter 8. Printing from Remote Systems in a TCP/IP Network" on page 111 describes how to submit and query jobs from remote Windows 3.1, AIX, OS/2, OS/390, or VM systems.
  - "Chapter 9. Printing from Remote Systems in a Novell Netware Network" on page 117 describes how to be sure that your system is configured for printing from Novell Netware clients.
- **Part 6. Appendixes**
  - "Appendix A. Job Attributes Valid for Different Printer Types" on page 121 shows whether job attributes are valid for each printer type that Infoprint Server supports. It also shows whether job attributes are validated for individual printers.
  - "Appendix B. JCL Parameters and Corresponding Job Attributes" on page 123 lists parameters of the OUTPUT and DD JCL statements and the Infoprint Server job attributes that correspond to them.
  - "Appendix C. SCS Code Points" on page 125 and "Appendix D. 3270 Data Stream Code Points" on page 129 list the code points in VTAM data streams that Infoprint Server supports.

This publication also contains a glossary, bibliography, and index.

Related Information

"Bibliography" on page 147 lists the publications referred to in this book and publications that contain additional information about related products.

For additional information about Infoprint Server, visit this Web site: **http://www.ibm.com/printers**

For additional information about OS/390 and for the latest OS/390 publications and documentation updates that result from authorized program analysis reports

(APARs) and program temporary fixes (PTFs), visit this Web site:
http://www.ibm.com/s390/os390

Table 1. Summary of Infoprint Server Publications

Publication	Form number
OS/390 Infoprint Server Introduction Introduces all components of Infoprint Server, including IP PrintWay, NetSpool™, and Print Interface. Contains printing scenarios that show how you can use Infoprint Server in your installation.	G544-5696
OS/390 Infoprint Server Migration Summarizes the new function in Infoprint Server for OS/390 V2R8, describes required and optional migration tasks to implement the new function in your installation, and describes the Infoprint Server migration program, which helps the administrator convert IP PrintWay, NetSpool, and Print Interface printer information to the format required by Infoprint Server for OS/390 V2R8.	G544-5697
OS/390 Infoprint Server Customization Describes customization tasks for all components of Infoprint Server, including IP PrintWay, NetSpool, and Print Interface. Describes required environment variables, configuration files, and startup procedures.	G544-5694
OS/390 Infoprint Server Operation and Administration Describes operator procedures and administrative tasks for all components of Infoprint Server, including IP PrintWay, NetSpool, and Print Interface. Describes in detail how to create entries and specify printer attributes in the Printer Inventory.	S544-5693
OS/390 Infoprint Server User's Guide Describes how to submit print jobs from remote systems (including Windows systems), the local OS/390 system, and Virtual Telecommunications Access Method (VTAM) applications. Describes in detail the **lp**, **lpstat**, **cancel**, **pcl2afp**, **ps2afp**, **pdf2afp**, and **sap2afp** UNIX commands; the AOPPRINT JCL procedure; OUTPUT JCL parameters supported by IP PrintWay; and the Infoprint Server Windows client.	S544-5692
OS/390 Infoprint Server Messages and Diagnosis Describes messages issued by all components of Infoprint Server, including IP PrintWay, NetSpool, and Print Interface. Also describes how to diagnose and report errors.	G544-5690

Conventions Used in This Publication

This section explains the conventions that this publication uses for the following:

- Highlighting
- Format notation
- Examples

Highlighting

This publication uses the following highlighting conventions:

Bold	Bold highlighting identifies OS/390 UNIX System Services and Windows commands, attributes, files, directories, and other items whose names the system predefines, such as **lp** and **/etc/Printsrv/aopd.conf**. In syntax diagrams, it identifies keywords that you must enter exactly as they appear, such as **CLASS**.
UPPERCASE	Uppercasing identifies OS/390, VM, and AS/400 commands, statements, parameters, files, libraries, and other items whose names the system predefines, such as OUTPUT JCL and PRMODE. **Note:** There is one exception: the JCL subparameter printer. This subparameter appears in lower case because you should enter it in lower case.
Italic	Italic highlighting identifies a variable item whose actual name or value you supply, such as *userid* or *filename.* Italics also identify publication titles.
Monospace	Monospacing identifies an example.

Format Notation

Format notation uses symbols to show specific conditions. Do not enter the following symbols, unless specifically instructed to do so:

Brackets	[ ]
Brackets and vertical bar	[|]
Braces and vertical bar	{ | }
Underlining	_
Ellipsis	...

These symbols have the following meanings:

- Brackets, [ ], around values indicate that they are optional. For example:

  [-**d**]

  means that you do not have to enter the -**d** option.

- A vertical bar within brackets, [\|], indicates an optional choice between values. For example:

  [**PORTNO**=*portnumber* \| **PRTQUEUE**=*printqueue*]

  means that you can enter the **PORTNO** parameter, the **PRTQUEUE** parameter, or neither, but not both.

- A vertical bar within braces, { \| }, indicates a required choice between values. For example:

  {'*hhhh:mm:ss*' \| **FOREVER**}

  means that you must enter either a time in hours, minutes, and seconds or the keyword **FOREVER**, but not both.

  Note: A vertical bar that does *not* appear within brackets or braces is the UNIX pipe symbol. Enter it as it appears. For example:

  ls | lp

means that the output of the **ls** command becomes the input to the **lp** command.

- Underlined text identifies the default value that is used if you do not specify a value. For example:

  document

  means that not specifying an output type is equivalent to specifying **document**.

- An ellipsis, ... , means that you can supply more than one occurrence of a keyword or value with the command. For example:

  filename ...

  means that you can enter more than one file name.

Examples

For ease of reading, long examples are broken into several lines. When you enter a command, enter it all on one line. Do not press the ENTER key until you have typed the entire command.

Summary of Changes

Summary of Changes for *OS/390 Infoprint Server User's Guide*, S544-5692-00

This publication contains the user information previously presented in the following publications:
- *OS/390 Print Server User's Guide for OS/390 UNIX System Services*, S544-5543-01
- *OS/390 Print Server User's Guide for Windows*, S544-5511-01
- *IBM IP PrintWay Guide*, S544-5379-04
- *IBM NetSpool Guide*, G544-5301-05

This publication contains technical additions and changes related to enhancements made in Infoprint Server for OS/390 Version 2 Release 8 (V2R8). Refer to *OS/390 Infoprint Server Migration* for a summary of the V2R8 enhancements.

Part 1. Introduction

Chapter 1. Introduction

Infoprint Server for OS/390, an optional element of OS/390 Version 2 Release 8, provides support for local area network (LAN) and host printing on OS/390. Infoprint Server consists of several components that work together to provide printing services. Figure 1 on page 4 shows some of the components and how they fit into your system. (The components and features of Infoprint Server are shaded in the figure.) Following the figure is a description of each Infoprint Server component.
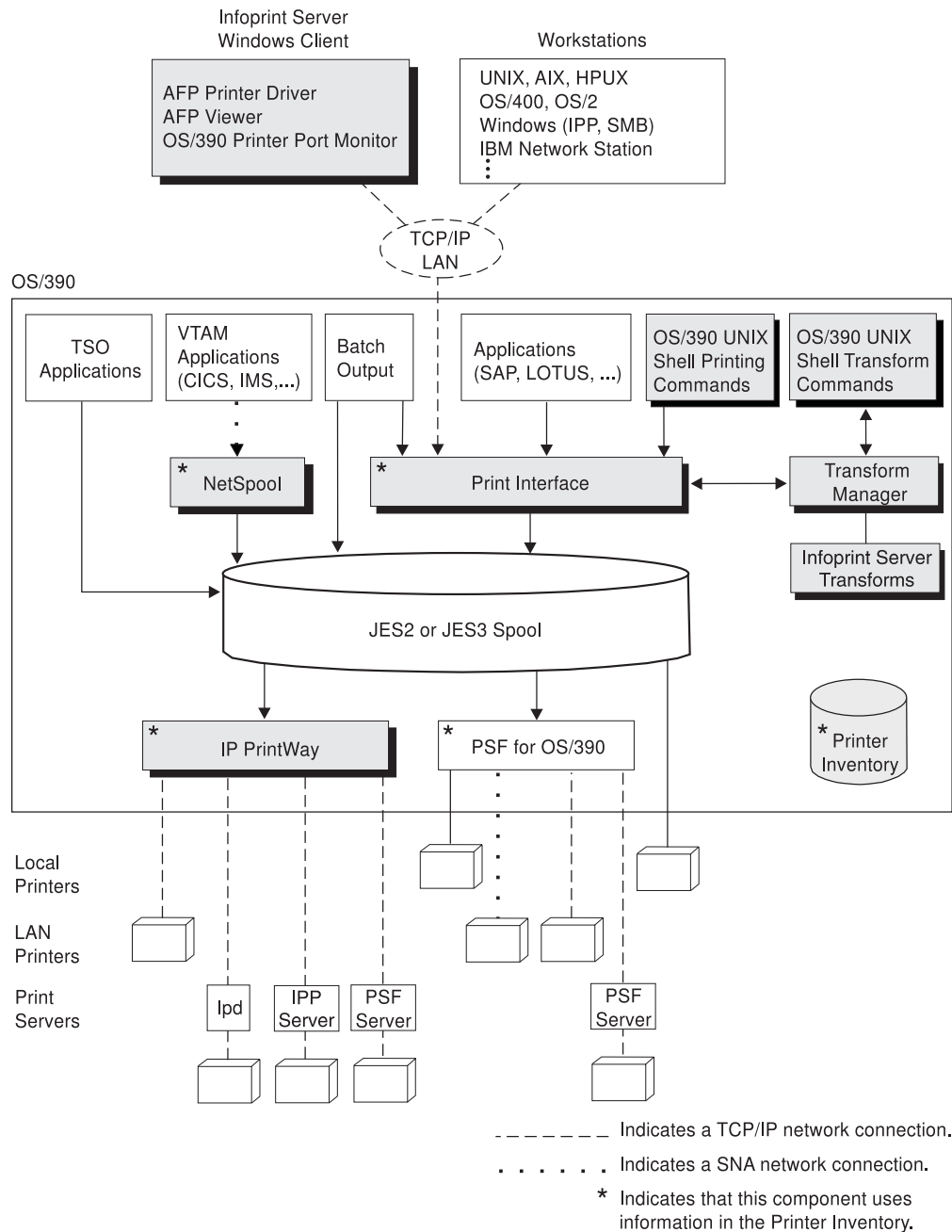
Figure 1. Infoprint Server Components

Printer Inventory and Printer Inventory Manager

The Printer Inventory Manager controls the Printer Inventory. The Printer Inventory is a set of files in the hierarchical file system (HFS) that contain information about each printer to which NetSpool, Print Interface, and IP PrintWay can print. The Printer Inventory also contains system configuration information for IP PrintWay. It can optionally contain configuration information for Print Services Facility™ (PSF) for OS/390.

Infoprint Server Windows client

The Windows client provides these features:

- An Advanced Function Presentation (AFP) printer driver
- An AFP viewer plug-in
- An OS/390 printer port monitor that sends print requests to the Print Interface component

Print Interface

Print Interface processes print requests from remote clients that use any of the following Transmission Control Protocol/Internet Protocol (TCP/IP) printing protocols:
- Line printer requester (LPR) to line printer daemon (LPD)
- Internet Printing Protocol (IPP)
- Server Message Block (SMB) protocol

Print Interface accepts any data format the target printer can print. It converts data to extended binary-coded decimal interchange code (EBCDIC) or American National Standard Code for Information Interchange (ASCII) as required by the target printer. It allocates output data sets on the Job Entry Subsystem (JES) spool. Print Interface can also transform Printer Control Language (PCL), Portable Document Format (PDF), PostScript, and SAP data to AFP format prior to writing data to the JES spool, for printing on IBM AFP printers.

Print Interface also provides OS/390 UNIX shell commands (**lp**, **lpstat**, and **cancel**) and the AOPPRINT Job Control Language (JCL) procedure to let local users submit print requests to Print Interface.

Infoprint Server Transforms for OS/390 and the Transform Manager

Infoprint Server Transforms for OS/390 is a licensed program product (5697-F51) that provides the following transforms for the OS/390 system:
- PCL to AFP
- PostScript and PDF to AFP
- SAP to AFP

The Transform Manager component of Infoprint Server manages the PCL and PostScript (and PDF) transforms.

Infoprint Server Transforms also provides OS/390 UNIX shell commands to let local users transform data without printing it.

NetSpool

NetSpool processes print requests from Virtual Telecommunications Access Method (VTAM) applications, such as Customer Information Control System (CICS) and Information Management System (IMS). NetSpool accepts Systems Network Architecture (SNA) character string (SCS), 3270, and binary data and allocates output data sets on the JES spool.

IP PrintWay

IP PrintWay transmits data sets from the JES spool to printers or print servers that use any of the following TCP/IP protocols:

- Line printer requester (LPR) to line printer daemon (LPD)
- Internet Printing Protocol (IPP)
- Direct socket printing

Simple Network Management Protocol (SNMP) subagent (not shown in figure)
The SNMP subagent lets you use an SNMP manager to view printer characteristics and printer status for printers controlled by PSF for OS/390 that do not have internal SNMP agents or are not TCP/IP-attached to PSF.

Printer Inventory Manager

The Printer Inventory Manager controls the Printer Inventory, hierarchical file system (HFS) files that contain information about the OS/390 printing environment. The administrator must create and manage information in the Printer Inventory.

The administrator can create the following objects:
- Printer definitions, which contain information about printers to which Print Interface, NetSpool, or IP PrintWay can print.
- Printer pool definitions, which contain information about groups of printers to which NetSpool can broadcast data.
- Functional subsystem application (FSA) definitions, which contain configuration information for IP PrintWay and PSF for OS/390 FSAs.
- Functional subsystem (FSS) definitions, which contain configuration information for IP PrintWay and PSF for OS/390 FSSs.

Figure 2 shows how the administrator can create definitions in the Printer Inventory and which components of Infoprint Server use the Printer Inventory.
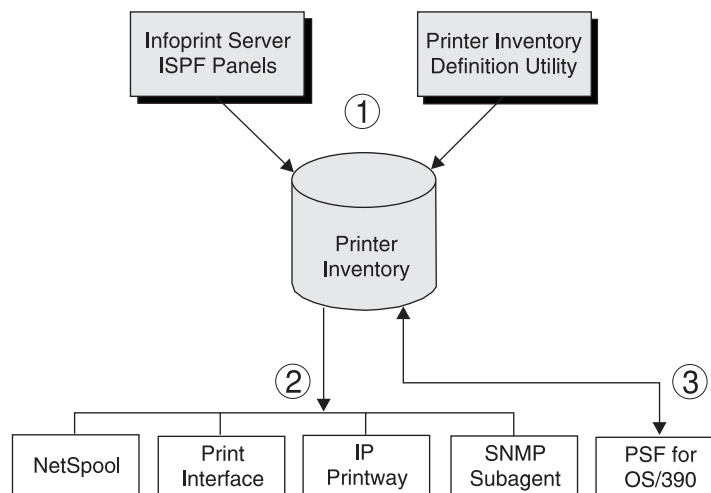
Figure 2. Printer Inventory Manager

1. The administrator can use Infoprint Server ISPF panels and the Printer Inventory Definition Utility (PIDU) to create and maintain the Printer Inventory. The PIDU is useful for creating many printer definitions at the same time and for backing up the Printer Inventory.
2. The following Infoprint Server components use information in the Printer Inventory:

- NetSpool uses information in printer definitions and in printer pool definitions.
- Print Interface uses information in printer definitions.
- IP PrintWay uses information in printer definitions. IP PrintWay also can use IP PrintWay configuration information in FSS and FSA definitions.
- The SNMP subagent uses printer information that PSF for OS/390 stores in the Printer Inventory about PSF printers.

3. Although it is not a component of Infoprint Server, PSF for OS/390 can use configuration information that the administrator specifies in FSS and FSA definitions. PSF for OS/390 can also store printer information in the Printer Inventory for use by the Infoprint Server SNMP subagent. For information about how to customize PSF for OS/390 to use the Printer Inventory, refer to *PSF for OS/390: Customization.*

Additional functions provided by the Printer Inventory Manager are:

- **Migration program**

  The Infoprint Server migration program helps the administrator migrate from previous releases of IP PrintWay, NetSpool, and the OS/390 Print Server. The migration program creates entries (such as printer definitions and printer pool definitions) in the new Infoprint Server Printer Inventory by merging printer information that is currently specified in all these places:
  – NetSpool print characteristics data sets
  – NetSpool tables
  – NetSpool startup procedures
  – IP PrintWay routing and options data sets
  – Print Interface printer inventory

  The migration program can also move printer information in PSF startup procedures to FSS and FSA definitions in the Printer Inventory.

- **Security**

  The administrator can restrict access to the Printer Inventory and to the operator commands that start and stop any of these programs:
  – Printer Inventory Manager
  – Print Interface LPD
  – Print Interface IPP server
  – Transform Manager
  – SNMP subagent

Windows Client

The Infoprint Server Windows client consists of the following programs:

AFP Printer Driver for Windows
>   The AFP Printer Driver creates output files in AFP format, so that users can print documents to IBM AFP printers. The AFP Printer Driver can create output files that contain documents, overlays, or page segments. It can also create inline form definitions for printing documents with special options, such as printing on both sides of the paper.

AFP Viewer Plug-in for Windows
>   The AFP Viewer plug-in lets users view documents in AFP format, for example, documents downloaded from the OS/390 system, or documents on the Web. The AFP Viewer plug-in also lets users print AFP documents to AFP as well as non-AFP printers.

OS/390 Printer Port Monitor for Windows

The OS/390 Printer Port Monitor lets users print documents using standard print-submission methods from any Windows application that supports printing. After the OS/390 Printer Port Monitor is installed and configured on the Windows system, the Port Monitor automatically sends documents to the Print Interface component of Infoprint Server.

Note: Infoprint Server also supports printing from a Windows system that uses the Server Message Block (SMB) protocol. To use the SMB protocol, Windows users do not need to install the Printer Port Monitor.

Print Interface

Print Interface accepts print requests from remote clients and local users. Figure 3 shows the steps that occur from the time Print Interface receives a print request until it allocates an output data set on the JES spool. An explanation of each step follows.
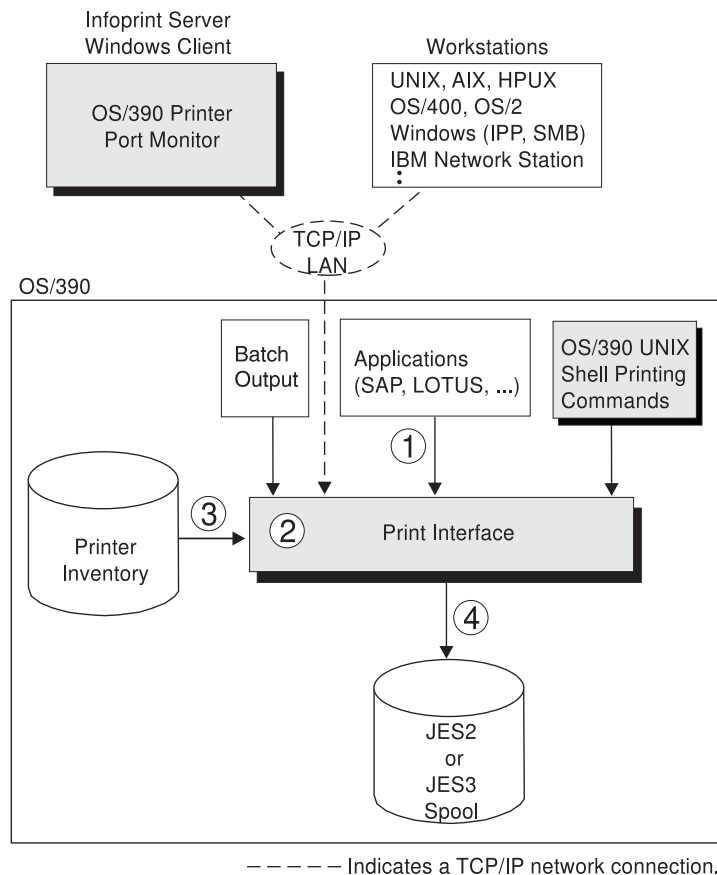
Figure 3. Print Interface System Diagram

1. Users can submit print requests from remote clients that use one of the following TCP/IP protocols:
   - LPR to LPD. The OS/390 Printer Port Monitor for Windows and commands, such as **lpr** and **lpq**, use this protocol.
   - Internet Printing Protocol (IPP).
   - SMB printing protocol.

Users can submit print requests from the local system with one of the following methods:

- OS/390 UNIX shell printing commands (**lp**, **lpstat**, and **cancel**). These commands, which adhere to the XPG4.2 standard, let users perform the following tasks:
  - Print OS/390 HFS and non-HFS data sets
  - Display the name and location of a printer or the status of a print job
  - Cancel a print job
- The AOPPRINT JCL procedure, which lets users print OS/390 HFS data sets and non-HFS data sets/390 HFS and non-HFS data sets.

2. Print Interface runs as a UNIX application that uses the services of OS/390 UNIX System Services.

   Print Interface accepts data in any format, including but not limited to the following formats: S/390 line data, MO:DCA-P (also known as AFP), PostScript, PDF, PCL, SAP, and text. Print Interface automatically detects the data format and can validate that the printer accepts that data format. It can also convert data to EBCDIC or ASCII, and transform data from one format to another.

3. Each print request specifies the name of a printer definition for the target printer in the Printer Inventory. Print Interface uses information in the printer definition to determine how to process the data, whether or not to transform the data, and so on.

4. Print Interface dynamically allocates output data sets on the JES2 or JES3 spool using JES allocation parameters specified in the printer definition, including:

   - JES work-selection parameters, such as class, forms name, and destination. These parameters cause JES to direct the output data sets to the correct JES output writer or FSA, such as PSF for OS/390 or IP PrintWay.
   - Advanced Function Presentation (AFP) parameters, such as the name of a form definition and page definition. PSF for OS/390 uses these parameters when printing data on IBM AFP printers.

Some additional functions provided by Print Interface include:

- **Validation of print requests**

  Before accepting print requests, Print Interface can validate, with some exceptions, that the document can print as requested on the selected printer. For example, Print Interface can reject documents with data formats that the printer does not support.

  Note: In some cases, Infoprint Server cannot validate that a file can print as requested; for example:
  - Infoprint Server cannot validate batch jobs that are submitted to the IP PrintWay component of Infoprint Server.
  - Infoprint Server cannot validate jobs that are submitted from VTAM applications to the NetSpool component of Infoprint Server.
  - Infoprint Server cannot validate that the printer supports the functions, such as duplex printing, requested in a form definition. If you use an inline form definition, Infoprint Server cannot validate that the printer can print the file. The same thing is true if you specify the name of a form definition with your print request.

- **Data Transforms**

  Print Interface can transform data if requested in the printer definition in the Printer Inventory:

- Print Interface can transform S/390 line data (for example, in a sequential data set or a partitioned data set) into text data for printing on a printer such as an IBM network printer.
- Print Interface can transform text data into S/390 line data for printing on an IBM AFP printer.
- Print Interface can use Infoprint Server Transforms to transform data to AFP format.
- Print Interface can transform PCL, PDF, and PostScript data remotely on an AIX system running Infoprint Manager for AIX V2R1 or higher. It can transform PCL and PostScript data on an AIX system running PSF for AIX V2R1.

- **Notification of completion**

  Print Interface can notify users on the local OS/390 system when processing of a document is complete and the data set has been removed from the JES spool.

- **Status reporting**

  Print Interface can report the status of its data sets that are still on the JES spool. It can report if the data set has been selected for processing, held by the system, retained due to a failed transmission to a LAN printer, or deleted before printing.

- **Identification of printed output**

  Print Interface retains the user ID of the job submitter for printing on separator pages and for display on the JES spool. As a result, the user ID can be printed on separator pages and the operator can view the name of the job submitter when the data set is on the JES spool.

- **Double-byte character set (DBCS) support**

  Print Interface can convert DBCS data from one code page to another before writing the data to the JES spool.

- **Filter support**

  An installation can write a filter program to modify data before Print Interface writes the data to an output data set. A filter can be used to add a separator page or modify data. For example, an installation can write a filter to transform data from one format to another.

Infoprint Server Transforms for OS/390 and the Transform Manager

Infoprint Server Transforms for OS/390 is a separate licensed program product (5697-F51) that provides transforms for the OS/390 system. Infoprint Server Transforms provides the following transforms, which convert data to Advanced Function Presentation (AFP) format for printing on IBM AFP printers:

- Printer Control Language (PCL) to AFP
- PostScript and Portable Data Format (PDF) to AFP
- SAP Output Text Format (OTF) and Advanced Business Application Programming (ABAP) to AFP

Infoprint Server Transforms also provides OS/390 UNIX shell commands (**pcl2afp**, **ps2afp** and its alias **pdf2afp**, and **sap2afp**) and transform filters.

The Transform Manager, a component of Infoprint Server, controls the PCL and PostScript (and PDF) transform daemons provided with Infoprint Server Transforms for OS/390. The Transform Manager starts and stops these transform

daemons using configuration information specified by the administrator. For example, the administrator can limit the number of transform daemons that are active at a time.

Figure 4 shows how Infoprint Server Transforms and the Transform Manager fit into your system. An explanation of each step follows:
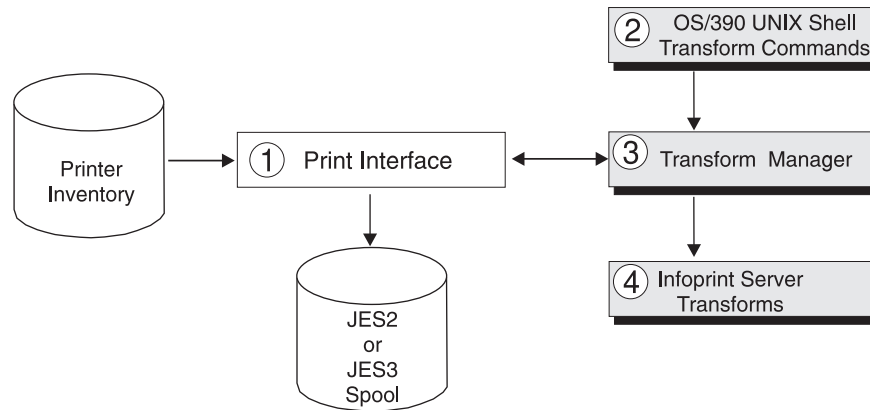
Figure 4. Transform Manager and Infoprint Server Transforms for OS/390

1. Print Interface uses the transform filters provided by Infoprint Server Transforms to transform data on the OS/390 system. The administrator must configure the printer definitions to use the transform filters; by default, Print Interface does not transform data. The administrator and users can also specify transform filter options that control the transforms.

   Instead of performing the transforms on the OS/390 system, Print Interface can transform PCL, PostScript, and PDF data remotely on an AIX system. The AIX system must be running Infoprint Manager for AIX or PSF for AIX. The Infoprint Server Transforms product does not need to be installed for remote transforms.

2. Users can use the OS/390 UNIX shell commands that are provided with Infoprint Server Transforms, to transform data without printing it.

3. The Transform Manager manages the PCL and PostScript (and PDF) transforms and controls how many transform daemons are active at one time. The Transform Manger does not manage the SAP to AFP transform, because the SAP to AFP transform is not a daemon.

4. Infoprint Server Transforms provides PCL to AFP, PostScript (and PDF) to AFP, and SAP to AFP transforms.

NetSpool

NetSpool intercepts print data from VTAM applications, such as CICS and IMS, converts the data into S/390 line data, and creates output data sets on the JES2 or JES3 spool. You can configure NetSpool so that you do not need to change existing VTAM applications. That is, existing VTAM applications can send print requests to NetSpool in the same manner as they currently send print requests to SNA network printers.

Figure 5 on page 12 shows the steps that occur from the time VTAM applications send print requests to NetSpool printer logical units (LUs) until NetSpool allocates output data sets on the JES spool. An explanation of each step follows.
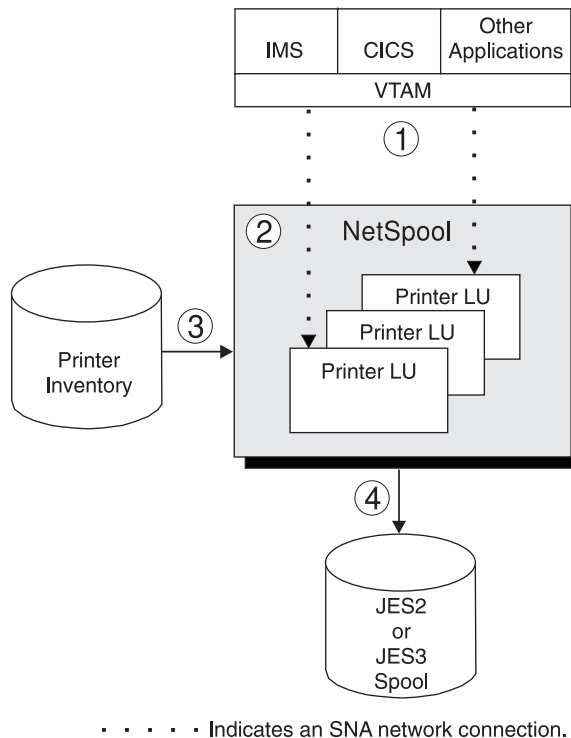
Figure 5. NetSpool System Diagram

1. VTAM applications, such as CICS or IMS, establish communication sessions with NetSpool printer logical units (LUs) instead of with SNA-network printers. Each NetSpool printer LU must be defined to VTAM as an application logical-unit (LU).

   NetSpool can process the following types of VTAM data streams:
   - SNA character string (SCS) data over an LU type 1 session
   - 3270 data over an LU type 3 or LU type 0 session
   - A binary data stream over an LU type 0, type 1, or type 3 session

2. NetSpool runs as a VTAM application on the same or different OS/390 system. Multiple instances of NetSpool can run simultaneously in separate address spaces; each instance of NetSpool can process VTAM print requests sent to different NetSpool printer LUs.

3. Each NetSpool printer LU must be defined in a printer definition in the Printer Inventory. NetSpool converts the data stream into S/390 line-data format and groups the data into output data sets using information in the printer definition.

4. NetSpool dynamically allocates output data sets on the JES2 or JES3 spool using JES allocation parameters specified in the printer definition, including:
   - JES work-selection parameters, such as class, forms name, and destination. These parameters cause JES to direct the output data sets to the correct JES output writer or FSA, such as PSF for OS/390 or IP PrintWay.
   - Advanced Function Presentation (AFP) parameters, such as the name of a form definition and page definition. PSF for OS/390 uses these parameters when printing data on IBM AFP printers.
   - Distribution information, such as name and address, which can be printed on output header pages

NetSpool can also broadcast the same data to several different printers. To broadcast data, NetSpool allocates multiple output data sets on the JES spool.

Additional functions provided by NetSpool are:

- **Operator control**

  The system operator can control NetSpool processing by issuing NetSpool commands while NetSpool is running. The operator can start and stop individual printer LUs and display the status of printer LUs. To assist in managing data sets from the console, the names of the output data sets created by NetSpool identify the VTAM application that generated the print request.

- **SCS data stream support**

  NetSpool converts an SCS data stream into variable-length records, each starting with an ASA carriage-control character. "Appendix C. SCS Code Points" on page 125 describes how NetSpool supports SCS code points. NetSpool does *not* support Function Management (FM) Headers.

- **Transparent data support for SCS data**

  NetSpool supports the Transparent (TRN) control in SCS data, which identifies the start of a transparent data stream. NetSpool provides two installation exits. One exit lets you add transparent data to the beginning of a data set. The other exit lets you modify or delete transparent data whenever it occurs in the data stream.

- **3270 data stream support**

  NetSpool converts a 3270 data stream into variable-length print records, each starting with an ASA carriage-control character. "Appendix D. 3270 Data Stream Code Points" on page 129 describes how NetSpool supports code points for the 3270 data stream.

- **Binary data support**

  The administrator can request in the printer definition that NetSpool treat the data stream as binary data. NetSpool writes binary data to the output data set as variable length records without formatting the data and without rejecting unsupported commands, orders, or data. This function is useful if you want to pass through all data without change and without including transparent (TRN) controls.

IP PrintWay

IP PrintWay transmits output data sets from the JES spool to printers or print servers in a TCP/IP network that uses one of the following TCP/IP protocols: LPR to LPD, IPP, or direct-socket printing.

Figure 6 on page 14 shows the steps that occur from the time IP PrintWay selects output data sets from the JES spool until IP PrintWay transmits the data sets to the target printer or print server and deletes the data sets from the JES spool. An explanation of each step follows.

JES2
or
JES3
Spool

①

②

IP PrintWay

③

Printer
Inventory

④

Transmission
Queue
Data Set

⑤

LAN
Printers

Print
Servers

lpd

IPP
Server

PSF
Server

– – – – – Indicates a TCP/IP network connection.
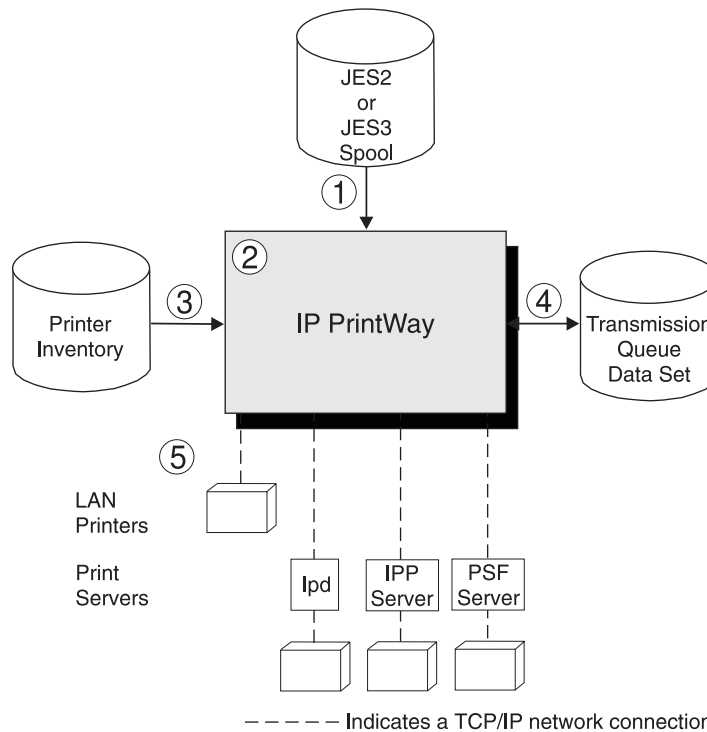
Figure 6. IP PrintWay System Diagram

1. IP PrintWay selects output data sets from the JES spool according to the JES work-selection parameters defined for the IP PrintWay FSA. For example, IP PrintWay might select all data sets in JES output class P.

   IP PrintWay can select data sets that were allocated on the JES spool by NetSpool or Print Interface, or submitted from TSO or batch applications. The data sets can contain S/390 line data. ASCII text data, or formatted data, such as PCL, PostScript, SAP, or MO:DCA-P (AFP) data.

2. IP PrintWay runs as an FSA of JES2 or JES3. Several IP PrintWay FSAs can run in one FSS address space to handle a high volume of data. However, one PrintWay FSA can transmit data sets to multiple printers or print servers.

3. IP PrintWay uses information in the printer definition in the Printer Inventory to perform these tasks:

   - Process data sets
   - Select the TCP/IP transmission protocol (LPR, IPP, or direct sockets)
   - Obtain the address of the target printer

   IP PrintWay can also use the Internet Protocol (IP) address of a target printer specified directly on the OUTPUT JCL statement.

   IP PrintWay recognizes data sets allocated on the JES spool by Print Interface and does not convert data from ASCII to EBCDIC or format the data. Print Interface has already converted data to ASCII if necessary. For other data sets, IP PrintWay can perform these conversion and formatting tasks:

   - Convert data from EBCDIC to ASCII
   - Add a header to each page
   - Format data using the carriage-control characters in S/390 line data, an FCB, or pagination attributes specified in the printer definition

4. IP PrintWay maintains a transmission queue to keep track of data sets being processed. This transmission queue contains the status of each transmission, routing information, and so on. Using Infoprint Server ISPF panels, the system operator can monitor the status of transmissions, reroute data sets to another print queue or port, and change the transmission options.

5. IP PrintWay can use the LPR to LPD, IPP, or direct-socket TCP/IP protocol to transmit data sets to remote printers or print servers. IP PrintWay also transmits LPD options and IPP job attributes to the target LPDs and IPP servers. For example, IP PrintWay can transmit information for the LPD to print on a separator page.

   IP PrintWay retries an unsuccessful transmission automatically for a short period of time right after transmission. In addition, IP PrintWay can also retry an unsuccessful transmission for a specified number of times at a specified interval. Retry limits and retry times can be specified in the printer definition or on an OUTPUT JCL statement.

Additional functions provided by IP PrintWay include:

- **Retaining jobs on the JES spool**

  After successfully transmitting each data set, or after completing the requested number of transmission attempts, IP PrintWay can retain the data set on the JES spool forever or for a period of time. Retention periods can be specified in the printer definition or on an OUTPUT JCL statement.

- **Printer selection using an OUTPUT JCL statement**

  On an OUTPUT JCL statement, a user can select the printer definition by specifying any of these values:

  – The name of the printer definition in the FSSDATA parameter

  – The DEST, CLASS, or FORMS parameter (or a combination of these parameters) associated with the printer definition

  Users can also specify the IP address for the target printer directly on the OUTPUT JCL statement. Therefore, the administrator does not need to create a printer definition for each printer in the Printer Inventory.

- **Accounting**

  For each data set processed, IP PrintWay writes a System Management Facility (SMF) type-6 record, which includes the number of bytes transmitted and the IP address of the target system.

- **Installation exits**

  IP PrintWay supports exits written by an installation to customize IP PrintWay processing. For example, an exit can change the IP address of the remote printer, add separator pages, modify SMF accounting records, and notify users of processing events.

- **Maintaining transmission order**

  IP PrintWay preserves the order of the data sets on the JES spool when transmitting data sets. IP PrintWay retains this order even if the transmission of the data sets must be retried. If a job contains more than one output data set, IP PrintWay acquires all of the data sets in the job before transmitting any of them. IP PrintWay can transmit the data sets to the remote printer as a single file. Although the data sets are a single file, each data set starts printing on a new page.

- **Transmitting printer instructions**

  The administrator can specify printer instructions in the printer definition for IP PrintWay to send to the printer before or after the data to be printed. Printer instructions might change fonts or switch between simplex and duplex printing.

SNMP Subagent

The Infoprint Server SNMP subagent, in conjunction with support provided by PSF for OS/390 and the OS/390 SNMP agent, lets the administrator view printer characteristics (such as the printer resolution) and printer status (such as paper jams) for any printer controlled by PSF for OS/390. Also, the administrator can be notified as soon as an intervention situation (such as a paper jam) occurs on the printer. This support does not let the administrator change any printer characteristics.

To view the printer information, the administrator must install an SNMP manager, such as IBM Network Printer Manager for the Web. Also, the OS/390 SNMP agent must be configured on the OS/390 system.

You can use this support for PSF printers that do not contain internal SNMP agents, such as the IBM 3900 printer, or for PSF printers that have internal SNMP agents but are not TCP/IP-attached to PSF. You can also use this support for PSF TCP/IP-attached printers that contain internal SNMP agents. In this case, consider defining the printer directly to the SNMP manager. When you define a printer directly to the SNMP manager, you can also view printer statistics and change some printer characteristics. Refer to the documentation for your printers to determine if they have internal SNMP agents.

Figure 7 on page 17 shows how the SNMP subagent fits into your system. An explanation of each step follows:

Windows, OS/2, …

Web browser

Windows NT

① Network Printer Manager for the Web

Windows, OS/2, …

Web browser

OS/390

② OS/390 SNMP Agent

③ Infoprint Server SNMP Subagent

Printer Inventory

④ PSF for OS/390

Local Printers

LAN Printers

— — — — — — Indicates a TCP/IP network connection.

. . . . . . Indicates a SNA network connection.
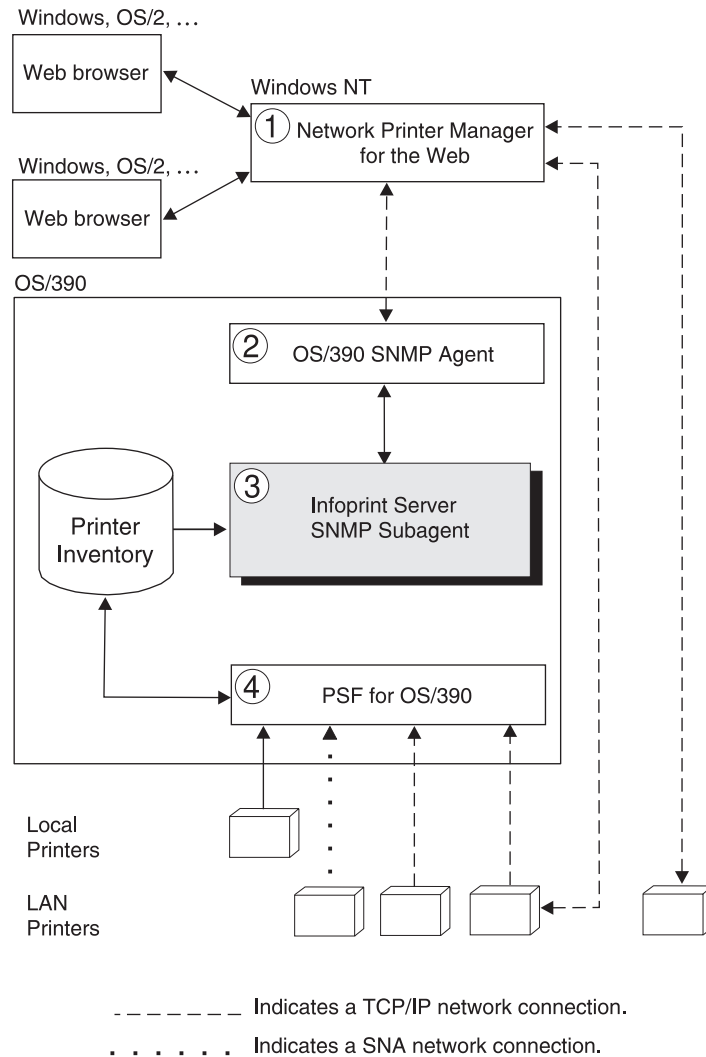
Figure 7. SNMP Subagent System Diagram

1. To view printer information, you must install an SNMP manager. You can install any SNMP manager that communicates with an SNMP agent with these characteristics:
   - The agent supports the general printer Management Information Base (MIB) (defined in RFC 1759).
   - The agent supports multiple printers that are defined with one IP address.

   You can download IBM Network Printer Manager (NPM) for the Web from the IBM Printing Systems Company Web site at **http://www.ibm.com.printers**. When you use NPM for the Web, administrators can view printer information using a Java®-enabled version of Netscape Navigator or Microsoft® Internet Explorer. The NPM server runs on a Windows NT system.

   Note: NPM is designed to support about 15 printers. Defining more printers may cause poor performance.

   As Figure 7 shows, the SNMP manager (NPM) can also communicate directly with any TCP/IP-attached printer that contains an internal SNMP agent. This printer can be controlled by PSF.

2. The OS/390 SNMP agent, part of the OS/390 SecureWay® Communications Server, communicates with the SNMP manager and with the Infoprint Server SNMP subagent.

3. The Infoprint Server SNMP subagent communicates with PSF for OS/390 through the Printer Inventory. PSF for OS/390 stores printer characteristics and printer status in the Printer Inventory for any printer that has SNMP-reporting enabled. (The administrator enables SNMP reporting in the FSA definition for the PSF printer).

   The SNMP subagent transmits the information stored by PSF for OS/390 to the SNMP manager (through the OS/390 SNMP agent). The SNMP subagent also notifies the SNMP manager immediately when PSF for OS/390 detects a change to printer characteristics or printer status.

4. PSF for OS/390 obtains printer characteristics and printer status from any PSF-controlled printer. The PSF printer can be channel-attached, TCP/IP-attached, or SNA-attached. However, the PSF printer cannot be attached using the Download for OS/390 feature of PSF.

   If a PSF-controlled printer is shared with another printing application, and is not connected to PSF when an intervention required situation occurs, PSF cannot report the change in printer status.

Part 2. Printing from OS/390 UNIX System Services

Chapter 2. Printing from OS/390 UNIX System Services Using Infoprint Server Commands

This chapter describes the following commands:

- "lp—Send a Job to a Printer" on page 25
- "lpstat—Show Printer Names and Locations and Status of Print Jobs" on page 31
- "cancel—Cancel a Print Job" on page 35
- "pcl2afp—Transform PCL Data to AFP Data" on page 37
- "pdf2afp and ps2afp—Transform PDF or PostScript Data to AFP Data" on page 41
- "sap2afp—Transform SAP OTF or ABAP Data to AFP Data" on page 50

Using these commands, you can print jobs on any printer that your system administrator has defined to Infoprint Server. You can print on local printers that are attached directly to OS/390, or on remote printers in a TCP/IP LAN network.

These printing commands provide enhanced function over the commands of the same name that are described in *OS/390 UNIX System Services Command Reference.* For example, when printing on Advanced Function Presentation (AFP) printers, you can specify options such as duplexing or a special overlay. You can also display the status of your print request, and you can cancel a print request. These printing commands adhere to the UNIX standards in XPG4.2. You do not need to change your UNIX applications when you port them to OS/390.

Online Help for Infoprint Server Commands

To get online help about Infoprint Server commands, use the **man** command. You can view man pages in English or Spanish. If the man pages do not appear in the language you desire, specify one of the following paths on the -**M** option of the **man** command. Alternatively, you can add one of the following values to your **MANPATH** environment variable. Add the value ahead of other values in the environment variable.

English	**/usr/lpp/Printsrv/man/C** or**/usr/lpp/Printsrv/man/En_US**
Spanish	**/usr/lpp/Printsrv/man/Es_ES**

Messages Issued by Infoprint Server Commands

The Infoprint Server commands issue messages to your console. These commands can issue messages in English, Japanese, or Spanish. If the messages do not appear in the language you desire, add one of the following values to your **NLSPATH** environment variable. Add the value ahead of other values in the environment variable.

English	**/usr/lpp/Printsrv/En_US/%N**
Japanese	**/usr/lpp/Printsrv/Ja_JP/%N**
Spanish	**/usr/lpp/Printsrv/Es_ES/%N**

Transforming Jobs to AFP Format

While Infoprint Server allows you to submit jobs in many different formats, Advanced Function Presentation (AFP) printers print the AFP data stream. You can submit other data streams to AFP printers because an optional product, Infoprint Server Transforms (5697-F51), converts jobs to AFP format.

Note: Documents in AFP format are also called Mixed Object Document Content Presentation Architecture (MO:DCA-P) documents.

Usually, you do not have to worry about transforming your jobs. If the Infoprint Server Transforms are installed, Infoprint Server automatically calls the appropriate transform when you send a job to a printer that your system administrator has configured for transformation. You might, however, want to transform a job before printing in these situations:

- You want to verify that the job can be transformed without errors.
- You intend to print a job many times. In this case, it is more efficient to transform the job once and print the output than to transform the job every time you print.

How Do You...

This section is a guide to the rest of this chapter. It tells you what Infoprint Server command you need to use for a printing task and sends you to the right place to get more information.

Send a Job to Print?

To send one or more files to print, use the **lp** command. For example, to print three copies of `myfile1` and `myfile2` on `Printer2`, enter:

```
lp -d Printer2 -n 3 myfile1 myfile2
```

For more information, see "lp—Send a Job to a Printer" on page 25.

Print a Job with Special Requirements?

Infoprint Server uses *attributes* to describe jobs. Attributes specify things like these:

- Whether to print on one or both sides of the paper
- Resources like fonts, page definitions, form definitions, and overlays
- Text to print on the separator sheet

Use the **-o** option of the **lp** command to specify attribute values when you send a job to print. For example, you want to print the file `special.job` on both sides of the paper that is loaded in input tray `top` of `Printer2`. You want to print one overlay, `O1ODD`, on all the front sides of the paper and another, `O1EVEN`, on all the back sides. Both overlays reside in a library called `MYOVR.LIBRARY`. Enter:

```
lp -d Printer2 -o "input-tray=top duplex=yes
   overlay-front=O1ODD overlay-back=O1EVEN
   resource-library=MYOVR.LIBRARY" special.job
```

Instead of entering all the attributes on the command line, you can store them in an attributes file. If the attributes file is called `myatts`, enter:

```
lp -d Printer2 -o attributes=myatts special.job
```

For a list of job attributes and a description of the use and values of each one, see "Attribute Listing" on page 54. For information about attributes files, see "Attributes Files" on page 54. For information about the **-o** option of the **lp** command, see "lp—Send a Job to a Printer" on page 25.

Find Out Where the Printers Are?

Use the **lpstat** command to display printer names and locations. For example, to see the names and locations of all printers known to Infoprint Server, enter:

```
lpstat -a
```

For more information, see "lpstat—Show Printer Names and Locations and Status of Print Jobs" on page 31.

Find Out if a Job Is Printing?

You can also use the **lpstat** command to display the status of a job. For example, you submitted several jobs to print and want to know if any of them are printing. To display information about all your jobs submitted to any printer, enter:

```
lpstat
```

You can also use **lpstat** to display printer location and job status at the same time. For example, you sent a job to `Printer3` and want to pick it up if it has printed instead of waiting to have it delivered to your output bin. To find out where `Printer3` is and whether any job that you submitted to it has printed, enter:

```
lpstat -o Printer3
```

For more information, see "lpstat—Show Printer Names and Locations and Status of Print Jobs" on page 31.

Cancel a Job?

Use the **cancel** command to cancel a job. For example, you realize that you need to make some changes in the file that you just sent to print on `Printer3`.

If you don't remember the job ID that the **lp** command returned, use the **lpstat** command to display all the jobs that you submitted to `Printer3`:

```
lpstat -o Printer3
```

Suppose that your job has an ID of 17. To cancel it, enter:

```
cancel 17
```

For more information, see "cancel—Cancel a Print Job" on page 35.

Transform a Job to AFP Format?

Infoprint Server automatically transforms jobs in other formats to the Advanced Function Presentation (AFP) data stream when you submit them to a printer that the print administrator has configured to do so. You can also use the **pcl2afp**, **pdf2afp**, **ps2afp**, and **sap2afp** commands to transform jobs in the following formats without printing them:
- Printer Control Language (PCL)
- Portable Document Format (PDF)
- PostScript
- SAP Advanced Business Application Programming (ABAP)
- SAP Output Text Format (OTF)

For example, to transform the PostScript file `myfile.ps` to an AFP file called `myfile.afp`, with each page 5.5 inches long and 4 inches wide, enter:

```
ps2afp -o myfile.afp -l 5.5i -w 4i myfile.ps
```

To submit the PCL file `sample.pcl` to the printer named `Printer1` and transform it automatically, enter:

```
lp -d Printer1 sample.pcl
```

For more information, see the following topics:

- "pcl2afp—Transform PCL Data to AFP Data" on page 37
- "pdf2afp and ps2afp—Transform PDF or PostScript Data to AFP Data" on page 41
- "sap2afp—Transform SAP OTF or ABAP Data to AFP Data" on page 50

lp—Send a Job to a Printer

Format

lp [-**cmsw**] [-**d** *destination*] [-**n** *copies*] [-**o** *option*] ... [-**t** *title*]

[*filename* ...]

Description

The **lp** command sends a job containing one or more files to a printer. If you do not specify any files on the command line, or if you specify a filename of -, **lp** prints from standard input.

The files can be:
- OS/390 data sets, such as partitioned data sets or sequential data sets
- Hierarchical file system (HFS) files
- Lists of printable files

If the Infoprint Server Transforms are installed, you can automatically transform jobs to the Advanced Function Presentation (AFP) data stream.

Options

-**c**   Makes a copy of the file and prints that copy. Copying files allows you to change the original files after submitting the **lp** command. The printed file does not contain the changes. -**c** is the default.

-**d** *destination*

      Selects the printer. Contact your system administrator for the names of available printers.

      You can omit this option if there is a default printer. You can define a default printer by setting the **LPDEST** or **PRINTER** environment variable. The system administrator can also define a default printer. If you do not specify a printer and there is no default, the **lp** command issues an error message.

-**m**   Notifies you by electronic mail when the file is removed from the system spool for any reason. Some reasons are:
- The file has finished printing.
- The file has been transmitted to a local area network (LAN) printer. You may receive notification before the file has finished printing, or even though a transmission error may have occurred.

      If your administrator has requested that Infoprint Server retain files on the system spool after transmission, you receive notification after the retain time expires.
- The operator has deleted the file.

      Note: Notification may be delayed to improve system performance.

-**n** *copies*

      Prints the specified number of copies of each file. The default is one copy.

      Note: The line printer daemons (LPDs) for some IP PrintWay™ printers do not support printing more than one copy of the same file. In this case, only one copy prints.

-o *option*

Specifies an option, that is, one or more attribute value assignments in the format *attribute=value*, separated by spaces.

- If a value contains spaces, enclose the value in single or double quotation marks:

```
attribute='value with spaces'
attribute="value with spaces"
```

- If an option contains spaces or characters that may be interpreted by the shell, such as **$, &, (,)**, >, <, |, ', ", and so on, enclose the option in single or double quotation marks:

```
-o 'attribute1=value1 attribute2=value2'
-o "attribute='value with spaces'"
-o "attribute=value(1)"
```

For information about how the shell interprets special characters, refer to *OS/390 UNIX System Services User's Guide*.

- If both value and option require quotation marks, do either of these things:

  - Use two pairs of double quotation marks and place a backslash before each quotation mark that surrounds the value:

```
-o "attribute=\"value with spaces\""
```

  - Use different quotation marks around the option and value, for example:

```
-o 'attribute="value with spaces"'
-o "attribute='value with spaces'"
```

See "Attribute Listing" on page 54 for a list of the attributes you can specify to describe the job and all the files in it.

Instead of entering a string of attributes on the command line, you can store attributes and values in a file. You use a special attribute called **attributes** to specify the file. See "Creating an Attributes File" on page 54 for how to create an attributes file and "Specify Attributes Files for a Job" on page 28 for an example of specifying one.

You can also set the **AOPOPTIONS** environment variable to a string of attributes and values. The **lp** command treats these attributes as if you had specified them before any other values of the **-o** option on the command line. See "Specify the AOPOPTIONS Environment Variable" on page 29 for an example of using the **AOPOPTIONS** environment variable.

If you specify an attribute more than once, the **lp** command uses the last value.

-s   Suppresses the message that the **lp** command returns when Infoprint Server has accepted the job for printing. This message contains the job identifier. You must know the job ID to query or cancel the job.

-t *title*   Prints the title on the separator page, a page that may be printed before or after the file. You can specify a title of up to 60 characters. If the title contains spaces or characters that the shell may interpret, enclose it in single or double quotation marks.

Note: Whether the title is printed depends on how the system administrator has configured the separator page.

-w Writes a message to the terminal when the file is removed from the system spool for any reason. Some reasons are:

- The file has finished printing.
- The file has been transmitted to a LAN printer. You may receive notification before the file has finished printing, or even though a transmission error may have occurred.

  If your administrator has requested that Infoprint Server retain files on the system spool after transmission, you receive notification after the retain time expires.

- The operator has deleted the file.

  Note: Notification may be delayed to improve system performance.

Operand

filename

The path name of each file that you want to print. To print from standard input (keyboard data or the output from another command), omit the file name or specify - as the file name. To print an OS/390 data set, specify // before the file name.

Examples

Print a File on the Default Printer
To submit the file `File1` to your default printer, enter the command:

```
lp File1
```

Print a File on a Specified Printer
To submit the file `File1` to the printer `fred`, enter the command:

```
lp -d fred File1
```

Print a File on an Undefined LAN Printer
You want to print the file `File1` on a LAN printer at a remote site. Your system administrator has not defined this printer. You must specify:

- The name that your system administrator has defined to represent all remote printers, for example, `remote`
- The printer's Internet Protocol (IP)address
- The remote print queue

Enter the command:

```
lp -d remote -o "print-queue-name=text
   printer-ip-address=leo.boulder.ibm.com" File1
```

Print an OS/390 Data Set
To submit the OS/390 data set `USERID.FILE1.LISTPS` to your default printer, enter the command:

```
lp //FILE1.LISTPS
```

To submit the OS/390 data set `FILE2.LISTPS` to your default printer, enter the command:

```
lp "//'FILE2.LISTPS'"
```

Print a Multi-Document Job
To submit the files `File1` and `File2` to the default printer, enter the command:

```
lp File1 File2
```

Each file is spooled to the printer separately.

Print a File-Reference Document
A *file-reference document* is a list of similar printable files that are separated by spaces, tabs, or new lines. For example, the file `bills.list` contains a list of files, each containing one customer's monthly statement. It looks like this:

```
40009801.dec97
40009802.dec97
40009803.dec97
40009804.dec97
⋮
```

To print all the files listed in `bills.list` on your default printer, enter the command:

```
lp -o document-type=file-reference bills.list
```

The files are concatenated and printed as a single file.

Print Multiple Copies of Each Document in a Job
To submit a job to the default printer and to specify two copies of each file in the job, enter one of these commands:

```
lp -n 2 Title Contents Body1 Body2 Append
```

```
lp -o copies=2 Title Contents Body1 Body2 Append
```

This command prints two copies of `Title`, followed by two of `Contents`, and so forth for each file in the job.

Note: The line printer daemons (LPDs) for some IP PrintWay printers do not support printing more than one copy of the same file. In this case, only one copy prints.

Print a Job on Both Sides of the Paper
To submit the file `File1` to the default printer and to print it on both sides of the paper, enter the command:

```
lp -o duplex=yes File1
```

Specify Attributes Files for a Job
To submit the file `File5` to the default printer and to specify the two attributes files `default.att` and `special.att`, enter the command:

```
lp -o "attributes=default.att attributes=special.att" File5
```

Suppose that the file `default.att` contains these lines:

```
input-tray=bottom
duplex=yes
output-bin=collator
```

The file `special.att` contains these lines:

```
input-tray=top
copies=5
title-text='Special Report'
```

The preceding command is equivalent to this command:

```
lp -o "input-tray=top duplex=yes output-bin=collator
   copies=5 title-text='Special Report'" File5
```

The value of **input-tray** in `special.att` overrides the value in `default.att` because you specified `special.att` last.

Note: These examples assume that the attributes files are in the current directory, or that you have set the **AOPPATH** environment variable to include the directories where the attributes files reside. If this is not the case, you would specify the attributes files by their absolute path names.

Override an Attribute Value in an Attributes File

To submit the file `File1` to the default printer and override the value of **yes** for the **duplex** attribute specified in the `default.att` attributes file, enter the command:

```
lp -o "attributes=default.att duplex=tumble" File1
```

Specify the AOPOPTIONS Environment Variable

To set the **AOPOPTIONS** environment variable to your address, add a line like the following one to your **.profile** file:

```
export AOPOPTIONS="address-text={'13 Division St.' 'Foxboro, MA 02035'}"
```

Until you reset the **AOPOPTIONS** environment variable, every **lp** command you issue includes this values. For example, the following command:

```
lp myfile.ps
```

is equivalent to:

```
lp -o "address-text={'13 Division St.' 'Foxboro, MA 02035'}" myfile.ps
```

Because the **lp** command reads the value of the **AOPOPTIONS** environment variable before the options you specify on the command line, you can override the values of this variable. For example, if you want a single job delivered to a different address, enter:

```
lp -o "address-text={'999 Eclipse Alley' 'Pawtucket, RI 02860'}" myfile.ps
```

Request Notification by Message

To submit the file `File1` to the default printer and to receive a message when the file is printed, enter the command:

```
lp -w File1
```

Note: If the printer is a LAN printer, the **lp** command writes a message when the file is transmitted to the printer. When you receive the message, the file may not actually have finished printing.

Submit and Hold a Job

To submit the file `File1` to the default printer and to hold it so that it does not print until the operator releases it, enter the command:

```
lp -o hold=true File1
```

Specify a Code Page for ASCII Jobs

To print the files `File1` and `File2` and to specify the code page `ISO8859-1`, enter the command:

```
lp -d Printer1 -o document-codepage=ISO8859-1 File1 File2
```

Print from Standard Input

You can use the **lp** command to print the output from other commands. For example, to print a list of all the files in the current directory, enter:

```
ls -la | lp
```

Environment Variables

The **lp** command uses the following environment variables:

AOPCONF   Names the Infoprint Server configuration file. This variable takes precedence over the user-specific configuration file, **$HOME/.aopconf**, and the system default configuration file, **/etc/Printsrv/aopd.conf**. For more information about the configuration file, refer to *OS/390 Infoprint Server Customization*.

AOPOPTIONS

Specifies a string of attributes and values that the **lp** command includes before the values of the -**o** option.

AOPPATH   Defines the directory path that the **lp** command searches for attributes files. The default is your current directory. If the directory where an attributes file resides is not included in the value of **AOPPATH**, you can specify the file by its absolute path name.

LPDEST   Names the default printer. This variable takes precedence over **PRINTER**.

PRINTER   Names the default printer if **LPDEST** is not defined.

NLSPATH   Names the directory paths that the **lp** command searches for message catalogues.

For information about setting and using environment variables, refer to *OS/390 UNIX System Services User's Guide*.

Files

$HOME/.aopconf
Contains the user-specific Infoprint Server configuration file. This file takes precedence over **/etc/Printsrv/aopd.conf**.

/etc/Printsrv/aopd.conf
Contains the system default Infoprint Server configuration file.

Exit Values

0   Infoprint Server accepted the request.

>0   An error occurred that prevented Infoprint Server from accepting the request. Some possible errors are:
- The command syntax is not valid.
- The selected printer cannot print the type of data in one of the files.
- The selected printer does not support one of the specified job attributes.
- Infoprint Server is not available.
- There was an error in reading the Infoprint Server configuration file.

Portability

The -**m**, -**o**, -**s**, -**t**, and -**w** options are extensions to the POSIX.2 standard. There are no extensions to the XPG4.2 standard for the **lp** command.

lpstat—Show Printer Names and Locations and Status of Print Jobs

Format

lpstat [**-dt**] [**-a** [*printername* ...]] [**-o** [*printername* ...]]

[**-p** [*printername* ...]] [**-u** [*userid* ...]] [*jobid* ...]

Description

lpstat writes the names and locations of printers or the status of print jobs to standard output.

For printers, the **lpstat** command returns the following information:
- The name of the printer
- The number of jobs submitted to the printer using Infoprint Server
- The location of the printer
- A description of the printer

For jobs, the **lpstat** command returns the following information:
- The job ID
- The user ID of the person who submitted the job
- The state of each file in the job:

pending	The file is waiting to print.
	Note: Because JES3 cannot distinguish job states, in a JES3 environment **lpstat** may return **pending** for files that have been selected for processing or held on the JES spool.
processing	The file has been placed on the JES spool and selected for processing. It may be:
	– Being transmitted to a local area network (LAN) printer or to a print server
	– Printing
held	The file is held on the JES spool and cannot print for one of these reasons:
	– The user specified **hold=true** when submitting the job.
	Note: JES3 does not recognize a job that is held for this reason and returns **pending**.
	– The operator held the job.
completed	The file has been processed successfully. It remains on the JES spool for one of these reasons:
	– Other files in the job are still being processed. The file will be removed from the spool after all files in the job have been processed.
	– Your system administrator has specified that files should be retained after transmission to a LAN printer or to a print server. The file will be removed from the spool when the retention period expires.
failed	Processing has failed. The file remains on the JES spool for one of these reasons:

- Transmission to a LAN printer or to a print server has failed. Your system administrator has specified that files should be retained after transmission. The file will be removed from the spool when the retention period expires.

- An error occurred during processing. The file is held.

purged The file was deleted before printing.

- The data format of the job, as specified by the **document-format** job attribute or as determined by Infoprint Server
- The number of bytes in each file in the job
- The name of each file or file-reference document in the job

When **lpstat** returns information about multiple jobs, the order is not significant. The first job listed may not be the next job to print.

Options

-a [*printername* ...]
Displays the names and locations of the specified printers. If you do not specify a printer name, this option displays the names and locations of all printers known to the Print Interface.

-d Displays the name and location of the default printer that the system administrator has defined. If there is no default printer, **lpstat** returns an error message.

Note: This option does not display the name or location of a default printer that you defined with the **LPDEST** or **PRINTER** environment variable. To display the values of these variables, use the **echo** command.

-o [*printername* ...]
Displays information about the specified printers and all jobs that you submitted to the specified printers. If you do not specify a printer name, this option displays information about all Print Interface printers and all jobs that you submitted to them.

-p [*printername* ...]
Displays the names and locations of the specified printers. If you do not specify a printer name, this option displays the names and locations of all printers known to the Print Interface.

-t Displays information about all printers known to the Print Interface and all jobs that any user submitted to them.

-u [*userid* ...]
Displays information about all jobs that the specified users submitted to any printer. If you specify **-u** without a user name, this option displays information about all jobs that all users submitted to any printer. If you do not specify **-u**, **lpstat** displays information about all jobs that you submitted to any printer.

Operand

jobid **...** Identifies the job you want to display information about. By default, the **lp** command returns the job ID when a job is accepted for printing.

Examples

Display the Names and Locations of All Printers
To display the names and locations of all printers known to the Print Interface, enter:

```
lpstat -a
```

Display the Name and Location of the Default Printer
To display the name and location of the default printer, enter:

```
lpstat -d
```

Display Information about Selected Jobs
To display the status of the jobs whose job IDs are 14 and 16, enter:

```
lpstat 14 16
```

Display Information about All Jobs that You Submitted to Any Printer
To display the status of all the jobs that you submitted to any printer, enter:

```
lpstat
```

Display Information about All Jobs that a User Submitted to Any Printer
To display the status of all the jobs that user MARTHA submitted to any printer, enter:

```
lpstat -u MARTHA
```

Display Information about a Printer and All Jobs that You Submitted to It
To display the location of printer Printer1 and the status of all jobs that you submitted to it, enter:

```
lpstat -o Printer1
```

Display Information about All Printers and All Jobs
To display the status of all printers and all jobs that have been submitted by all users in the system, enter:

```
lpstat -t
```

Environment Variables

The **lpstat** command uses the following environment variables:

AOPCONF   Names the Infoprint Server configuration file. This variable takes precedence over the user-specific configuration file, **$HOME/.aopconf**, and the system default configuration file, **/etc/Printsrv/aopd.conf**. For more information about the configuration file, refer to *OS/390 Infoprint Server Customization*.

NLSPATH   Names the directory paths that the **lpstat** command searches for message catalogues.

For information about setting and using environment variables, refer to *OS/390 UNIX System Services User's Guide*.

Files

$HOME/.aopconf
　　　　Contains the user-specific Infoprint Server configuration file. This file takes precedence over **/etc/Printsrv/aopd.conf**.

/etc/Printsrv/aopd.conf
Contains the system default Infoprint Server configuration file.

Exit Values

0   Infoprint Server accepted the request.

>0   An error occurred that prevented Infoprint Server from accepting the request. Some possible errors are:

- The command syntax is not valid.
- Infoprint Server is not available.
- There was an error in reading the Infoprint Server configuration file.

Portability

There are no extensions to any Portable Operating System Interface for Computer Environments (POSIX) standard or to the XPG4.2 standard for the **lpstat** command.

cancel—Cancel a Print Job

Format

cancel *jobid* ...

Description

The **cancel** command cancels one or more print jobs that you submitted, with these restrictions:

- You can only cancel your own jobs.
- You cannot cancel a job after it has started processing.
- In a JES3 environment, you may not be able to cancel a job that is held on the Job Entry Subsystem (JES) spool.

Operand

jobid **...**   The job ID of the print job you want to cancel. By default, the **lp** command returns the job ID when a job is accepted for printing. You can also determine the job ID by using the **lpstat** command to query all the jobs that you submitted.

Examples

Cancel Jobs
To cancel jobs 3, 5, and 6, enter:

```
cancel 3 5 6
```

Identify a Job and Cancel It
You submitted a job to print and want to cancel it, but you don't remember the job ID. Enter:

```
lpstat
```

lpstat returns information about all your jobs, including the job ID and the names of the files in each job. You identify the job you want to cancel as job 27. To cancel it, enter:

```
cancel 27
```

Environment Variables

The **cancel** command uses the following environment variables:

AOPCONF   Names the Infoprint Server configuration file. This variable takes precedence over the user-specific configuration file **$HOME/.aopconf**, and the system default configuration file, **/etc/Printsrv/aopd.conf**. For more information about the configuration file, refer to *OS/390 Infoprint Server Customization*.

NLSPATH   Names the directory paths that the **cancel** command searches for message catalogues.

For information about setting and using environment variables, refer to *OS/390 UNIX System Services User's Guide*.

Files

$HOME/.aopconf
> Contains the user-specific Infoprint Server configuration file. This file takes precedence over **/etc/Printsrv/aopd.conf**.

/etc/Printsrv/aopd.conf
> Contains the system default Infoprint Server configuration file.

Exit Values

0   Infoprint Server accepted the request.

>0   An error occurred that prevented Infoprint Server from accepting the request. Some possible errors are:
- The command syntax is not valid.
- Infoprint Server is not available.
- There was an error in reading the Infoprint Server configuration file.

Portability

There are no extensions to any Portable Operating System Interface for Computer Environments (POSIX) standard or to the XPG4.2 standard for the **cancel** command.

pcl2afp—Transform PCL Data to AFP Data

Format

pcl2afp [-**a** *imagetype*] [-**c** *transformclass*] [-**o** *outputfile*]

[-**p** *pagerange*] ... [-**t** *outputtype*] [*inputfile* ...]

Description

The **pcl2afp** command transforms a Printer Control Language (PCL) data stream file into an Advanced Function Presentation (AFP) data stream file. This command is part of the Infoprint Server Transforms product.

If you specify multiple values of the same option, **pcl2afp** uses the last value that you specified, with the exception of the -**p** option. Up to 20 values of the -**p** option accumulate.

When using the **pcl2afp** command, you can specify one or more input files to be transformed. If you do not specify an input file name, or if you specify - as the file name, **pcl2afp** uses standard input. The output file name is also optional; if you do not specify one, the **pcl2afp** command writes the results to standard output.

Limitations

- PCL data can contain device commands (for example, to begin or end duplexing or to change the input bin). Because the AFP architecture defines those device functions in a form definition resource, the **pcl2afp** command ignores the device commands in the print data. To access those device functions, you must specify them in the form definition or attributes file, or on the print command when you print the job.
- Resolution conversion algorithms may produce a degraded appearance when used to reduce the resolution of a data stream. For this reason, **pcl2afp** may degrade the appearance of higher-resolution data streams when used with 240-pel printers. You should verify that print fidelity is satisfactory.
- There are subtle differences between PCL4 and PCL5e when it comes to handling fonts. While many PCL4 files work with **pcl2afp**, some may not produce the expected output.

Options

Note: You can use the **filter-options** job attribute with the **lp** command to pass any of these options except -**o** *outputfile* to the PCL transform.

-**a** *imagetype*
    Determines the type of AFP data stream image to generate for each page in the PCL file.

    Values are:

    io1-**g4**   Compressed Image Object Content Architecture (IOCA) image in
            Modified Telecommunication Standardization Sector (TSS) T.6 G4
            Facsimile Coding Scheme (G4 MMR) format. This is the
            recommended output type because it takes up less space on the
            hard disk, and it prints faster.

Notes:

1. Some older AFP printers do not support printing with an image type of **io1**-**g4**. For these printers, specify an image type of **io1**-**mmr** because it is the compressed image type that they support. This image type results in faster printing than uncompressed image types.

2. TSS was formerly the International Telegraph and Telephone Consultative Committee (CCITT).

im1　IM1 image. This type of image is not compressed.

io1　IOCA image. This type of image is not compressed.

io1-**mmr**
Compressed IOCA image in Modified Modified Read (MMR) format.

-c *transformclass*
Specifies the name of a transform class that your system administrator has defined. The transform class determines the following options:

- The length and width of the generated image
- The page margins
- The resolution of the output image
- The amount of memory that the transform allocates

Ask your system administrator for the name of a transform class suitable for the printer and the type of job.

Note: If the transform class specifies a resolution that the printer does not support, Infoprint Server prints the image under most conditions, but with degraded results.

-o *outputfile*
Specifies the output path and file into which the transformed PCL files are to be written. If you specify more than one output file, the last path and file name are used. If you do not specify an output file, the result is written to standard output.

You cannot use **-o** *outputfile* on the command line with the **lp** command. You can only use **-o** *outputfile* with the **pcl2afp** command.

-p *pagerange*
Specifies that the output should contain only selected pages. Up to 20 values of the **-p** option accumulate.

The **-p** option counts pages by their actual sequence in the document, not by page number. For example, to write only the last page of a document whose pages are numbered i, ii, 1, 2, 3, 4, specify -p 6.

Examples of values include:

-p even　　　　Write even pages.

-p odd　　　　Write odd pages.

-p 1-10　　　　Write the first through tenth pages.

-p 10-　　　　Write pages from the tenth page until the end of the job.

-p 1 -p 3 -p 6
Write the first, third, and sixth pages.

-t *outputtype*

> Determines the type of output to generate.
>
> Values are:
>
> **document**
> > Printable document.
>
> **overlay**
> > Graphic image that can be printed on each page of a printable document.
>
> **pagesegment**
> > Graphic image that can be embedded in a printable document.
>
> **Note:** When generating overlays or page segments from multiple-page documents, you might want to use the **-p** option to select pages. Otherwise, one overlay or page segment is created for each page of the input file.

Operand

inputfile

> Specifies an input file to be transformed. If you specify more than one input file name, the **pcl2afp** command concatenates the files. The results are written to a single output file (if one is specified) or to standard output.
>
> In addition, you can specify PCL inline resource files as input files to the **pcl2afp** command. The file name of the inline resource file must precede the file name of the PCL printable file so that **pcl2afp** concatenates the files in the correct order.
>
> If you do not specify an input file, or if you specify the file name as -, **pcl2afp** uses standard input.

Examples

Transform a Job, Specifying Transform Class
To transform the PCL file myfile.pcl into an AFP data stream, using the a4_300 transform class, and write the result to a file called myfile.afp, enter either of the following commands:

```
pcl2afp -c a4_300 -o myfile.afp myfile.pcl

pcl2afp -c a4_300 < myfile.pcl > myfile.afp
```

Transform and Print a Job, Specifying Image Type
To transform the PCL file myfile.pcl into an AFP data stream as an IO1-MMR image, and send the result to the default printer with the **lp** command, enter:

```
pcl2afp -a io1-mmr myfile.pcl | lp
```

Environment Variables

The **pcl2afp** command uses the following environment variables:

AOPCONF   Names the Infoprint Server configuration file. This variable takes precedence over the user-specific configuration file **$HOME/.aopconf**, and the system default configuration file, **/etc/Printsrv/aopd.conf**. For more information about the configuration file, refer to *OS/390 Infoprint Server Customization*.

NLSPATH   Names the directory paths that the **pcl2afp** command searches for message catalogues.

For information about setting and using environment variables, refer to *OS/390 UNIX System Services User's Guide.*

Files

$HOME/.aopconf
Contains the user-specific Infoprint Server configuration file. This file takes precedence over **/etc/Printsrv/aopd.conf**.

/etc/Printsrv/aopd.conf
Contains the system default Infoprint Server configuration file.

Exit Values

0   The data were transformed successfully.

>0   An error occurred.

pdf2afp and ps2afp—Transform PDF or PostScript Data to AFP Data

Format

pdf2afp [-a *imagetype*] [-c *transformclass*] [-l *length*] [-o *outputfile*]

[-p *pagerange*] ... [-r *resolution*] [-t *outputtype*] [-w *width*]

[-x *xoffset*] [-y *yoffset*] [*inputfile...*]

ps2afp [-a *imagetype*] [-c *transformclass*] [-g *pagerange*] ...

[-i *initializationfile...*] [-l *length*] [-o *outputfile*] [-p *pagerange*] ...

[-r *resolution*] [-t *outputtype*] [-w *width*] [-x *xoffset*] [-y *yoffset*]

[*inputfile...*]

Description

The **ps2afp** command and its alias, the **pdf2afp** command, convert a PostScript or Portable Document Format (PDF) data stream file into an Advanced Function Presentation (AFP) data stream file. These commands are part of the Infoprint Server Transforms product.

If you specify multiple values of the same option, **ps2afp** uses the last value, with the exception of the -**g** and -**p** options. Up to 20 values of the -**p** option, or any number of values of the -**g** option, accumulate.

When using the **ps2afp** or **pdf2afp** command, you can specify one or more input files to be transformed. If you do not specify an input file name, or if you specify - as the file name, **ps2afp** reads standard input. The output file name is also optional; if you do not specify one, the **ps2afp** command writes the results to standard output.

Notes:
1. The PostScript or PDF file may contain the commands **letter** and **legal**. If these commands are present in the PostScript or PDF file, the size of the transformed image may not be what you expect. The **letter** and **legal** commands override the length and width values specified for the transform.
2. If the **letter** and **legal** commands are not used, the position of PostScript or PDF data on the page depends on the interaction of the length and width values specified for the transform with the form definition you use. In general, to position data on the page:
   - Use -**l** and -**w** to set the physical page dimensions.
   - Use a form definition that specifies zero vertical offset and zero horizontal offset or specify X and Y offsets of 0 when you submit the print job.
3. Use -**x** and -**y** to avoid any areas that your printer cannot print. These options do not shift the image on the page. If the image is defined to print in the unprintable areas, it is clipped.

Limitations

- PostScript data can contain device commands (for example, to begin or end duplexing or to change the input bin). Because the AFP architecture defines those device functions in a form definition resource, the **ps2afp** command

ignores the device commands in the print data. To access those device functions, you must specify them in the form definition or attributes file, or on a print command, when you print the job.

- Resolution conversion algorithms may produce a degraded appearance when used to reduce the resolution of images imbedded in a data stream. For this reason, **ps2afp** may degrade the appearance of higher-resolution images when used with 240-pel printers. You should verify that print fidelity is satisfactory.

Options

Note: You can use the **filter-options** job attribute with the **lp** command to pass any of these options except -**o** *outputfile* to the PostScript or PDF transform.

-**a** *imagetype*
: Determines the type of AFP data stream image to generate for each page in the PostScript or PDF file.

Values are:

io1-**g4**
: Compressed Image Object Content Architecture (IOCA) image in Modified Telecommunication Standardization Sector (TSS) T.6 G4 Facsimile Coding Scheme (G4 MMR) format. This is the recommended output type because it takes up less space on the hard disk, and it prints faster.

  Notes:
  1. Some older AFP printers do not support printing with an image type of **io1**-**g4**. For these printers, specify an image type of **io1**-**mmr** because it is the compressed image type supported by these printers. This image type results in faster printing than uncompressed image types.
  2. TSS was formerly the International Telegraph and Telephone Consultative Committee (CCITT).

im1
: IM1 image. This type of image is not compressed.

io1
: IOCA image. This type of image is not compressed.

io1-**mmr**
: Compressed IOCA image in Modified Modified Read (MMR) format.

-**c** *transformclass*
: Specifies the name of a transform class that your system administrator has defined. The transform class determines the following options:
  - The initial transform configuration
  - The fonts used in the transformed files

  Ask your system administrator for the name of a transform class suitable for the type of job.

-**g** *pagerange*
: Specifies that the output should contain only selected pages. Any number of values of the -**g** option accumulate. The -**g** option can be used only for PostScript documents that conform to the Data Stream Compatibility (DSC) standard. It is not valid for PDF documents.

  The difference between the -**g** and -**p** options is that -**g** identifies pages by the label specified with the PostScript **%%Page** command (usually a page number), while -**p** counts them by their actual sequence in the document.

For example, to write only the last page of a document whose pages are numbered i, ii, 1, 2, 3, 4, specify -g 4 or -p 6.

Note: Unlike the -**p** option, the -**g** option does not support the **even** and **odd** keywords.

Examples of values include:

-g iii-vi   Write pages iii through vi.

-g 1-10   Write pages 1 through 10.

-g 10-   Write pages from page 10 until the end of the job.

-g 1 -g 3 -g 6
      Write pages 1, 3, and 6.

-g 3-1 3-28   Write pages 3-1 through 3-28.

-**i** *initializationfile*
Specifies one or more ASCII PostScript files that are prepended to the job to set up and initialize the PostScript device. If you specify more than one file, they are processed in the order that you specify them. The -**i** option is not valid for PDF documents.

-**l** *length*
Specifies the length of the generated image as a number followed by one of the following units:

in   Inches

mm   Millimeters

pel   Pels, the default unit

Inch values and millimeter values can contain a decimal point; pel values cannot.

Values are:

11i   11 inches, the default for all printers

0.1334in to **53in**
      Inch values for 240-pel printers

0.1067in to **53in**
      Inch values for 300-pel printers

0.0667in to **53in**
      Inch values for 480-pel printers

0.0534n to **53in**
      Inch values for 600-pel printers

3.3867mm to **1346.2mm**
      Millimeter values for 240-pel printers

2.7094mm to **1346.2mm**
      Millimeter values for 300-pel printers

1.6934mm to **1346.2mm**
      Millimeter values for 480-pel printers

1.3547mm to **1346.2mm**
      Millimeter values for 600-pel printers

32pel to **12720pel**

     Pel values for 240-pel printers

32pel to **15900pel**

     Pel values for 300-pel printers

32pel to **25440pel**

     Pel values for 480-pel printers

32pel to **31800pel**

     Pel values for 600-pel printers

Examples of values include:

```
-l 40mm
-l 200.5mm
-l 13in
-l 5280
-l 5280pel
```

Note: If a text margin is already built into the file, try -**l 11in** to set the length to 11 inches.

-**o** *outputfile*

Specifies the output path and file into which the transformed files are to be written. If you specify more than one output file, the last path and file name are used. If you do not specify an output file, the result is written to standard output.

You cannot use -**o** *outputfile* on the command line with the **lp** command. You can only use -**o** *outputfile* with the **pdf2afp** command or the **ps2afp** command.

-**p** *pagerange*

Specifies that the output should contain only selected pages. Up to 20 values of the -**p** options accumulate.

The difference between the -**p** and -**g** options is that -**p** counts pages by their actual sequence in the document, while -**g** identifies them by page label. For example, to write only the last page of a document whose pages are numbered i, ii, 1, 2, 3, 4, specify -p 6 or -g 4.

Examples of values include:

-p even   Write even pages.

-p odd   Write odd pages.

-p 1-10   Write the first through tenth pages.

-p 10-   Write pages from the tenth page until the end of the job.

-p 1 -p 3 -p 6

     Write the first, third, and sixth pages.

-**r** *resolution*

Specifies the resolution of the output image. Select the correct resolution for the printer on which you intend to print the image.

Values are:

240   240 pels per inch (for example, IBM 3812, 3825, 3827, 3835, and 3900 printers).

300   300 pels per inch (for example, IBM 4019, 4028, 4029, and 4039 printers and Hewlett-Packard printers)

480 480 pels per inch

600 600 pels per inch (for example, IBM Infoprint 60 and Infoprint 4000 printers), the default

Note: If you specify a resolution that the printer does not support, Infoprint Server prints the image under most conditions, but with degraded results.

-t *outputtype*
Determines the type of output to generate.

Values are:

document
Printable document.

overlay
Graphic image that can be printed on each page of a printable document.

pagesegment
Graphic image that can be embedded in a printable document.

Note: When generating overlays or page segments from multiple-page documents, you might want to use the **-g** or **-p** option to select pages. Otherwise, one overlay or page segment is created for each page of the input file.

-w *width*
Specifies the width of the generated image as a number followed by one of the following units:

in Inches

mm Millimeters

pel Pels, the default unit

Inch values and millimeter values can contain a decimal point; pel values cannot.

Values are:

8.5in 8.5 inches, the default for all printers

0.1334in to **25.5in**
Inch values for 240-pel printers

0.1067in to **25.5in**
Inch values for 300-pel printers

0.0667in to **25.5in**
Inch values for 480-pel printers

0.0534n to **25.5in**
Inch values for 600-pel printers

3.3867mm to **647.7mm**
Millimeter values for 240-pel printers

2.7094mm to **647.7mm**
Millimeter values for 300-pel printers

1.6934mm to **647.7mm**
> Millimeter values for 480-pel printers

1.3547mm to **647.7mm**
> Millimeter values for 600-pel printers

32pel to **6120pel**
> Pel values for 240-pel printers

32pel to **7650pel**
> Pel values for 300-pel printers

32pel to **12240pel**
> Pel values for 480-pel printers

32pel to **15300pel**
> Pel values for 600-pel printers

Examples of values include:

```
-w 40mm
-w 200.5mm
-w 13in
-w 4000
-w 4000pel
```

Note: If a text margin is already built into the file, try -**w 8.5in** to set the width to 8.5 inches.

-**x** *xoffset*
> Specifies a horizontal margin or border around the generated image to avoid the non-printable areas of some printers. The value is a number followed by one of the following units:

in   Inches

mm   Millimeters

pel   Pels, the default unit

Inch values and millimeter values can contain a decimal point; pel values cannot.

Values are:

0   Zero, the default for all printers

0in to **12.75in**   Inch values for all printers

0mm to **323.85mm**
> Millimeter values for all printers

0pel to **3060pel**
> Pel values for 240-pel printers

0pel to **3825pel**
> Pel values for 300-pel printers

0pel to **6120pel**
> Pel values for 480-pel printers

0pel to **7650pel**
> Pel values for 600-pel printers

Notes:

1. Because the X-offset value specifies margins on *both* the left and right sides of the page, the X offset can be no more than half of the width (**-w**) of the generated image. For example, if you specify a width of 8 inches, then the X offset can be no larger than 4 inches. If you specify an X offset of 5 inches, a blank page is printed because the sum of the left and right margins exceeds the width of the paper.

2. The X offset does not shift the image on the page. The image is clipped if it is defined to print in the left or right margin.

This option is similar to the **x-image-shift-front** and **x-image-shift-back** job attributes on the **lp** command.

-y *nnnn.nnnu*

Specifies a vertical margin or border around the generated image to avoid the non-printable areas of some printers. The value is a number followed by one of the following units:

in   Inches

mm   Millimeters

pel   Pels, the default unit

Inch values and millimeter values can contain a decimal point; pel values cannot.

Values are:

0   Zero, the default for all printers

0in to **26.5in**   Inch values for all printers

0mm to **673.1mm**
                Millimeter values for all printers

0pel to **6360pel**
                Pel values for 240-pel printers

0pel to **7950pel**
                Pel values for 300-pel printers

0pel to **12720pel**
                Pel values for 480-pel printers

0pel to **15900pel**
                Pel values for 600-pel printers

Notes:

1. Because the Y-offset value specifies margins on *both* the top and bottom of the page, the Y offset can be no more than half of the length (**-l**) of the generated image. For example, if you specify a length of 12 inches, then the Y offset can be no larger than 6 inches. If you specify a Y offset of 7 inches, a blank page is printed because the sum of the top and bottom margins exceeds the length of the paper.

2. The Y offset does not shift the image on the page. The image is clipped if it is defined to print in the top or bottom margin.

This option is similar to the **y-image-shift-front** and **y-image-shift-back** job attributes on the **lp** command.

Operand

inputfile

> Specifies an input file to be transformed. If you specify more than one input file name, the **ps2afp** command concatenates the files. The results are written to a single output file (if one is specified) or to standard output.
>
> In addition, you can specify PostScript inline resource files as input files to the **ps2afp** command. The file name of the inline resource file must precede the file name of the PostScript or PDF print file so that **ps2afp** concatenates the files in the correct order.
>
> If you do not specify an input file, or if you specify a file name of -, **ps2afp** uses standard input.

Examples

Transform a Job, Specifying Image Size

To transform the PostScript file `myfile2.ps` into an AFP data stream, with an image that is 8 inches high and 5 inches wide, and write the result to a file called `myfile2.afp`, enter one of these commands:

```
ps2afp -l 8in -w 5in -o myfile2.afp myfile2.ps

ps2afp -l 8in -w 5in < myfile2.ps > myfile2.afp
```

Transform and Print a Job, Specifying Resolution

To transform the PDF file `myfile1.pdf` into an AFP data stream, and then submit it to the 4019 printer called `robin`, enter:

```
pdf2afp -r 300 myfile1.pdf | lp -d robin
```

Note: You need to specify a resolution of 300 pels (`-r 300`) because the 4019 is a 300-pel resolution printer. The default resolution for the **pdf2afp** command is 600 pels.

Transform a Job, Specifying Transform Class

To transform the PostScript file `myfile.ps` into an AFP data stream, using the `bigjob` transform class, and write the result to a file called `myfile.afp`, enter either of the following commands:

```
ps2afp -c bigjob -o myfile.afp myfile.ps

ps2afp -c bigjob < myfile.ps > myfile.afp
```

Transform and Print a Job, Specifying Image Type and Resolution

To transform the PDF `myfile1.pdf` file into an AFP data stream in 300-pel resolution, as an IO1-MMR image, and send the result to the default printer with the **lp** command, enter:

```
pdf2afp -a io1-mmr -r 300 myfile1.pdf | lp
```

Transform and Print a Job, Specifying Image Type

To transform the PDF `myfile1.pdf` file into an AFP data stream as an IO1-MMR image, and send the result to the default printer with the **lp** command, enter:

```
pdf2afp -a io1-mmr myfile1.pdf | lp
```

Environment Variables

The **pdf2afp** and **ps2afp** commands use the following environment variables:

AOPCONF   Names the Infoprint Server configuration file. This variable takes

precedence over the user-specific configuration file
$HOME/.aopconf, and the system default configuration file,
/etc/Printsrv/aopd.conf. For more information about the
configuration file, refer to *OS/390 Infoprint Server Customization*.

NLSPATH   Names the directory paths that the **pdf2afp** command and the
ps2afpcommand search for message catalogues.

For information about setting and using environment variables, refer to *OS/390 UNIX System Services User's Guide*.

Files

$HOME/.aopconf
Contains the user-specific Infoprint Server configuration file. This file takes
precedence over **/etc/Printsrv/aopd.conf**.

/etc/Printsrv/aopd.conf
Contains the system default Infoprint Server configuration file.

Exit Values

0   The data were transformed successfully.

>0   An error occurred.

sap2afp—Transform SAP OTF or ABAP Data to AFP Data

Format

sap2afp [**-o** *outputfile*] [**-p** *pagerange*] ... [**-r** *resolution*] [**-s**]

[*inputfile ...*]

Description

The **sap2afp** command transforms a SAP Output Text Format (OTF) or SAP Advanced Business Application Programming (ABAP) Version 1 or Version 2 data stream file into an Advanced Function Presentation (AFP) Presentation Text Object Content Architecture (PTOCA) data stream file. This command is part of the Infoprint Server Transforms product.

If you specify multiple values of the same option, **sap2afp** uses the last value, with the exception of the -**p** option. Up to 20 values of the -**p** option accumulate.

When using the **sap2afp** command, you can specify one or more input files to be transformed. If you do not specify an input file name, or if you specify - as the file name, **sap2afp** uses standard input. The output file name is also optional; if you do not specify one, the **sap2afp** command writes the results to standard output.

Note: The size of the transformed image and the position of SAP data on the page depend on the values that the system administrator has defined.

Options

Note: You can use the **filter-options** job attribute with the **lp** command to pass any of these options except -**o** *outputfile* to the SAP transform.

-**o** *outputfile*
> Specifies the output path and file into which the transformed SAP files are to be written. If you specify more than one output file, the last specified path and file name are used. If you do not specify an output file, the result is written to standard output.
>
> You cannot use -**o** *outputfile* on the command line with the **lp** command. You can only use -**o** *outputfile* with the **sap2afp** command.

-**p** *pagerange*
> Specifies that the output should contain only selected pages. Up to 20 values of the -**p** option accumulate.
>
> The -**p** option counts pages by their actual sequence in the document, not by page number. For example, to write only the last page of a document whose pages are numbered i, ii, 1, 2, 3, 4, specify -p 6.
>
> Examples of values include:
>
> | | |
> |---|---|
> | -p even | Write even pages. |
> | -p odd | Write odd pages. |
> | -p 1-10 | Write the first through tenth pages. |
> | -p 10- | Write pages from the tenth page until the end of the job. |
> | -p 1 -p 3 -p 6 | |
>
> Write the first, third, and sixth pages.

-r *resolution*

> Specifies the resolution used to print image data in the job. Select the correct resolution for the printer on which you intend to print the job.

> Values are:

> **240**   240 pels per inch (for example, IBM 3812, 3825, 3827, 3835, and 3900 printers)

> **300**   300 pels per inch (for example, IBM 3112, 3116, 4019, 4028, 4029, and 4039 printers and Hewlett-Packard printers)

> **480**   480 pels per inch

> **600**   600 pels per inch (for example, the IBM Infoprint 60 and Infoprint 4000 printers)

> The default resolution is the resolution defined by the system administrator.

> **Note:** If you specify a resolution that the printer does not support, Infoprint Server prints the image data under most conditions, but with degraded results.

-s   Suppresses Graphic Object Content Architecture (GOCA) boxes. Some older printers do not print these boxes.

Operand

inputfile

> Specifies an input file to be transformed. If you specify more than one input file name, the **sap2afp** command concatenates the files. The results are written to a single output file (if one is specified) or to standard output.

> If you do not specify an input file, or if you specify a file name of -, **sap2afp** uses standard input.

Customization

You can customize the **sap2afp** transform by modifying the following configuration files:

barcode.tab

> Maps SAP OTF bar code names to the bar codes in Bar Code Object Content Architecture (BCOCA).

defcp.tab

> Maps the Open Systems EBCDIC 1047 code page to the code page associated with the ABAP coded fonts specified in **pagedef.tab**.

fonts.tab

> Maps the fonts used in the OTF data stream to AFP fonts.

image.tab

> Defines values used to print image data.

pagedef.tab

> Specifies the page definition, form definition, ABAP coded fonts, and the value of the OTF print option **PJPAPER**.

*xxxx*0000.tab

> Maps a SAP code page to an AFP code page.

See your system administrator for help with any file that you need to change. Note that even if you change only one configuration file, you must perform these steps in order for **sap2afp** to find the configuration files:

- Copy all the configuration files into the same directory.
- Change the **AOP_SAP2AFP_RESOURCES** environment variable to point to that directory.

Examples

Transform a Job, Specifying Resolution

To transform the SAP ABAP file myfile.abap for printing on a 600-pel AFP printer, and write the result to a file called myfile.afp, enter one of the following commands:

```
sap2afp -r 600 -o myfile.afp myfile.abap
sap2afp -r 600 < myfile.abap > myfile.afp
```

Transform and Print a Job

To transform the SAP OTF file myfile.otf into an AFP data stream, and send the result to the default printer with the **lp** command, enter:

```
sap2afp myfile.otf | lp
```

Environment Variables

The **sap2afp** command uses the following environment variables:

AOP_SAP2AFP_RESOURCES
> Specifies the directory that contains resources for the **sap2afp** transform. The default value is **/usr/lpp/Printsrv/sap2afp**.

AOPCONF
> Names the Infoprint Server configuration file. This variable takes precedence over the user-specific configuration file **$HOME/.aopconf**, and the system default configuration file, **/etc/Printsrv/aopd.conf**. For more information about the configuration file, refer to *OS/390 Infoprint Server Customization*.

NLSPATH
> Names the directory paths that the **sap2afp** command searches for message catalogues.

For information about setting and using environment variables, refer to *OS/390 UNIX System Services User's Guide*.

Files

$HOME/.aopconf
> Contains the user-specific Infoprint Server configuration file. This file takes precedence over **/etc/Printsrv/aopd.conf**.

/etc/Printsrv/aopd.conf
> Contains the system default Infoprint Server configuration file.

barcode.tab, defcp.tab, fonts.tab, image.tab, pagedef.tab, *xxxx*0000.tab
> Customization files for the **sap2afp** transform.

Exit Values

0   The data were transformed successfully.

>0   An error occurred.

Chapter 3. Using Job Attributes

A job is a set of one or more documents that you submit to Infoprint Server for printing in a single printing session. A document is either a file or a group of similar files.

Infoprint Server uses *attributes* to describe jobs and the documents in jobs. For example, you can specify the number of copies of a document to print by setting a value for the **copies** attribute.

You can use the -**o** option of the **lp** command to set attribute values when you submit a job to print from OS/390 UNIX System Services. You can use the OPTIONS parameter of the AOPPRINT JCL procedure to set attribute values when you submit a job to print from OS/390.

Attributes are only one of the factors that determine how your job is printed. The following values also affect your job:
* Print command options. For example, you can use the -**n** option of the **lp** command to specify the number of copies of a job.
* Values in the data stream. For example, the document can specify an overlay.
* Values in the page definition used to print the job. For example, the page definition can specify fonts.
* Values in the form definition used to print the job. For example, the form definition can specify duplex printing.
* Printer specifications. Infoprint Server allows the system administrator to specify printer characteristics for each printer.
  - The system administrator can limit the jobs that a printer can accept. For example, if the system administrator specifies that a certain printer can print at most 5 copies of a job, and you submit a job with a value of 10 for the **copies** job attribute, your job will not be accepted.
  - The system administrator can specify default values for jobs that are printed on a printer. For example, the system administrator can specify the form definition that the printer uses to print jobs that are submitted without a value for the **form-definition** attribute.
* Printer setup. For example, the **duplex** job attribute is not valid for jobs submitted to IP PrintWay printers. If duplexing is not specified in the data stream, the way that the system administrator sets up these printers controls whether they print on one or both sides of the paper.

Abbreviations

This publication shows attribute names and values in their complete form. Often, you can abbreviate attribute names and values by using the first letter of each word in the name or value. For example, you can use the abbreviation **c**-**c**-**t** for the **carriage**-**control**-**type** attribute. You can use **m** for the **machine** value, and specify the attribute and value pair as **c**-**c**-**t=m**.

Sometimes specifying only the first letter in each word is ambiguous. For example, **o**-**b** might stand for either **output**-**bin** or **overlay**-**back**. Here, specify enough of the name so that it is unique, as in **o**-**bi** and **o**-**ba**. If the values are ambiguous, Infoprint Server rejects the command and issues an error message.

Attributes Files

You may want to predefine specific attribute and value pairs in permanent files. You can use the permanent files when you need those specific values within the **lp** command.

Creating an Attributes File

- You can list any job attribute in an attributes file.
- You can also list the command attribute **attributes**. Thus, an attributes file can call other attributes files.

  Note: If an attributes file calls itself, the **lp** command issues an error message.
- Attributes files must not contain any attributes without values.
- When creating an attributes file, consider spelling out the complete attribute names and attribute values rather than using abbreviations.
- You can use spaces between the attribute name and the equals sign to align the equals sign and values. This makes your files easier to read and maintain.
- You can use comment lines in attributes files. The comment starts with a number sign, # , and ends at the end of line.

  For example, you could create an attributes file called **myatts** to request 5 copies of a job, simple duplex printing, and a specific output bin. Your file contains these lines:

  ```
  # These are my job attributes
  copies     = 5
  duplex     = yes
  output-bin = collator # Collate the job
  ```

  Note: You can include a number sign, # , as part of an attribute value if you precede it immediately with a backslash, \# .

Using an Attributes File

Use the -**o** flag to read an attributes file into the **lp** command. For example, to print a file called myfile, using the attributes in the myatts file, enter:

```
lp -o "attributes=myatts" myfile
```

This command is equivalent to the following command:

```
lp -o "copies=5 duplex=yes output-bin=collator" myfile
```

Job Attributes and JCL Parameters

If you have previous experience with OS/390, you are accustomed to using the OUTPUT and DD statements of the Job Control Language (JCL) to specify processing options for print jobs. Many job attributes correspond to parameters of the OUTPUT JCL statement. A few correspond to parameters of the DD JCL statement. For a list of OUTPUT and DD JCL parameters with corresponding job attributes, see "Appendix B. JCL Parameters and Corresponding Job Attributes" on page 123.

Attribute Listing

This section lists job attributes in alphabetical order.

address-text

This **multi**-**valued** attribute specifies one to four lines of address information that can be printed in the address field of a separator sheet.

Allowed Values
You can specify one to four values. If you specify more than one value, separate the values by spaces and enclose the list of values in braces.

For each value, you can enter a text string of up to 60 characters. If the text string you specify contains spaces, enclose the text string in single or double quotation marks, for example:

```
-o "address-text={'Acme Novelties, Inc.' '13 Division St.'
   'Foxboro, MA 02035' USA}"
```

If any string contains double quotation marks, enclose the string in single quotation marks.

Default Value
The default text that the system administrator has defined for the printer.

Usage Guidelines
- This attribute is valid for jobs submitted to all printers.
- Whether the text specified by this attribute is printed depends on how the system administrator configures the printer's separator sheet.
- The **address**-**text** attribute is equivalent to the ADDRESS parameter of the OUTPUT JCL statement.

building-text

This **single**-**valued** attribute specifies building information that can be printed in the building field of a separator sheet.

Allowed Values
You can enter a text string of up to 60 characters. If the text string you specify contains spaces, enclose the text string in single or double quotation marks, for example:

```
-o "building-text='Building 7: third floor'"
```

If the string contains double quotation marks, enclose the string in single quotation marks.

Default Value
The default text that the system administrator has defined for the printer.

Usage Guidelines
- This attribute is valid for jobs submitted to all printers.
- Whether the text specified by this attribute is printed depends on how the system administrator configures the printer's separator sheet.
- This attribute is equivalent to the BUILDING parameter of the OUTPUT JCL statement.

carriage-control-type

This **single**-**valued** attribute identifies the type of carriage control characters that the printer device uses when interpreting and printing this document.

Allowed Values

You can enter one of these fixed values:

ansi
machine
none

Default Value

- For non-HFS data sets, such as partitioned data sets and sequential data sets, Infoprint Server determines the carriage control type from the record format in the data set control block (DCB).
- For HFS data sets, the default is **none**.

Usage Guidelines

- This attribute is most useful for line-data and MO:DCA-P documents.
- This attribute is valid for jobs submitted to all printers.
- Use this attribute when you print documents with carriage controls that are part of a hierarchical file system (HFS). For non-HFS data sets and for MO:DCA-P documents, Infoprint Server can determine the carriage control type.

chars

This **multi-valued** attribute identifies from one to four coded fonts that are used to print a line-data document.

A coded font is a pair of a character set and a code page. Coded font names begin with a two-character prefix (X0 or XZ), followed by up to four alphanumeric characters. `X042B2` is an example of a coded font name. For more information about coded fonts, refer to *IBM AFP Fonts: Font Summary for AFP Font Collection.*

Allowed Values

You can enter a text string that contains the names of the coded fonts. The name of each font can be one to four characters long.

Note: Some coded fonts have six-character names, not counting the prefix. For these coded fonts, refer to *IBM AFP Fonts: Font Summary for AFP Font Collection* for the four-character alternate coded font name.

Omit the two-character prefix from the coded font name or the alternate coded font name.

If you specify more than one coded font, separate the font names by spaces and surround the string of font names with braces, for example:

```
-o "chars={GT10 GT12}"
```

Default Values

1. The default coded fonts that the system administrator has defined for the printer.
2. The coded fonts that the page definition used to print the job specifies.

Usage Guidelines

- This attribute is most useful for line-data documents.
- This attribute is valid for jobs submitted to all printers, but IP PrintWay printers that do not use Print Services Facility (PSF) ignore it.
- PSF for OS/390 uses this attribute only if the page definition used to print the job does not specify fonts, or if the default page definition is used. If you specify

fonts with this attribute and the page definition also specifies fonts, PSF for OS/390 uses the fonts that are named in the page definition.

- If you specify more than one coded font with the **chars** attribute, the job must contain either shift-out-shift-in (SOSI) codes or table reference characters (TRCs) in order to use coded fonts other than the first one. IBM recommends that you do not mix SOSI codes and TRCs.
  - If the job contains TRCs, you must specify the **table-reference-characters** attribute value as **true**. PSF for OS/390 uses the TRC characters to select the corresponding coded font specified with the **chars** attribute.
  - If the job contains SOSI codes, PSF for OS/390 uses the first coded font specified with the **chars** attribute as the single-byte font and the second coded font as the double-byte font.

  Refer to *AFP: Programming Guide and Line Data Reference* and *PSF for OS/390: User's Guide* for more information about using multiple coded fonts.

- This attribute is equivalent to the CHARS parameter of the OUTPUT and DD JCL statements.

copies

This **single**-**valued** attribute specifies the number of copies of each document in the job to print.

Allowed Values
You can enter an integer from 1 to 255.

Default Value
1. The default value that the system administrator has defined for the printer.
2. **1**

Usage Guidelines
- This attribute is valid for jobs submitted to all printers.
- Some line printer daemons (LPDs) do not support printing more than one copy of the same file; in this case, only one copy prints.
- The system administrator can limit the number of copies that a printer can print. Before accepting a job, Infoprint Server verifies that the printer can support the value of this attribute.
- The value you specify for this attribute overrides any value in the form definition that is used to print the job.
- This attribute is similar to the COPIES parameter of the OUTPUT and DD JCL statements.

department-text

This **single**-**valued** attribute specifies department information that can be printed in the department field of a separator sheet.

Allowed Values
You can enter a text string of up to 60 characters. If the text string you specify contains spaces, enclose the text string in single or double quotation marks, for example:

```
-o "department-text='Customer Relations'"
```

If the string contains double quotation marks, enclose the string in single quotation marks.

Default Value

The default text that the system administrator has defined for the printer.

Usage Guidelines

- This attribute is valid for jobs submitted to all printers.
- Whether the text specified by this attribute is printed depends on how the system administrator configures the printer's separator sheet.
- This attribute is equivalent to the DEPT parameter of the OUTPUT JCL statement.

document-codepage

This **single**-**valued** attribute is the name of the code page used to create the document.

Allowed Values

You can enter the name of a code page. See the *OS/390 C/C++ Programming Guide* for a list of code pages.

Default Value

1. The default code page that the system administrator has defined for the printer.
2. The code page for the current locale of OS/390 UNIX System Services. This is usually an extended binary-coded decimal interchange code (EBCDIC) code page.

Usage Guidelines

- This attribute is valid for jobs submitted to all printers.
- To print an American National Standard Code for Information Interchange (ASCII) job, you must use an ASCII code page. If the printer is not defined to use an ASCII code page, you must specify one as the value of this attribute. ISO8859-1 is an example of an ASCII code page.
- Infoprint Server uses this attribute to translate documents before placing them on the Job Entry Subsystem (JES) spool. Because Infoprint Server does not translate data streams such as MO:DCA-P, PCL, or PostScript, it ignores this attribute when printing these data streams.

document-format

This **single**-**valued** attribute identifies the format (data type) of this document.

Allowed Values

You can enter one of these fixed values:

line-**data**
> A data format whose bytes map to characters. Line data is stored as records, for example, in sequential data sets. The records can contain carriage-control characters and table-reference characters. Line data is typically found in mainframe data sets.

text A data format whose bytes map to characters. Text data contains no control characters other than line feed (LF), carriage return (CR), horizontal tab (HT), vertical tab (VT), and form feed (FF). Text data is typically found in workstation files.

modca-**p**
> Mixed Object Document Content Architecture Presentation (MO:DCA-P) data format, defined by IBM.

pcl   Printer Control Language (PCL) data format, defined by Hewlett-Packard.

pdf   Portable Document Format (PDF) data format, defined by Adobe.

postscript
     PostScript data format, defined by Adobe.

sap   SAP Output Text Format (OTF) or SAP Advanced Business Application Programming (ABAP) Version 1 or Version 2 data format, defined by SAP AG.

other   Any other data format.

Default Value
The value that Infoprint Server determines from the contents of the data stream.

Usage Guidelines
- This attribute is valid for jobs submitted to all printers.
- By default, PSF for OS/390 supports only the values **line**-**data**, **text**, and **modca**-**p**. The system administrator can define other supported values.
- If you do not provide a value for this attribute with the **lp** command, Infoprint Server attempts to determine the data format.
- Before accepting a job, Infoprint Server verifies that the printer can support the value of this attribute.

document-type

This **single**-**valued** attribute indicates that the document is either a printable document or a list of printable documents.

Allowed Values
You can enter one of these fixed values:
- **file**-**reference**
- **printable**

Default Value
printable

Usage Guidelines
- This attribute is valid for jobs submitted to all printers.
- A printable document contains data that you want to print.
- A file-reference document is a list of similar printable documents. Separate the document names with spaces, tabs, or new lines, for example:

```
file1.txt
file2.txt
file3.txt
```

  All these documents must have the same format, because Infoprint Server processes them all the same way.
- Do not combine file-reference documents and printable documents in the same job.

duplex

This **single**-**valued** attribute indicates whether to print on one or both sides of the paper and the relative orientation of consecutive pages.

Allowed Values

You can enter one of these fixed values:

no   The job is printed on one side of the paper.

yes   The job is printed on both sides of the paper so that the top of side 1 is the top of side 2 (for side binding).

tumble

The job is printed on both sides of the paper so that the top of side 1 is the bottom of side 2 (for top binding).

Default Value

1. The default value that the system administrator has defined for the printer.
2. The value in the form definition used to print the job.

Usage Guidelines

* This attribute is not valid for jobs submitted to IP PrintWay printers.
* This attribute is valid only for printers that support duplexing.
* The value you specify for this attribute overrides any value in the form definition used to print the job.
* Before accepting a job, Infoprint Server verifies that the printer can support the value of this attribute.
* This attribute is equivalent to the DUPLEX parameter of the OUTPUT JCL statement.

filter-options

This **single**-**valued** attribute allows you to pass options to the transform that converts this document from one data stream to another.

Allowed Values

You can enter a text string that contains the transform options. If the string contains blanks, enclose the string in single or double quotes, for example:

```
-o filter-options='-p 5-12 -p 21-30'
```

Default Value

The default transform values that the system administrator has defined for the printer.

Usage Guidelines

* This attribute is valid for jobs submitted to all printers.
* See "Chapter 2. Printing from OS/390 UNIX System Services Using Infoprint Server Commands" on page 21 for information about transform options.
* The system administrator controls whether the individual transform options that you specify with this attribute override the corresponding values defined by the system administrator. Other options defined by the system administrator are always used. For example, if you specify:

```
-o filter-options='-t overlay'
```

your output type value overrides the predefined output type value only if the system administrator allows it to do so. In any case, the other predefined values, such as the image type, are still in effect.

form-definition

This **single**-**valued** attribute identifies the form definition used when printing this document.

Allowed Values
You can enter a text string of up to 8 characters that contains the identification for this resource. You can specify the form definition name either with or without the **F1** prefix.

Default Value
The default form definition that the system administrator has defined for the printer.

Usage Guidelines
- This attribute is valid for jobs submitted to all printers, but IP PrintWay printers that do not use PSF ignore it.
- If the document has an inline form definition, specify either the name of that form definition or **dummy**.
- This attribute is equivalent to the FORMDEF parameter of the OUTPUT JCL statement.

forms

This **single**-**valued** attribute identifies the form (medium) on which this job is printed.

Allowed Values
You can enter a text string of up to 8 characters.

Default Value
1. The default form that the system administrator has defined for the printer.
2. The default form that the system administrator has defined for the installation.

Usage Guidelines
- This attribute is not valid for jobs submitted to IP PrintWay printers.
- Before accepting a job, Infoprint Server verifies that the printer can support the value of this attribute.
- This attribute is equivalent to the FORMS parameter of the OUTPUT JCL statement.

hold

This **single**-**valued** attribute indicates whether Infoprint Server holds all data sets in the job on the JES spool.

Allowed Values
You can enter one of these fixed values or synonyms:

Fixed Value	Input Synonym
true	yes
false	no

Default Value
1. The default value that the system administrator has defined for the printer.
2. **false**

Usage Guidelines

- This attribute is valid for jobs submitted to all printers.
- A held job remains in the queue until the OS/390 operator releases it.

input-tray

This **single**-**valued** attribute identifies an input tray on the printer device that contains the medium used for normal document pages.

Allowed Values

You can enter any value that the system administrator has defined. Some typical values are the following:

- **alternate**
- **bottom**
- **envelope**
- **large**-**capacity**
- **main**
- **manual**
- **middle**
- **side**
- **top**

Default Value

1. The default input tray that the system administrator has defined for the printer.
2. The input tray that the form definition used to print the job specifies.

Usage Guidelines

- This attribute is not valid for jobs submitted to IP PrintWay printers.
- Before accepting a job, Infoprint Server verifies that the printer can support the value of this attribute.
- The value you specify for this attribute overrides any input tray selection in the data stream or form definition.
- This attribute is similar to the INTRAY parameter of the OUTPUT JCL statement.

jes-priority

This **single**-**valued** attribute indicates the scheduling priority for the job.

Allowed Values

You can enter an integer from 0 to 255.

Default Value

The default value that the system administrator has defined for the printer.

Usage Guidelines

- This attribute is valid for jobs submitted to all printers.
- 255 is the highest priority; 0 is the lowest.
- If the OS/390 system is not configured to honor priority values, it ignores this attribute.
- This attribute is equivalent to the PRTY parameter of the OUTPUT JCL statement.

name-text

This **single**-**valued** attribute specifies name information that can be printed in the name field of a separator sheet.

Allowed Values
You can enter a text string of up to 60 characters. If the text string you specify contains spaces, enclose the text string in single or double quotation marks, for example:

```
-o "name-text='C. J. Brown'"
```

If the string contains double quotation marks, enclose the string in single quotation marks.

Default Value
The default text that the system administrator has defined for the printer.

Usage Guidelines
- This attribute is valid for jobs submitted to all printers.
- Whether the text specified by this attribute is printed depends on how the system administrator configures the printer's separator sheet.
- This attribute is equivalent to the NAME parameter of the OUTPUT JCL statement.

output-bin

This **single**-**valued** attribute specifies the name of the output bin to which you want Infoprint Server to direct the output from your job.

Allowed Values
You can enter any value that the system administrator has defined. Some typical values are the following:

> **bottom**
> **collator**
> **face**-**down**
> **face**-**up**
> **large**
> **left**
> **middle**
> **private**
> **right**
> **side**
> **top**

Default Value
1. The default output bin that the system administrator has defined for the printer.
2. The output bin that the form definition used to print the job specifies.

Usage Guidelines
- This attribute is not valid for jobs submitted to IP PrintWay printers.
- Before accepting a job, Infoprint Server verifies that the printer can support the value of this attribute.
- The value you specify for the **output**-**bin** attribute overrides any output bin that the form definition used to print the job specifies.
- This attribute is similar to the OUTBIN parameter of the OUTPUT JCL statement.

overlay-back

This **single**-**valued** attribute specifies the name of an overlay that PSF for OS/390 prints on the back of each page in a two-sided job. An overlay contains predefined data, such as lines, shading, text, boxes, or logos that can merge with variable data on a page.

Allowed Values
You can enter an overlay name of up to 8 characters. The first character must be alphabetic. Note that for overlays, unlike form definitions and page definitions, you must specify the complete name, including the **O1** prefix.

Default Value
The default overlay that the system administrator has defined for the printer.

Usage Guidelines
- This attribute is not valid for jobs submitted to IP PrintWay printers.
- This overlay prints in addition to any overlay specified by the form definition for the job.
- This attribute is equivalent to the OVERLAYB parameter of the OUTPUT JCL statement.

overlay-front

This **single**-**valued** attribute specifies the name of an overlay that PSF for OS/390 prints on the front of each page in the job. An overlay contains predefined data, such as lines, shading, text, boxes, or logos that can merge with variable data on a page.

Allowed Values
You can enter an overlay name of up to 8 characters. The first character must be alphabetic. Note that for overlays, unlike form definitions and page definitions, you must specify the complete name, including the **O1** prefix.

Default Value
The default overlay that the system administrator has defined for the printer.

Usage Guidelines
- This attribute is not valid for jobs submitted to IP PrintWay printers.
- This overlay prints in addition to any overlay specified by the form definition for the job.
- This attribute is equivalent to the OVERLAYF parameter of the OUTPUT JCL statement.

page-definition

This **single**-**valued** attribute identifies the page definition used to print a line-data document.

Allowed Values
You can enter a text string of up to 8 characters. You can specify the page definition name either with or without the **P1** prefix.

Default Value
The default page definition that the system administrator has defined for the printer.

Usage Guidelines

- This attribute is valid for jobs submitted to all printers, but IP PrintWay printers that do not use PSF ignore it.
- This attribute is valid only for line-data documents.
- If the document has an inline page definition, specify either the name of that page definition or **dummy**.
- This attribute is equivalent to the PAGEDEF parameter of the OUTPUT JCL statement.

print-error-reporting

This **single**-**valued** attribute indicates the type of data fidelity problems (print-positioning errors or invalid-character errors) that the printer reports while printing this document.

Allowed Values
You can enter one of these fixed values:

all   Report both print-positioning and invalid-character errors.
character
      Report only invalid-character errors.
none   Report no errors.
position
      Report only print-positioning errors.

Default Value
The default value that the system administrator has defined for the printer.

Usage Guidelines

- This attribute is valid for jobs submitted to all printers, but IP PrintWay printers that do not use PSF ignore it.
- Before accepting a job, Infoprint Server verifies that the printer can support the value of this attribute.
- This attribute is similar to the DATACK parameter of the OUTPUT JCL statement.

print-queue-name

This **single**-**valued** attribute specifies the name of the print queue on the target printer.

Allowed Values
You can enter a text string up to 127 characters long.

Default Value
The default print queue that the system administrator has defined for the printer.

Usage Guidelines

- This attribute is not valid for jobs submitted to PSF for OS/390 printers.
- You must use this attribute for local area network (LAN) printers not defined by your system administrator.
- This attribute is equivalent to the PRTQUEUE parameter of the OUTPUT JCL statement.

printer-ip-address

This **single**-**valued** attribute identifies the Internet Protocol (IP) address of the target printer.

Allowed Values

You can enter a text string of up to 115 characters. The string must be one of these types of address:

Dotted decimal address
> A series of integers within the range of 0 to 255, separated by periods (decimal address), for example:
>
> 9.99.12.85

Host name
> A series of domain names that can contain alphanumeric characters and dashes (–), separated by periods (.). The first character must be alphabetic or numeric, for example:
>
> leo.boulder.IBM.com

Default Value

The IP address that the system administrator has defined for the printer.

Usage Guidelines

* This attribute is not valid for jobs submitted to PSF for OS/390 printers.
* Use this attribute when you submit jobs to LAN printers not defined by your system administrator.
* When you specify this attribute, you must also specify the **print**-**queue**-**name** attribute.
* For printers attached using the i-data 7913 Intelligent Printer Data Stream™ (IPDS™) Printer LAN Attachment, use the IP address of the 7913.
* This attribute is equivalent to the DEST=IP parameter of the OUTPUT JCL statement.

resource-library

This **multi**-**valued** attribute defines the location for document-specific resources: fonts, form definitions, overlays, and page definitions.

Allowed Values

You can enter 1 to 8 names of OS/390 cataloged data sets. Each name can be up to 44 characters long. Separate multiple library names with spaces and surround the string of library names with braces, for example:

-o 'resource-library={FONT.LIBRARY OVERLAY.LIBRARY}'

Default Values

1. The default resource libraries that the system administrator has defined for the printer.
2. PSF for OS/390 determines the resource libraries.

Usage Guidelines

* This attribute is not valid for jobs submitted to IP PrintWay printers.
* If PSF for OS/390 cannot find a resource, it processes the job and prints error messages at the end of the job. Infoprint Server reports the job as completed.
* This attribute is equivalent to the USERLIB parameter of the OUTPUT JCL statement.

room-text

This **single**-**valued** attribute specifies room information that can be printed in the room field of a separator sheet.

Allowed Values
You can enter a text string of up to 60 characters. If the text string you specify contains spaces, enclose the text string in single or double quotation marks, for example:

```
-o "room-text='Room 306-B'"
```

If the string contains double quotation marks, enclose the string in single quotation marks.

Default Value
The default text that the system administrator has defined for the printer.

Usage Guidelines
- This attribute is valid for jobs submitted to all printers.
- Whether the text specified by this attribute is printed depends on how the system administrator configures the printer's separator sheet.
- This attribute is equivalent to the ROOM parameter of the OUTPUT JCL statement.

shift-out-shift-in

This **single**-**valued** attribute specifies the printer scanning modes used when processing EBCDIC line data that prints with either a single-byte or a double-byte font.

Allowed Values
You can enter one of these fixed values:

one   PSF for OS/390 converts each shift-out, shift-in code to a blank and a Set Coded Font Local text control.

two   PSF for OS/390 converts each shift-out, shift-in code to a Set Coded Font Local text control.

three   PSF for OS/390 converts each shift-in code to a Set Coded Font Local text control and two blanks. It converts each shift-out code to a Set Coded Font Local text control.

Default Value
The default value that the system administrator has defined for the printer.

Usage Guidelines
- This attribute is valid only for line-data documents.
- This attribute is not valid for jobs submitted to IP PrintWay printers.
- For the shift-in, shift-out process to work correctly, either the **chars** attribute or the page definition used to print the job must specify two coded fonts. The first must be a single-byte font, and the second must be a double-byte font.
- IBM recommends that you do not mix SOSI codes and TRCs in the same job.
- This attribute is similar to the PRMODE parameter of the OUTPUT JCL statement.

table-reference-characters

This **single**-**valued** attribute specifies whether the document contains table-reference characters (TRCs). A TRC selects a font character set named by the **chars** attribute or in the page definition used to print the job. A TRC is the first character of each line in the document unless the first character is a carriage control character. In that case, the TRC is the second character.

Allowed Values
You can enter one of these fixed values or synonyms:

Fixed Value	Input Synonym
true	yes
false	no

Default Value
The default value that the system administrator has defined for the printer.

Usage Guidelines
- This attribute is valid only for line-data documents.
- This attribute is valid for jobs submitted to all printers, but IP PrintWay printers that do not use PSF ignore it.
- If the value of this attribute is **true** and the page definition does not identify fonts, you must specify fonts with the **chars** attribute.
- If the line data contains TRCs and you do not specify this attribute, your printed output will not be correct. PSF for OS/390 interprets the TRCs as text characters instead of font identifiers.
- IBM recommends that you do not mix SOSI codes and TRCs in the same job.
- This attribute is equivalent to the TRC parameter of the OUTPUT JCL statement.
- For more information about using table-reference characters, refer to *AFP: Programming Guide and Line Data Reference.*

title-text

This **single**-**valued** attribute specifies title information that can be printed in the title field of a separator sheet.

Allowed Values
You can enter a text string of up to 60 characters. If the text string you specify contains spaces, enclose the text string in single or double quotation marks, for example:

```
-o "title-text='Meeting Agenda'"
```

If the string contains double quotation marks, enclose the string in single quotation marks, for example:

```
-o "title-text='A New Interpretation of "Finnegans Wake"'"
```

Default Value
The default text that the system administrator has defined for the printer.

Usage Guidelines
- This attribute is valid for jobs submitted to all printers.
- Whether the text specified by this attribute is printed depends on how the system administrator configures the printer's separator sheet.
- This attribute is equivalent to the TITLE parameter of the OUTPUT JCL statement.

x-image-shift-back

This **single**-**valued** attribute specifies the X offset, in millimeters, of the logical page origin to the right of the physical page origin on the back side of a double-sided sheet.

Allowed Values
You can enter a value from 0 through 999.999. The value you specify is in the form *nnn.nnn*, which is a number that can optionally contain a decimal point. The unit of measure is millimeters.

Default Value
1. The default X offset that the system administrator has defined for the printer.
2. The X offset that the form definition used to print the job specifies.

Usage Guidelines
- This attribute is not valid for jobs submitted to IP PrintWay printers.
- This attribute overrides the X-offset value in the form definition used to print the job.
- This attribute is similar to the OFFSETXB parameter of the OUTPUT JCL statement.

x-image-shift-front

This **single**-**valued** attribute specifies the X offset, in millimeters, of the logical page origin to the right of the physical page origin on the front of the sheet.

Allowed Values
You can enter a value from 0 through 999.999. The value you specify is in the form *nnn.nnn*, which is a number that can optionally contain a decimal point. The unit of measure is millimeters.

Default Value
1. The default X offset that the system administrator has defined for the printer.
2. The X offset that the form definition used to print the job specifies.

Usage Guidelines
- This attribute is not valid for jobs submitted to IP PrintWay printers.
- This attribute overrides the X-offset value in the form definition used to print the job.
- This attribute is similar to the OFFSETXF parameter of the OUTPUT JCL statement.

y-image-shift-back

This **single**-**valued** attribute specifies the Y offset, in millimeters, of the logical page origin below the physical page origin on the back side of a double-sided sheet.

Allowed Values
You can enter a value from 0 through 999.999. The value you specify is in the form *nnn.nnn*, which is a number that can optionally contain a decimal point. The unit of measure is millimeters.

Default Value

1. The default Y offset that the system administrator has defined for the printer.

2. The Y offset that the form definition used to print the job specifies.

Usage Guidelines

- This attribute is not valid for jobs submitted to IP PrintWay printers.
- This attribute overrides the Y-offset value in the form definition used to print the job.
- This attribute is similar to the OFFSETYB parameter of the OUTPUT JCL statement.

y-image-shift-front

This **single**-**valued** attribute specifies the Y offset, in millimeters, of the logical page origin below the physical page origin on the front of the sheet.

Allowed Values

You can enter a value from 0 through 999.999. The value you specify is in the form *nnn.nnn*, which is a number that can optionally contain a decimal point. The unit of measure is millimeters.

Default Value

1. The default Y offset that the system administrator has defined for the printer.

2. The Y offset that the form definition used to print the job specifies.

Usage Guidelines

- This attribute is not valid for jobs submitted to IP PrintWay printers.
- This attribute overrides the Y-offset value in the form definition used to print the job.
- This attribute is similar to the OFFSETYF parameter of the OUTPUT JCL statement.

Part 3. Printing Batch Jobs from OS/390

There are many ways to submit batch jobs to Infoprint Server from OS/390. This part describes two of them.

- Chapter 4. Printing Batch Jobs from OS/390 Using the AOPPRINT JCL Procedure describes the simplest way to submit batch jobs to Print Services Facility (PSF) for OS/390 or to the IP PrintWay component of Infoprint Server.
- Chapter 5. Printing Batch Jobs from OS/390 Using IP PrintWay describes another way to submit batch jobs to the IP PrintWay component of Infoprint Server. Use this procedure to update and print an existing job or when your system administrator recommends it.
- For another way to submit batch jobs to PSF for OS/390, refer to *PSF for OS/390: User's Guide*. Use this procedure to update and print an existing job or when your system administrator recommends it.
- To submit batch jobs from Virtual Telecommunications Access Method (VTAM) applications to the NetSpool component of Infoprint Server, see "Chapter 6. Printing from VTAM Applications" on page 95. This chapter is in a separate part of this manual because not all VTAM jobs are batch jobs.

If you are not sure what procedure to use to print batch jobs, consult your system administrator.

Chapter 4. Printing Batch Jobs from OS/390 Using the AOPPRINT JCL Procedure

The AOPPRINT Job Control Language (JCL) procedure submits data sets to print from OS∕390. This procedure allows you to take advantage of all the features of Infoprint Server and of the optional Infoprint Server Transforms (5697-F51).

- Because the AOPPRINT JCL procedure provides the full spooling capabilities of Infoprint Server, you can specify job attributes.
- If the Infoprint Server Transforms are installed, you can automatically transform jobs to the Advanced Function Presentation (AFP) data stream.
- Infoprint Server validates jobs that are submitted with the AOPPRINT JCL procedure.

Notes:

1. The AOPPRINT JCL procedure makes more effective use of Infoprint Server than the procedures described in "Chapter 5. Printing Batch Jobs from OS∕390 Using IP PrintWay" on page 77 and in the *PSF for OS/390: User's Guide.* Use the AOPPRINT procedure except in these circumstances:

   - You have to update and print a job that is already coded.
   - Your system administrator tells you that no printer definition corresponds to your job requirements; and the job attributes do not include the options you need. This should happen only if you have unusual job requirements.

2. For information about the JOB, EXEC, DD, and IF∕THEN∕ELSE∕ENDIF JCL statements, which appear in the examples in this chapter, refer to *OS/390 MVS JCL Reference.*

3. For information about the **lp** command, see "lp—Send a Job to a Printer" on page 25.

Parameters

ERRCLASS=*class*
OPTIONS='*attribute=value*'...
OUTCLASS=*class*
PRINTER=*printerdefinition*

Figure 8. AOPPRINT JCL Parameters: Format

ERRCLASS=*class*
  Specifies the 1 character alphanumeric name of the system output data set (sysout) class for error messages. The name of the data set where error messages are written is specified by the STDERR data definition name (DDname).

  Default: Infoprint Server uses the class specified by your system administrator.

OPTIONS='*attribute=value*'...
  Specifies job attributes and values to use in processing the job. For descriptions of all job attributes, see "Attribute Listing" on page 54. Enter the attributes and values in lower case.

You can store attributes and values in a hierarchical file system (HFS) file or in a data set. Use a special attribute called **attributes** to specify the file or DDname from which attributes are to be read, as in these examples:

```
OPTIONS='attributes=BIGJOB.ATT'
OPTIONS='attributes=//''''MVS.DATA.SET'''''
OPTIONS='attributes=//DD:ATTRS'
```

If the attributes are stored in an MVS data set, you must specify four single quotation marks before the data set name and four single quotation marks after it.

See "Creating an Attributes File" on page 54 for how to create an attributes file.

OUTCLASS=*class*
Specifies the 1 character alphanumeric name of the sysout class for informational messages. The name of the data set where informational messages are written is specified by the STDOUT DDname.

Default: Infoprint Server uses the class specified by your system administrator.

PRINTER=*printerdefinition*
Specifies the name of a printer definition created by your system administrator. The printer definition identifies a printer and sets default values for transform options and for some job attributes. The name of the printer definition is case-sensitive. Enter it exactly as your system administrator tells you.

Default: Infoprint Server uses the printer definition specified by your system administrator.

DDnames

STDERR
Specifies the system output data set where error messages are to be written. The ERRCLASS parameter defines the class of this data set.

STDOUT
Specifies the system output data set where informational messages are to be written. The OUTCLASS parameter defines the class of this data set.

SYSIN
Specifies the data set to be printed.

Examples

Print a File on the Default Printer

This example shows how to submit the data set FILE1.LISTPS to your default printer:

```
//JOB1   JOB  707,JONES
//PRINT  EXEC AOPPRINT
//SYSIN  DD   DSNAME=FILE1.LISTPS,DISP=SHR
```

Print a File on a Specified Printer

This example shows how to submit the data set FILE1.LISTPS to the printer fred:

```
//JOB2     JOB  D31,'H. EVANS'
//PRINTPS  EXEC PROC=AOPPRINT,PRINTER='fred'
//SYSIN    DD   DSNAME=FILE1.LISTPS,DISP=SHR
```

Print Multiple Copies of a Data Set

This example shows how to submit a data set to the default printer and to specify two copies of the job:

```
//JOB3    JOB  ,'MARTHA'
//PRINT2  EXEC AOPPRINT,OPTIONS='copies=2'
//SYSIN   DD   DSNAME=MYJOB.PDF,DISP=SHR
```

Note: The line printer daemons (LPDs) for some IP PrintWay printers do not support printing more than one copy of the same file. In this case, only one copy prints.

Specify Attributes Files for a Job

This example shows how to submit the file FILE5.AFPDS to the default printer, specifying the attributes file DEPT.ATT and a set of attributes in the DDname MYATTR:

```
//JOB4      JOB  ,'MARTHA'
//PRINTATT  EXEC AOPPRINT,
//     OPTIONS='attributes="DEPT.ATT" attributes=//DD:MYATTR'
//SYSIN     DD   DSNAME=FILE5.AFPDS,DISP=SHR
//MYATTR    DD   *
input-tray=top
copies=5
title-text='Special Report'
/*
```

Note: In this example, the EXEC statement continues on a second line because a single line would be longer than 71 characters. When you continue a JCL statement, observe these rules:

1. Break after a complete parameter or subparameter, at or before column 71. A comma belongs with the preceding parameter or subparameter.
2. Code // in columns 1 and 2 of the continuation line.
3. Leave column 3 of the continuation line blank.
4. Continue the interrupted parameter or field starting in any column from 4 through 16.

Suppose that the file DEPT.ATT contains these lines:

```
document-format=modca-p
input-tray=bottom
duplex=yes
output-bin=collator
```

The value of **input-tray** in MYATTR overrides the value in DEPT.ATT because you specified MYATTR last.

Submit and Hold a Job

This example shows how to submit the data set FILE1.LISTPS to Printer1 and to hold it so that it does not print until the operator releases it:

```
//JOB5    JOB  (DIV1,GROUP7),OPERATOR
//PRHOLD  EXEC AOPPRINT,PRINTER='Printer1',OPTIONS='hold=true'
//SYSIN   DD   DSNAME=FILE1.LISTPS,DISP=SHR
```

Specify a Code Page for ASCII Jobs

This example shows how to print the data sets JAN.REPORT and FEB.REPORT on the default printer and to specify the code page ISO8859-1:

```
//JOB6    JOB  (DIV1,GROUP7),'ANNE BROWN'
//PRINT  EXEC AOPPRINT,OPTIONS='document-codepage=ISO8859-1'
//SYSIN  DD   DSNAME=JAN.REPORT,DISP=SHR
//       DD   DSNAME=FEB.REPORT,DISP=SHR
```

Print with Error Processing

This example shows how to print the data set `BIGJOB.PCL` on `Printer1`, writing error messages to the data set `BIGJOB.PCL`. This example calls one program if the job succeeds, or a different program if it fails.

```
//JOB8     JOB  ,'MARTHA'
//PRINTERR EXEC AOPPRINT,PRINTER='Printer1'
//SYSIN    DD   DSNAME=BIGJOB.PCL,DISP=SHR
//STDERR   DD   DSNAME=BIGJOB.ERR
//*
//         IF   PRINT.LP.RC ¬= 0 THEN
//FAIL     EXEC PGM=BADJOB
//         ELSE
//SUCCEED  EXEC PGM=GOODJOB
//         ENDIF
```

Print In-Stream Data

This example shows how to print data from the JCL input stream:

```
//JOB9   JOB  D10,CHARLIE
//HELLO  EXEC AOPPRINT
//SYSIN  DD   *
        Hello, world!
/*
```

Exit Values

0   Infoprint Server accepted the request.

>0   An error occurred.

Chapter 5. Printing Batch Jobs from OS/390 Using IP PrintWay

This chapter describes some parameters of the OUTPUT and DD statements of the Job Control Language (JCL). It shows how to code these statements in order to use the IP PrintWay component of Infoprint Server to transmit an output data set to a remote printer or to a host system in your Transmission Control Protocol/Internet Protocol (TCP/IP) network. The printer can be attached to a host through TCP/IP, or it can contain an Internet Printing Protocol (IPP) server.

Note: The procedure described in this chapter makes less effective use of Infoprint Server than the AOPPRINT JCL procedure, which is described in "Chapter 4. Printing Batch Jobs from OS/390 Using the AOPPRINT JCL Procedure" on page 73. For example, the AOPPRINT JCL procedure allows you to specify job attributes and automatically transform jobs to the Advanced Function Presentation (AFP) data stream. Infoprint Server validates jobs submitted with the AOPPRINT JCL procedure, but it does not validate jobs submitted with the procedure described here. Use the AOPPRINT procedure except in these circumstances:

- You have to update and print a job that is already coded.
- Your system administrator tells you that no printer definition corresponds to your job requirements; and the job attributes do not include the options you need. This should happen only if you have unusual job requirements.

Directing Output to a Printer

To transmit your output to a printer, you must direct the output to the IP PrintWay output writer. To do this, specify the Job Entry Subsystem (JES) work-selection criteria that your system administrator has defined for the IP PrintWay output writer, for example, an output class. Consult your system administrator for the appropriate values to specify.

You can select a printer in one of these ways:
- By specifying the printer definition name
- By specifying the printer's Internet Protocol (IP) address
- By specifying an output class, destination name, or form name

Specifying the Printer Definition Name

You can specify a value for the FSSDATA='printer' parameter on the OUTPUT JCL statement. This value is the name of a printer definition created by your system administrator.

If you also specify an IP address, IP PrintWay uses that address to locate the printer. If not, it uses the address in the printer definition. Specify both an IP address and a printer definition when you want to send a job to a printer that the system administrator has not defined, using the values in the printer definition for another printer.

See "Direct Output to a Printer By Specifying the Printer Definition Name" on page 88 for an example.

Specifying the Printer's IP Address

To submit a print data set to a printer for which your system administrator has not created a printer definition, specify a value for the DEST=IP parameter on the OUTPUT JCL statement. This value is the IP address or host name of the system to which the printer is attached.

When you specify DEST=IP, you must also specify a value for either the PRTQUEUE parameter or the PORTNO parameter.

See "Direct Output to a Printer By Specifying a Host Name or an IP Address" on page 89 for an example.

Specifying Class, Destination, or Form

If you do not know the printer definition name or IP address, specify a value for at least one of the CLASS, DEST, and FORMS parameters on the OUTPUT JCL statement. You can specify any or all of these values. IP PrintWay sends the print data set to a printer whose printer definition matches the values that you specify.

Consult your system administrator to determine the values that you can specify.

See "Direct Output to a Printer by Specifying CLASS, FORMS, or DEST" on page 89 for an example.

Parameters

This section describes JCL parameters that have special considerations for use with IP PrintWay. Figure 9 summarizes these JCL parameters.

CLASS=*class*
COPIES=*nnn*
DEST={[*nodename.*]*name* | '[*nodename.*]**IP:***host*'}
FCB=*fcbname*
FORMS=*formname*
FSSDATA='**printer**=*printername*'
NOTIFY=([*nodename.*]*userid,...*)
[**PORTNO**=*portnumber* | **PRTQUEUE**='*printqueue*']
PRTOPTNS='*componentname*'
RETAINF={'*hhhh:mm:ss*' | **FOREVER**}
RETAINS={'*hhhh:mm:ss*' | **FOREVER**}
RETRYL=*nnnnn*
RETRYT='*hhhh:mm:ss*'
SYSOUT=(*class,,formname*)

Figure 9. OUTPUT and DD JCL Parameters: Format

You specify the JCL parameters that are described in Figure 9 on one or both of the following JCL statements:

- DD statement
- OUTPUT statement

The examples included with each parameter show on which JCL statements you can specify each parameter. If you specify the same parameter on both the DD and the OUTPUT JCL statements, the parameter on the DD statement is used.

For more details about how to code these parameters, and for information about the other parameters of the OUTPUT and DD JCL statements, refer to *OS/390 MVS JCL Reference.*

CLASS=*class*

Specifies the 1-character alphanumeric output class of the data set. If you do not specify the FSSDATA='printer' parameter or the DEST=IP parameter, IP PrintWay sends the data set to a printer whose definition matches this class, in combination with the destination name and form name. Consult your system administrator to determine the correct class to specify.

Notes:

1. You can also specify the class in the SYSOUT parameter of a DD JCL statement.

2. If you specify more than one parameter that can be used to locate a printer, IP PrintWay uses the following priorities:

    a. The host name or address specified by the DEST=IP parameter

    b. The address in the printer definition specified by the FSSDATA='printer' parameter

    c. The address in the printer definition that matches the values of any combination of the DEST=*name*, CLASS, and FORMS parameters

Example: To specify a class on an OUTPUT statement, also enter a null class in the SYSOUT parameter of the DD statement:

```
//OUTDS  OUTPUT CLASS=E
//DD1    DD SYSOUT=(,),OUTPUT=(*.OUTDS)
```

COPIES=*nnn*

Specifies the number of copies you want to print, from 1 to 255.

The target system must be able to print a copy for each data set name in the control file that is sent to the line printer daemon (LPD) on the target system. If the LPD does not support multiple copies, then only the original data set is printed.

Note: If the LPD does not support multiple copies, you can print them by specifying multiple values for the OUTPUT parameter of the DD statement, for example:

```
//DD1  DD SYSOUT=(,),OUTPUT=(*,OUTDS1,*,OUTDS1...)
```

This workaround creates multiple output data sets on the JES spool.

IP PrintWay ignores group values that you specify on this parameter.

Examples: You can specify the COPIES parameter on either a DD or OUTPUT JCL statement:

```
//DD1  DD COPIES=14
```

```
//OUTDS  OUTPUT COPIES=14
```

DEST={[*nodename.***]***name* | '[***nodename.***]IP:***host*'}

Specifies either the destination name or the IP address of the printer's host system.

DEST=[*nodename.***]***name*

Specifies the node name and destination name of the printer's host system.

nodename
> Specifies the 1 to 8 character node name of the printer's host system. The node name is optional on an OUTPUT JCL statement. It is not permitted on a DD JCL statement. IP PrintWay ignores the node name, but JES may use it.

name
> Specifies a 1 to 8 character alphanumeric destination name. If you specify the DEST=*name* parameter and do not specify the FSSDATA='printer' parameter, IP PrintWay sends the data set to a printer whose definition matches this destination name, in combination with the output class and form name. Consult your system administrator to determine the correct destination name to specify.

Examples: You can specify the DEST=*nodename.name* parameter only on an OUTPUT JCL statement. You can specify the DEST=*name* parameter, without the *nodename*, on either a DD or OUTPUT JCL statement. If you specify the DEST=*name* parameter on a DD statement, you must also specify the SYSOUT parameter. Otherwise, the system ignores the DEST=*name* parameter after checking it for syntax.

```
//DD1  DD SYSOUT=E,DEST=DEPT001
```

```
//OUTDS  OUTPUT DEST=BOULDER.DEPT001
```

DEST='[*nodename*.]IP:*host*'
> Specifies the node name and the IP address of the printer's host system.

nodename
> Specifies the 1 to 8 character node name of the printer's host system. The node name is optional. IP PrintWay ignores it, but JES may use the node name.

host
> Specifies the 1 to 115 character IP address of the printer's host system in either of these formats:

> **Dotted decimal address**
>> A series of integers within the range of 0 to 255, separated by periods (decimal address), for example:
>> ```
>> 9.99.12.85
>> ```

> **Host name**
>> A series of domain names that can contain alphanumeric characters and dashes (–), separated by periods (.). The first character must be alphabetic or numeric, for example:
>> ```
>> leo.boulder.IBM.com
>> ```

> Always enclose the IP keyword and value in single quotation marks.

> IBM recommends that you use the same method of identifying the host system, either the host name or the IP address, in all references to the host system. Also, use the same lower and uppercase characters. This ensures that data sets transmitted to the same printer are transmitted in the correct order.

Examples: You can specify the DEST=IP parameter only on an OUTPUT JCL statement:

```
//OUTDS  OUTPUT DEST='IP:99.153.123.232'
//OUTDS  OUTPUT DEST='IP:BOULDER.VNET.IBM.COM'
//OUTDS  OUTPUT DEST='NODE01.IP:BOULDER'
```

Notes:

1. JES does not use the host name or the IP address when determining whether the output data set meets its work-selection criteria. Therefore, if your system administrator has defined destination as a JES work-selection criterion, specify DEST=*name* rather than DEST=IP. If you specify DEST=IP, JES will not find a match.

2. If you specify more than one parameter that can be used to locate a printer, IP PrintWay uses the following priorities:

    a. The host name or address specified by the DEST=IP parameter

    b. The address in the printer definition specified by the FSSDATA='printer' parameter

    c. The address in the printer definition that matches the values of any combination of the DEST=*name*, CLASS, and FORMS parameters

FCB=*fcbname*

Specifies the 1 to 4 character name of the forms control buffer (FCB) member of the SYS1.IMAGELIB library. The library is searched first for FCB4*xxxx*, then FCB2*xxxx*, then FCB3*xxxx*, where *xxxx* is the FCB name.

IP PrintWay can use the FCB to format the data set before transmitting it to the printer. Whether it does so depends on how your system administrator has defined the print options.

Notes:

1. The system administrator can specify a default FCB name in the JES initialization member of SYS1.PARMLIB.

2. For more information about the FCB parameter, see "AFP Parameters" on page 88.

Examples: You can specify the FCB parameter on either a DD or an OUTPUT JCL statement.

```
//DD1    DD      FCB=STD2
```

```
//OUTDS  OUTPUT FCB=STD2
```

FORMS=*formname*

Specifies the 1 to 8 character form name. If you do not specify the FSSDATA='printer' parameter or the DEST=IP parameter, IP PrintWay selects a printer whose definition matches this form name, in combination with the output class and destination name. Consult your system administrator to determine the correct form name to specify.

Notes:

1. You can also specify the form name in the SYSOUT parameter of a DD statement.

2. If you specify more than one parameter that can be used to locate a printer, IP PrintWay uses the following priorities:

    a. The host name or address specified by the DEST=IP parameter

    b. The address in the printer definition specified by the FSSDATA='printer' parameter

    c. The address in the printer definition that matches the values of any combination of the DEST=*name*, CLASS, and FORMS parameters

Example: You can specify the FORMS parameter only on an OUTPUT JCL statement.

```
//OUTDS   OUTPUT FORMS=WIDE
```

FSSDATA='printer=*printername***'**
Specifies data to pass to the functional subsystem (FSS) that controls printing. The printer subparameter specifies the 1 to 17 character name of a printer definition. The printer definition identifies a printer and supplies default values for other JCL parameters.

Because the FSS may be running on a case-sensitive system, enter the printer subparameter in *lower case*. Enter the printer definition name exactly as the system administrator tells you.

Notes:
1. If you specify more than one parameter that can be used to locate a printer, IP PrintWay uses the following priorities:
   a. The host name or address specified by the DEST=IP parameter
   b. The address in the printer definition specified by the FSSDATA='printer' parameter
   c. The address in the printer definition that matches the values of any combination of the DEST=*name*, CLASS, and FORMS parameters
2. If you do not specify the FSSDATA='printer' parameter, you must specify either the DEST=IP parameter or at least one of the following parameters: DEST=*name*, CLASS, FORMS.

Example: You can specify the FSSDATA='printer' parameter only on an OUTPUT JCL statement.

```
//OUTDS   OUTPUT FSSDATA='printer=Printer5'
```

NOTIFY=([*nodename.***]***userid,...***)**
Specifies up to 4 userids that IP PrintWay is to notify when the data set has been successfully or unsuccessfully transmitted. Separate the userids with commas.

nodename
Specifies a 1 to 8 character node name. The node name is optional.

userid
Specifies a 1 to 8 character user ID.

IP PrintWay notifies the users when the transmission is successful, when the transmission fails, or when IP PrintWay deletes the data set from the JES spool.

Example: You can specify the NOTIFY parameter only on an OUTPUT JCL statement:

```
//OUTDS   OUTPUT NOTIFY=(SEATTLE.JOE,SEATTLE.MARY)
```

PORTNO=*portnumber*
Specifies the number of the port to use for a direct socket printing connection. The valid range is 100 to 65535.

IP PrintWay uses the number of the port specified in this parameter instead of the port number or the print queue name in the printer definition.

Notes:
1. You can specify either PORTNO or PRTQUEUE, but not both.

2. If you specify DEST=IP, you must also specify a value for either PRTQUEUE or PORTNO.

Note:

Default: IP PrintWay uses the port number or the print queue name defined by the system administrator:
- If you specify FSSDATA='printer', the default is the value in the specified printer definition.
- If you specify DEST=IP and do not specify FSSDATA='printer', there is no default value.
- If IP PrintWay matches the CLASS, DEST=*name*, or FORMS value in a printer definition, the default is the value in that printer definition.

Example: You can specify the PORTNO parameter only on an OUTPUT JCL statement:

```
//OUTDS  OUTPUT PORTNO=2501
```

PRTOPTNS='*componentname***'**
Specifies the 1 to 17 character name of an options component or components that your system administrator has defined. If multiple options components have the same name, they contain different sets of options. For example, one component might contain formatting options and another might contain options used by the line printer requester (LPR).

The formatting options and transmission options in these components override the formatting options and transmission options in the printer definition. Other options defined in these components are not used.

Some formatting options are:
- Whether to use the FCB to format the data set
- How many lines to print on a page
- Whether to print a header on each page
- The names of installation exit routines

Some transmission options are:
- Whether to translate a data set from extended binary-coded decimal interchange code (EBCDIC) to American National Standard Code for Information Interchange (ASCII)
- Whether to transmit multiple data sets in a job at the same time
- The names of installation exit routines

Consult your system administrator for the names of components suitable for your data set. The name is case-sensitive; enter it exactly as your system administrator tells you. Enclose a string of names or a name that contains lower-case letters in single quotation marks.

Default: IP PrintWay determines the default formatting and transmission options as follows:
1. The values defined by the system administrator:
   - If you specify FSSDATA='printer', the defaults are the values in the specified printer definition.
   - If you specify DEST=IP and do not specify FSSDATA='printer', the defaults are the values in the default printer definition.

- If IP PrintWay matches the CLASS, DEST=*name*, or FORMS value in a printer definition, the defaults are the values in that printer definition.

2. Hard-coded default values.

Example: You can specify the PRTOPTNS parameter only on an OUTPUT JCL statement:

```
//OUTDS  OUTPUT PRTOPTNS='PostScript'
```

PRTQUEUE='*printqueue*'
Specifies the 1 to 127 character alphanumeric name of the target print queue.

This parameter may be case-sensitive. For example, on UNIX systems, `lp0` and `LP0` refer to different printers. Enclose a value that contains lower-case letters in single quotation marks.

IP PrintWay uses the print queue specified in this parameter instead of the print queue name or the port number in the printer definition.

Notes:

1. You can specify either PORTNO or PRTQUEUE, but not both.
2. If you specify DEST=IP, you must also specify a value for either PRTQUEUE or PORTNO.

Default: IP PrintWay uses the print queue name or the port number defined by the system administrator:

- If you specify FSSDATA='printer', the default is the value in the specified printer definition.
- If you specify DEST=IP and do not specify FSSDATA='printer', there is no default value.
- If IP PrintWay matches the CLASS, DEST=*name*, or FORMS value in a printer definition, the default is the value in that printer definition.

Example: You can specify the PRTQUEUE parameter only on an OUTPUT JCL statement:

```
//OUTDS  OUTPUT PRTQUEUE='lpd0'
```

RETAINF={'*hhhh*:*mm*:*ss*' | FOREVER }
Specifies the period of time for which IP PrintWay retains the data set on the JES queue after a transmission fails and all requested retries have been attempted.

Specify the time in the format *hhhh*:*mm*:*ss*, where:
hhhh   is the number of hours (range 0 to 9999)
mm   is the number of minutes (range 0 to 59)
ss   is the number of seconds (range 0 to 59)

You can omit zeroes and colons to the left of the significant portion of the time value. Enclose the entire value in single quotation marks.

To retain data sets forever, enter `FOREVER`. In this case, IP PrintWay never automatically deletes failed data sets from the JES spool. The system administrator must delete the data set from the JES spool or retransmit the data set.

IP PrintWay uses the retention value specified in this parameter instead of the value in the printer definition.

Note that the retention period for failed transmissions is separate from the retry limit and time. The retention period indicates the amount of time that IP PrintWay retains data sets on the JES spool *after* the last retry fails.

Default: IP PrintWay determines the default value as follows:
1. The value defined by the system administrator:
   - If you specify FSSDATA='printer', the default is the value in the specified printer definition.
   - If you specify DEST=IP and do not specify FSSDATA='printer', the default is the value in the default printer definition.
   - If IP PrintWay matches the CLASS, DEST=*name*, or FORMS value in a printer definition, the default is the value in that printer definition.
2. No retention.

Examples: You can specify the RETAINF parameter only on an OUTPUT JCL statement:
- The following OUTPUT statement specifies that IP PrintWay should retain the data set on the JES spool for 48 hours.

  ```
  //OUTDS  OUTPUT RETAINF='48:00:00'
  ```
- The following OUTPUT statement specifies that IP PrintWay should retain the data set on the JES spool until the system administrator deletes it or retransmits it.

  ```
  //OUTDS  OUTPUT RETAINF=FOREVER
  ```

RETAINS={'*hhhh*:*mm*:*ss*' | FOREVER}
Specifies the period of time for which IP PrintWay retains the data set on the JES queue after a successful transmission.

Specify the time in the format *hhhh*:*mm*:*ss*, where:
hhhh   is the number of hours (range 0 to 9999)
mm   is the number of minutes (range 0 to 59)
ss   is the number of seconds (range 0 to 59)

You can omit zeroes and colons to the left of the significant portion of the time value. Enclose the entire value in single quotation marks.

To retain data sets forever, enter FOREVER. In this case, IP PrintWay ever automatically deletes successfully-transmitted data sets from the JES spool. The system administrator must delete the data set from the JES spool.

IP PrintWay uses the retention time specified in this parameter instead of the value in the printer definition.

Note that the retention period for successful transmissions is separate from the retry limit and time. The retention period indicates the amount of time that IP PrintWay retains data sets on the JES spool *after* transmission succeeds.

Default: IP PrintWay determines the default value as follows:
1. The value defined by the system administrator:
   - If you specify FSSDATA='printer', the default is the value in the specified printer definition.
   - If you specify DEST=IP and do not specify FSSDATA='printer', the default is the value in the default printer definition.

- If IP PrintWay matches the CLASS, DEST=*name*, or FORMS value in a
  printer definition, the default is the value in that printer definition.
2. No retention.

Examples: You can specify the RETAINS parameter only on an OUTPUT JCL
statement:
- The following OUTPUT statement specifies that IP PrintWay should retain
  the data set on the JES spool for 4 hours.
  ```
  //OUTDS  OUTPUT RETAINS='04:00:00'
  ```
- The following OUTPUT statement specifies that IP PrintWay should not
  retain the data set on the JES spool.
  ```
  //OUTDS  OUTPUT RETAINS='0'
  ```

RETRYL=*nnnnn*
Specifies the maximum number of times that IP PrintWay is to retry an
unsuccessful transmission. Specify a number from 0 to 32767.

IP PrintWay uses the retry limit specified in this parameter instead of the retry
limit in the printer definition.

Default: See Table 2.

Examples: You can specify the RETRYL parameter only on an OUTPUT JCL
statement:
```
//OUTDS  OUTPUT RETRYL=10
```

Table 2. How the RETRYL and RETRYT Parameters Work Together

RETRYL	RETRYT	Result
Blank	Blank or 0	IP PrintWay does not retry the transmission.
Blank	>0 but <5 seconds	IP PrintWay retries the transmission once after the specified interval.
Blank	≥5 seconds	IP PrintWay retries the transmission several times immediately, then once after the specified interval.
0	Any value	IP PrintWay does not retry the transmission.
>0	Blank or 0	IP PrintWay retries the transmission the specified number of times immediately.
>0	>0 but <5 seconds	IP PrintWay retries the transmission the specified number of times at the specified interval.
>0	≥5 seconds	IP PrintWay retries the transmission several times immediately, then the specified number of times at the specified interval.

RETRYT='*hhhh:mm:ss*'
Specifies the time interval between attempts to retransmit an unsuccessful
transmission.

Specify the retry time in the format *hhhh:mm:ss*, where:
hhhh   is the number of hours (range 0 to 9999)
mm   is the number of minutes (range 0 to 59)
ss   is the number of seconds (range 0 to 59)

You can omit zeroes and colons to the left of the significant portion of the time
value. Enclose the retry time in single quotation marks.

IP PrintWay uses the retry time specified in this parameter instead of the retry time in the printer definition.

Note: Consider specifying a short retry time for these reasons:
- Transmission usually fails because the LPD is not receiving data. The LPD is likely to recover either quickly or not at all.
- If transmission fails for some other reason, IP PrintWay does not transmit any other data sets until transmission is successful or the specified number of retries has been attempted, even though the LPD is able to receive data.

Default: See Table 2 on page 86.

Examples: You can specify the RETRYT parameter only on an OUTPUT JCL statement. The following examples both specify that IP PrintWay should retry several times immediately, then wait 1 minute between subsequent retries:
```
//OUTDS   OUTPUT RETRYT='0000:01:00'
//OUTDS   OUTPUT RETRYT=1:00
```

SYSOUT=(*class,,formname***)**
Specifies the class and the form name.

class
Specifies a 1 character alphanumeric class.

formname
Specifies a 1 to 4 character form name.

You can also specify the output class and the form name in the CLASS parameter and FORMS parameter of an OUTPUT statement. To specify a form name longer than 4 characters, you *must* use the FORMS parameter of an OUTPUT statement. See the description of the CLASS parameter and the FORMS parameter for more detail about these parameters.

Examples: You can specify the SYSOUT parameter only on a DD JCL statement:
```
//DD1  DD SYSOUT=(E,,WIDE)
```

Distribution Parameters

You can specify the following distribution parameters on an OUTPUT JCL statement:
> ADDRESS
> BUILDING
> DEPT
> NAME
> ROOM
> TITLE

IP PrintWay does not use the values that are specified in these parameters. They are printed on the separator sheet if your system administrator has set up a sheet that includes them.

For information about these distribution parameters, refer to *OS/390 MVS JCL Reference.*

AFP Parameters

You can specify parameters that Infoprint Manager for Advanced Interactive Executive (AIX), Print Services Facility (PSF) for AIX, and PSF for OS/390 use to print on Advanced Function Presentation (AFP) printers if your installation meets all of these conditions:

- The system where you send a data set is running Infoprint Manager for AIX, PSF for AIX, or PSF for OS/390.
- IP PrintWay uses the LPR/LPD protocol to transmit data.
- The printer definition specifies the **lpr-mode=to-remote-psf** option.

You can specify the following parameters on an OUTPUT JCL statement:
    CHARS
    DATACK
    FCB
    FORMDEF
    PAGEDEF
    PRMODE

> **Note:** SOSI1 and SOSI2 are the only values of PRMODE that are valid for Infoprint Manager for AIX and PSF for AIX.

    TRC
    UCS

You can specify the following parameters on a DD JCL statement:
    CHARS
    FCB
    UCS

IP PrintWay does not use any of these parameters except FCB. (For more information about using FCB, see "Parameters" on page 78.) Instead, it transmits them with the data set to the target system.

Examples

In the following examples, assume that:

- `p9` is the name of a printer definition for a printer attached to a remote system running Infoprint Manager for AIX. Note that the printer definition name is in lower case.
- Class `E` is a JES work-selection criterion for the IP PrintWay output writer (FSA).
- Class `E` and destination `DEPT001` are printer-selection values specified in a printer definition. This printer definition does not specify a form name.
- Class `E`, destination `DEPT002`, and form name `WIDE` are printer-selection values specified in another printer definition.
- `myoptions` is the name of an options component defined by the system administrator. Note that the component name is in lower case.

The following examples are all JES2 examples. For differences between JES2 and JES3, refer to *OS/390 MVS JCL Reference.*

Direct Output to a Printer By Specifying the Printer Definition Name

These examples show how to direct an output data set to a printer by specifying the printer definition name.

Because these examples do not specify retry values, retention periods, or the name of an options component, IP PrintWay uses the values defined by your system administrator in this printer definition. If these values are not defined in the printer definition, IP PrintWay uses the standard defaults described in "Parameters" on page 78.

1. In this example, the OUTPUT statement specifies the printer definition name (p9).

```
//PWAYJOB3 JOB ...
//STEP1    EXEC PGM=USERA
//OUTDS    OUTPUT CLASS=E,FSSDATA='printer=p9'
//DD1      DD SYSOUT=(,),OUTPUT=(*.OUTDS)
```

2. In this example, the OUTPUT statement specifies the printer definition name (p9)and the IP address (99.123.453). IP PrintWay uses this IP address instead of the address defined in p9. It uses the rest of the information in the p9 printer definition.

```
//PWAYJOB3 JOB ...
//STEP1    EXEC PGM=USERA
//OUTDS    OUTPUT CLASS=E,FSSDATA='printer=p9',DEST='IP:99.153.123.232'
//DD1      DD SYSOUT=(,),OUTPUT=(*.OUTDS)
```

Direct Output to a Printer By Specifying a Host Name or an IP Address

These examples show how to direct an output data set to a printer by specifying the host name or IP address of the target system and the name of the print queue.

Because these examples do not specify retry values, retention periods, or the name of an options component, IP PrintWay uses default values defined by your installation in a default printer definition. If no default printer definition exists, IP PrintWay uses the standard defaults described in "Parameters" on page 78.

1. In this example, the OUTPUT statement specifies the host name (BOULDER.IBM.COM) and the name of the print queue (lpd1).

```
//PWAYJOB3 JOB ...
//STEP1    EXEC PGM=USERA
//OUTDS    OUTPUT CLASS=E,DEST='IP:BOULDER.IBM.COM',PRTQUEUE='lpd1'
//DD1      DD SYSOUT=(,),OUTPUT=(*.OUTDS)
```

2. In this example, the OUTPUT statement specifies the IP address (99.123.453) and the name of the print queue (lpd1).

```
//PWAYJOB3 JOB ...
//STEP1    EXEC PGM=USERA
//OUTDS    OUTPUT CLASS=E,DEST='IP:99.153.123.232',PRTQUEUE='lpd1'
//DD1      DD SYSOUT=(,),OUTPUT=(*.OUTDS)
```

Direct Output to a Printer by Specifying CLASS, FORMS, or DEST

These examples show how to specify the class, form name, or destination name to direct an output data set to a printer. IP PrintWay uses a printer whose definition matches the values you specify.

You can override the name of the print queue in the printer definition, as shown in Example 3 on page 90.

1. In this example, the DD statement specifies a class, form, and destination name. The class and destination name match a printer definition. The DD statement also specifies a form name, but the printer definition does not specify one.

Therefore, IP PrintWay does not use the form name as a printer selection criterion. It can send this data set to this printer.

```
//PWAYJOB1 JOB ...
//STEP1    EXEC PGM=USERA
//DD1      DD SYSOUT=(E,,WIDE),DEST=DEPT001
```

Note: If the form name is more than 4 characters, you must specify the name on the OUTPUT statement, as shown in Example 3.

2. In this example, the OUTPUT statement specifies the class and the destination name. It does not specify a form name. A JES default is used for the form name.

```
//PWAYJOB2 JOB ...
//STEP1    EXEC PGM=USERA
//OUTDS    OUTPUT CLASS=E,DEST=DEPT001
//DD1      DD SYSOUT=(,),OUTPUT=(*.OUTDS)
```

3. In this example, the OUTPUT statement specifies the class, form, and destination name. The print queue name, lpd2, overrides the name of the print queue or the port number in the printer definition.

```
//PWAYJOB2 JOB ...
//STEP1    EXEC PGM=USERA
//OUTDS    OUTPUT CLASS=E,FORMS=WIDE,DEST=DEPT002,PRTQUEUE='lpd2'
//DD1      DD SYSOUT=(,),OUTPUT=(*.OUTDS)
```

Direct Output to More Than One Printer

These examples show how to transmit an output data set to more than one printer at the same time by specifying multiple OUTPUT statements. The OUTPUT parameter on the DD statement refers to two OUTPUT JCL statements; therefore, JES creates two output data sets.

1. In this example, the OUTPUT statements specify two different destination names:

```
//PWAYJOB4 JOB ...
//STEP1    EXEC PGM=USERA
//OUTDS1   OUTPUT CLASS=E,DEST=DEPT001
//OUTDS2   OUTPUT CLASS=E,DEST=DEPT002
//DD1      DD SYSOUT=(,),OUTPUT=(*.OUTDS1,*.OUTDS2)
```

2. In this example, the OUTPUT statements specify the IP addresses of two printers:

```
//PWAYJOB5 JOB ...
//STEP1    EXEC PGM=USERA
//OUTDS1   OUTPUT DEST='IP:99.153.123.232',PRTQUEUE='lpd1'
//OUTDS2   OUTPUT DEST='IP:99.153.123.232',PRTQUEUE='lpd2'
//DD1      DD SYSOUT=(E,),OUTPUT=(*.OUTDS1,*.OUTDS2)
```

Specify an Options Component

These examples show how to specify the name of an options component defined by your system administrator.

1. In this example, the OUTPUT statement specifies the name of a printer definition and the name of an options component. IP PrintWay uses the component named myoptions instead of the options in the printer definition.

```
//PWAYJOB6 JOB ...
//STEP1    EXEC PGM=USERA
//OUTDS    OUTPUT FSSDATA='printer=p9',PRTOPTNS='myoptions'
//DD1      DD SYSOUT=(E,),OUTPUT=(*.OUTDS)
```

2. In this example, the OUTPUT statement specifies the name of the print queue and the IP address of the host. IP PrintWay uses the component named myoptions instead of the options in the default printer definition.

```
//PWAYJOB7 JOB ...
//STEP1    EXEC PGM=USERA
//OUTDS    OUTPUT CLASS=E,DEST='IP:99.153.123.232',PRTQUEUE='lpd1',
//         PRTOPTNS='myoptions'
//DD1      DD SYSOUT=(,),OUTPUT=(*.OUTDS)
```

Specify Retry Values

These examples show how to specify the following retry values:

- Retry time of 1 minute. IP PrintWay retries a failed transmission several times immediately, then waits 1 minute between retries.
- Retry limit of 10 times. If the immediate retries fail, IP PrintWay retries a maximum of 10 more times.

1. In this example, the OUTPUT statement specifies a printer definition name. IP PrintWay uses the retry values specified on the OUTPUT statement instead of the values in this printer definition.

```
//PWAYJOB8 JOB ...
//STEP1    EXEC PGM=USERA
//OUTDS    OUTPUT FSSDATA='printer=p9',
//         RETRYL=10,RETRYT='0000:01:00'
//DD1      DD SYSOUT=(E,),OUTPUT=(*.OUTDS)
```

2. In this example, the OUTPUT statement specifies the name of the print queue and the IP address of the host. IP PrintWay uses the retry values specified on the OUTPUT statement instead of the values in the default printer definition.

```
//PWAYJOB9 JOB ...
//STEP1    EXEC PGM=USERA
//OUTDS    OUTPUT CLASS=E,DEST='IP:99.153.123.232',PRTQUEUE='lpd1',
//         RETRYL=10,RETRYT='0000:01:00'
//DD1      DD SYSOUT=(,),OUTPUT=(*.OUTDS)
```

Specify Retention Periods

These examples show how to specify the following retention periods:

- Retention period of 1 day (24 hours) if the transmission is successful
- Retention period of 4 days (96 hours) if the transmission fails

1. In this example, the OUTPUT statement specifies a printer definition name. IP PrintWay uses the retention values specified on the OUTPUT statement instead of the values in this printer definition.

```
//PWAYJOBA JOB ...
//STEP1    EXEC PGM=USERA
//OUTDS    OUTPUT FSSDATA='printer=p9',
//         RETAINF='96:00:00',RETAINS='24:00:00'
//DD1      DD SYSOUT=(E,),OUTPUT=(*.OUTDS)
```

2. In this example, the OUTPUT statement specifies a form and destination name. IP PrintWay uses the retention values specified on the OUTPUT statement instead of the values in the printer definition for the printer that matches this form and destination name.

```
//PWAYJOBA JOB ...
//STEP1    EXEC PGM=USERA
//OUTDS    OUTPUT CLASS=E,FORMS=WIDE,DEST=DEPT001,
//         RETAINF='96:00:00',RETAINS='24:00:00'
//DD1      DD SYSOUT=(,),OUTPUT=(*.OUTDS)
```

3. In this example, the OUTPUT statement specifies the name of the print queue and the IP address of the host. IP PrintWay uses the retention values specified on the OUTPUT statement instead of the values in the default printer definition.

```
//PWAYJOBB JOB ...
//STEP1    EXEC PGM=USERA
//OUTDS    OUTPUT CLASS=E,DEST='IP:99.153.123.232',PRTQUEUE='lpd1',
//         RETAINF='96:00:00',RETAINS='24:00:00'
//DD1      DD SYSOUT=(,),OUTPUT=(*.OUTDS)
```

Specify AFP Resources

This example shows how to specify a page definition and coded font for printing on an AFP printer attached to a system that is running PSF for OS/390, Infoprint Manager for AIX, or PSF for AIX. IP PrintWay prefixes P1 to the specified page definition name before transmitting the value.

```
//PWAYJOBC JOB ...
//STEP1    EXEC PGM=USERA
//OUTDS    OUTPUT CLASS=E,FSSDATA='printer=p9',
//         CHARS=60DB,PAGEDEF=000001
//DD1      DD SYSOUT=(,),OUTPUT=(*.OUTDS)
```

Note: You can specify AFP resources only if IP PrintWay uses the LPR/LPD protocol to transmit data. The printer definition must specify the RECORD option.

Part 4. Printing from VTAM Applications

Chapter 6. Printing from VTAM Applications

The NetSpool component of Infoprint Server lets you print jobs from Virtual Telecommunications Access Method (VTAM) applications, such as Customer Information Control System (CICS) or Information Management System (IMS), without changing the applications. In order to use NetSpool effectively, you should understand:

- The data streams that NetSpool supports, including transparent data
- Differences between printing with NetSpool and printing on Systems Network Architecture (SNA) printers
- End-of-file processing in NetSpool
- Page formatting in NetSpool

Data-Stream Support

NetSpool accepts the following types of VTAM data streams:

- SNA character string (SCS) data over a logical unit (LU) type 1 session.
- 3270 data over an LU type 3 or LU type 0 session.
- Any data, if your system administrator has configured NetSpool to treat VTAM data as binary data. In this case, NetSpool creates variable length records from the data that is received as input without converting or translating any controls or data.

For information about SCS and 3270 data streams, refer to *SNA—Sessions Between Logical Units* and *3270 Information Display System Data Stream Programmer's Reference.* For information about double-byte character set (DBCS) SCS and 3270 data streams, refer to *IBM 3270 Kanji Data Streams.*

NetSpool converts the SCS or 3270 data stream that it receives as input into a series of variable-length print records. Each record starts with an American Standards Association (ASA) carriage-control character.

NetSpool uses default page-formatting values defined by the system administrator if the SCS data stream does not contain Set Horizontal Format or Set Vertical Format commands.

"Appendix C. SCS Code Points" on page 125 describes the code points that NetSpool supports for the SCS data stream.

"Appendix D. 3270 Data Stream Code Points" on page 129 describes the code points that NetSpool supports for the 3270 data stream.

Transparent Data Support (SCS Data Stream)

The Transparent (TRN) control in SCS data streams identifies the start of a transparent data stream. NetSpool supports transparent data by including TRN controls and transparent data in the S/370™ line-data output. NetSpool increases the output column and line position by the number of bytes of transparent data, as specified in a TRN control.

NetSpool provides two installation exits that allow the system administrator to customize the processing of transparent data for all or selected printer names:

- The Beginning of File exit (APIPPTD1) adds transparent data to the beginning of a data set.
- The Transparent Data Control exit (APIPPTD2) inspects, changes, or deletes transparent data whenever it occurs in the data stream.

Double-Byte Character Set (DBCS) Support

NetSpool supports DBCS data in both SCS and 3270 data streams. In an SCS data stream, NetSpool supports the following controls, which identify DBCS strings:

- Shift Out and Shift In controls
- Set Attribute controls, with the Character Set attribute

In a 3270 data stream, NetSpool supports the following controls and orders, which identify DBCS strings:

- Shift Out and Shift In controls
- Set Attribute (SA) orders, with the Character Set attribute
- Start Field Extended (SFE) orders with the Character Set attribute
- Modify Field (MF) orders with the Character Set attribute

In place of these controls and orders, NetSpool inserts Shift Out and Shift In line-data controls where necessary in the S/370 line-data output.

Note: To prevent unwanted blanks in DBCS output, specify the PRMODE=SOSI2 parameter on the OUTPUT JCL statement that NetSpool uses to allocate data sets for the printer name.

Binary Data Support

The system administrator can create a printer definition that specifies that NetSpool should treat input data as binary data. NetSpool writes binary data to the output data set, in variable length records, without examining or converting the data stream.

The system administrator can specify the record size and record format (VB, VBA, or VBM) to use in outputting binary data to the spool.

NetSpool does not process TRN controls in binary data.

Data-Stream Restrictions

For SCS data streams, NetSpool does *not* support the following codes:

- Function Management (FM) headers

  NetSpool cannot handle FM headers because it does not expect FM data requests that it receives to be formatted. NetSpool rejects any request that contains an FM header of function error (X'10030000'), indicating an unsupported function.
- Some SCS commands.

  See "Appendix C. SCS Code Points" on page 125 for details.

For 3270 data streams, NetSpool supports only the following codes:

- Orders in the basic function set, as described in *SNA—Sessions Between Logical Units*
- Shift Out and Shift In controls
- Set Attribute (SA), Set Field Extended (SFE), and Modify Field (MF) orders, with the Character Set attribute. NetSpool ignores other attributes of the SA, SFE, and MF orders. For more information, see Table 8 on page 131.

NetSpool rejects other orders in a 3270 data stream with an SNA sense code of function error (X'10030000'), indicating an unsupported function. Note that the Write Structured Fields (WSF) order is not included in the basic function set and, therefore, is not supported.

NetSpool does not reject unsupported commands or orders in binary data.

Data Encryption and Compression

Encrypted or compressed data sent to NetSpool are decrypted and decompressed as they arrive at the OS/390 system where NetSpool is running. The data remain unencrypted and uncompressed during processing and after placement on the job entry subsystem (JES) spool.

Differences from SNA Network Printing

You may notice differences in the following areas when sending output from VTAM application programs to NetSpool instead of to an SNA network printer:

- Notification of printing

  When you send output to an SNA network printer, a positive response from the printer means that the data has been printed successfully. However, when you send output to NetSpool, a positive response from NetSpool means only that NetSpool has successfully created a JES output data set.

- Data-set printing

  An SNA-network printer prints each VTAM print request separately. However, NetSpool combines several print requests into one output data set, according to installation parameters that are specified by the system administrator.

- Deferred printing

  When you print output on an SNA network printer, each print request is printed immediately. However, JES or the system operator may defer the printing of data sets that are created by NetSpool until system resources are available.

- Printer sharing

  Because an SNA network printer usually has a session limit of 1, your output is usually the only output that is printed on that printer. However, because JES supports printer sharing, data sets from other users may be printed on the same printer. An installation can print distribution information on the header pages to aid in distributing output.

End-of-File Processing

Printing in a JES environment requires that NetSpool keep all related print data together in an output data set on the JES spool. This ensures that related print data is printed in the correct order and is not interleaved with other output.

For printing in the SNA network, the concept of a data set is not necessary. An application starting a session with a printer gains exclusive control of that printer for the duration of the session. Therefore, data always prints in the correct order and is not interleaved with any other application's print output.

In contrast, when you print in a JES environment, the sending application is not guaranteed exclusive control of the printer. Between two successive data sets from one application, nothing prevents the printing of data sets from other applications. If the first attempt to print a data set fails, and a later retry succeeds, two successive data sets from the same application could even be printed in reverse

order. Therefore, to guarantee that data belonging together gets printed in the correct order, without other data between sets, NetSpool batches that data into one data set.

Thus, for printing in a JES environment, NetSpool must determine where one data set should end and the next one should begin. NetSpool receives print data from VTAM applications as a stream of request units (RUs). The SNA architecture defines two groupings of RUs that are of interest:

- A *chain* consists of one or more RUs.
- A *bracket* consists of all of the RUs in one or more related chains.

To assist in determining when end-of-file occurs, NetSpool provides the following end-of-file rules for defining data sets:

- End-of-bracket (the default rule)
- End-of-session
- End-of-chain
- End-of-file indicated by a specified string of data in the file's last end-of-chain request
- End-of-file indicated by the expiration of a timer

The system administrator specifies which end-of-file rule to use. If NetSpool does not correctly determine the end of your data sets, ask the system administrator to specify another end-of-file rule.

Page Formatting

In some cases, the SCS data streams used in LU type 1 sessions depend on a page format that has been preset for the SNA network printer. Instead, NetSpool uses a default page format that IBM supplies or a page format that the system administrator has defined in a component of the Printer Inventory.

If the print data stream contains the SCS commands Set Horizontal Format (SHF) and Set Vertical Format (SVF), the page-formatting values in these commands take effect immediately. They remain in effect for all following print data sets on the same session. If no SHF or SVF command occurs in the print data stream, NetSpool uses the default page format or the page format that the system administrator defines.

These are the page-formatting values:

MPP=*linelength* | **80**
  Specifies the maximum presentation position, that is, the line length. Specify zero or any integer from 1 through 255, inclusive. Zero, the default, uses the device line length, which Print Interface implements as 80 columns.

LM=*leftmargin* | **1**
  Specifies where the left margin starts. Specify zero or any integer from 1 through MPP, inclusive. Zero, the default, uses the architectural default of column 1.

RM=*rightmargin* | **0**
  Specifies where the right margin starts. Specify zero or a number from the left margin (LM) to the line length (MPP), inclusive. Zero, the default, uses the architectural default of the MPP value.

HT=(_tab1,tab2 ..._ **) | 0**

Specifies positions of horizontal tabs. The first tab is always the same as the left margin (LM) value and does not need to be specified. Each tab can be zero or greater than or equal to LM, or less than RM. Zero, the default, is valid and ignored. The application data stream can add additional tab stops but cannot remove default tab stops.

MPL=_pagelength_ **| 1**

Specifies the number of the maximum presentation line, that is, the maximum number of lines to be printed on the page. Specify zero or any integer from 1 through 255, inclusive. Zero, the default, uses the architectural default of 1 line.

TM=_topmargin_ **| 1**

Specifies where the top margin (also channel 1) starts. The top margin is also used as the line number for Select Vertical Channel 1. Specify zero or any integer from 1 through the page length (MPL), inclusive. Zero, the default, uses the architectural default of line 1.

BM=_bottommargin_ **| 0**

Specifies where the bottom margin starts. Specify zero or any integer from top margin (TM), which is also channel 1, to the page length (MPL), inclusive. Zero, the default, uses the architectural default of MPL. A bottom margin of 1 suppresses automatic form feed when the application spaces past the bottom margin.

VT=(_tab1,tab2, ..._**) | 0**

Identifies the position of vertical tabs (also channels 2–12). The first tab is always the same as the top margin value (TM) and does not need to be specified. The first 11 vertical tabs are also used as the line numbers for Select Vertical Channel 2 through 12. Each tab must be either zero or greater than or equal to top margin (TM), which is also Channel 1, and less than or equal to the bottom margin (BM), inclusive. Zero, the default, is valid and ignored. The application data stream can add additional tab stops but cannot remove default tab stops.

If the default page-formatting values are not appropriate for all target printers, the system administrator must define appropriate values in one or more options components of the Printer Inventory.

Note: In the interface that the system administrator uses to define the Printer Inventory, the fields for setting page formatting values are called **SCS-to-Line Conversion** fields.

Part 5. Printing from Remote Systems

Chapter 7. Printing from Windows

Using Infoprint Server, you can print from your Windows 95, Windows 98, Windows NT, or Windows 2000 system to any OS/390 printer. This includes IBM's Advanced Function Presentation (AFP) printers, also known as Intelligent Printer Data Stream (IPDS) printers.

Infoprint Server provides the following programs that run on a Windows system:

AFP Printer Driver for Windows
> The AFP Printer Driver allows you to print to AFP printers. It creates output files in AFP format. These files can contain documents, overlays, or page segments. Refer to *PSF for OS/390: User's Guide* for information about overlays and page segments.
>
> **Note:** If the Infoprint Server Transforms are installed on OS/390, you can submit PostScript and PCL jobs to AFP printers. The Infoprint Server Transforms automatically convert jobs to the AFP data stream.

AFP Viewer plug-in for Windows
> The AFP Viewer plug-in allows you to view files in AFP format from a Web browser. For example, you can download AFP files from your OS/390 host system and view them. You can also view files that are in AFP format on the Web. Using the AFP Viewer plug-in, you can print AFP files to non-AFP printers as well as to AFP printers.

OS/390 Printer Port Monitor for Windows
> The OS/390 Printer Port Monitor allows you to print from Windows applications to any OS/390 printer that your OS/390 system administrator has defined to Infoprint Server and that you have defined to your Windows system. The printer can be attached directly to the OS/390 system or can be a printer in your Transmission Control Protocol/Internet Protocol (TCP/IP) local area network (LAN). The OS/390 Printer Port Monitor allows you to specify job attributes when you print.
>
> The OS/390 Printer Port Monitor is an alternate to the Server Message Block (SMB) printing protocol, used by Windows 95, Windows 98, and Windows NT; or to the Internet Printing Protocol (IPP), used by Windows 2000. Because Infoprint Server provides transparent support for both these protocols, the OS/390 Printer Port Monitor is optional.

Getting Started

You can install any or all of these programs, depending on your needs:

- To print to AFP printers, install the AFP Printer Driver. Your Windows administrator may also tell you to install the OS/390 Printer Port Monitor to improve performance or to allow you to specify job attributes.
- To print to non-AFP printers, you may not have to install any of these programs. However, your Windows administrator may tell you to install the OS/390 Printer Port Monitor to improve performance or to allow you to specify job attributes.
- To view files that are in AFP format, install the AFP Viewer plug-in.

Note: The installation instructions in this chapter are current as of publication. If the product files are subsequently updated, the installation instructions may change. The Web site at **http://www.ibm.com/printers** will have the latest instructions.

Requirements

These programs require Windows 95, Windows 98, Windows NT (Version 3.51 or higher), or Windows 2000. The Microsoft TCP/IP protocol must be configured and operational.

The AFP Viewer plug-in also requires Netscape Navigator (Version 3.01 or later) or Microsoft Internet Explorer (Version 3.01, Level 4.70.1215 or later).

Downloading Files

Use one of the following methods to download files to your workstation. Alternatively, your Windows administrator can download the files to a shared Windows folder.

- Download each program separately from the Web at **http://www.ibm.com/printers**.
- Use a file transfer program, such as **ftp**, to download the files in **binary**. To download the files, you need an account on the OS/390 system where Infoprint Server is installed.

  Download the AFP Printer Driver and the OS/390 Printer Port Monitor from one of the following OS/390 directories, depending on the language version you want:

English	**/usr/lpp/Printsrv/win/En_US**
Japanese	**/usr/lpp/Printsrv/win/Ja_JP**
Spanish	**/usr/lpp/Printsrv/win/Es_ES**

  Download the AFP Viewer plug-in from the English directory:

English	**/usr/lpp/Printsrv/win/En_US**

  Download one or more of the following files:

afpdrv95.exe	AFP Printer Driver for Windows 95 and 98
afpdrvnt.exe	AFP Printer Driver for Windows NT and 2000
afpviewr.exe	AFP Viewer plug-in for Windows 95, 98, NT, and 2000
aopwin.exe	OS/390 Printer Port Monitor for Windows 95, 98, NT, and 2000

The following examples assume that you downloaded files to folder **c:\temp**.

Installing Files

This section describes how to install the files in a Windows folder on your workstation.

You do not need to install the OS/390 Printer Port Monitor or the AFP Printer Driver on your workstation if your Windows administrator has installed these programs on the Windows server and used the OS/390 Printer Port Monitor to configure the OS/390 printers as shared printers. However, to use the AFP Viewer plug-in, you need to install the AFP Viewer plug-in on your own workstation.

Installing the AFP Printer Driver for Windows 95 and 98

To install the AFP Printer Driver on a Windows 95 or Windows 98 system, run the **afpdrv95** command to extract files. Specify a Windows folder for the extracted files. For example, if you downloaded the driver to folder **c:\temp** and want to place the extracted files in folder **d:\afpdriver**, in the Run dialog, type:

```
c:\temp\afpdrv95 d:\afpdriver
```

Installing the AFP Printer Driver for Windows NT and 2000

To install the AFP Printer Driver on a Windows NT or Windows 2000 system, run the **afpdrvnt** command to extract files. Specify a Windows folder for the extracted files. For example, if you downloaded the driver to folder **c:\temp** and want to place the extracted files in folder **d:\afpdriver**, in the Run dialog, type:

```
c:\temp\afpdrvnt d:\afpdriver
```

Installing the AFP Viewer Plug-in

To install the AFP Viewer plug-in:

1. Install the Web browser on your workstation.
2. Run the **afpviewr** command to extract files. For example, if you downloaded the viewer to folder **c:\temp**, type the following command in the Run dialog:
   ```
   c:\temp\afpviewr
   ```
3. If your Web browser is running, stop and restart it.

Installing the OS/390 Printer Port Monitor

Attention: If you are currently using the OS/390 Printer Port Monitor for OS/390 Version 2 Release 5, Version 2 Release 6, or Version 2 Release 7, you must uninstall it before trying to install this port monitor for OS/390 Version 2 Release 8.

To install the OS/390 Printer Port Monitor:

1. Run the **aopwin** command to extract files and specify a Windows folder to contain the extracted files. For example, if you downloaded the port monitor to folder **c:\temp** and want to place the extracted files in folder **c:\390temp**, type the following command in the Run dialog:
   ```
   c:\temp\aopwin c:\390temp
   ```
2. Run the **setup** command for the OS/390 Printer Port Monitor. For example, in the Run dialog, type:
   ```
   c:\390temp\setup
   ```

   The **setup** command asks you where you want to install files. Specify a directory on a drive that has enough space to temporarily hold files you want to print.
3. Restart your Windows system.

Deleting Files

After installing the files, you can delete the files that you downloaded to your workstation. If you downloaded files to the folders that are shown in the examples, delete these files:

- File **c:\temp\afpdrv95.exe**
- File **c:\temp\afpdrvnt.exe**
- File **c:\temp\afpviewr.exe**
- File **c:\temp\aopwin.exe**
- Files in folder **c:\390temp**

Adding an OS/390 Printer

Before you can print to an OS/390 printer, you must define the OS/390 printer to your Windows system. Ask your Windows administrator which of the following procedures to use:

- On Windows 2000, your administrator may tell you to define the printer as an Internet printer.
- If your Windows administrator has defined the printer as a shared printer in your Windows network, define it to your system as a network printer.
- If your Windows administrator has not defined the printer as a shared printer in your Windows network, define it to your system as a local printer.

Adding an Internet Printer

To define an OS/390 printer to your Windows 2000 system as an Internet printer, follow these steps:

1. Ask your OS/390 system administrator for the following information:
   - The Uniform Resource Identifier (URI) of the printer. The URI may start with **http:**//, like the Uniform Resource Locator (URL) of a Web page; or it may start with **ipp:**//.

     Be careful to note the exact spelling of the URI. Upper and lower case letters are *not* equivalent.
   - The manufacturer and model number of the printer.
   - The name of the printer driver to use. This driver may be available online; or the system administrator may give it to you on a diskette or CD-ROM.

2. Use the standard Windows procedure to add a printer, and follow these special steps:
   a. When the **Add Printer Wizard** asks you whether to install the printer as a local printer or a network printer, select **Network printer**.
   b. When the **Add Printer Wizard** asks you how to connect, select **Connect to a printer on the Internet or your company's intranet**. Enter the URI of the printer in the **URL** field.
   c. When the **Add Printer Wizard** asks you whether to install the printer driver, select **Yes**.

      While Windows is installing the printer driver, the **Add Printer Wizard** returns to the screen where you entered the URI. For some time, it may seem that nothing is happening. Do *not* cancel the job. Wait for the **Add Printer Wizard** to go on to the next screen.

Adding a Network Printer

If your Windows administrator has defined the OS/390 printer as a shared printer in your Windows network, follow these steps:

1. Ask your Windows administrator for the name that he or she has assigned to the printer.
2. Follow standard Windows procedures to add the OS/390 printer as a network printer.

Adding a Local Printer

If your Windows administrator has not defined the OS/390 printer as a shared printer in your Windows network, follow these steps to install it as a local printer:

1. Ask your OS/390 system administrator for the following information:
   - The host name or the Internet Protocol (IP) address of the OS/390 system.
   - The port number for the OS/390 system. The default is 515.

- The name of the printer to use. This is the name your system administrator used when defining the printer to Infoprint Server.
- The name of the printer driver to use.
- If you installed the AFP Printer Driver, the model number of the AFP printer.
- If you installed the AFP Printer Driver, the resolution of the printer.

2. Use the standard Windows procedure to add a printer, and follow these special steps, which may occur in a different order on your Windows system:

   a. When the **Add Printer Wizard** asks you to select a port, follow these steps if you installed the OS/390 Printer Port Monitor:

      1) Select the **OS/390 Port**, and click **Configure** to configure it.

      2) On the OS/390 Printer Port Configuration panel, follow the online instructions to connect to the OS/390 system and select the printer.

         The **Options** button on this panel displays a screen where you can specify job attributes. By default, these attributes will apply to every job you send to this printer.

         - In the Separator Sheet box, fill in the information that you want to appear on the cover sheet printed before each job. Whether a field is printed depends on how your system administrator has configured the separator sheet.
         - In the **Job Attributes** field, enter any of the job attributes described in "Chapter 3. Using Job Attributes" on page 53. For example, if you want the printer to print jobs on both sides of the paper, enter:

           ```
           duplex=yes
           ```
         - If you think that you may want to specify different attributes for some jobs, select the **Prompt for attributes when printing** check box.

   b. When the **Add Printer Wizard** asks you to select a printer, follow these steps if you want to select the AFP Printer Driver:

      1) Select **Have Disk**.

      2) On the next panel, type the location of the Windows folder in which you installed the driver files, for example, **d:\afpdriver**, and click **OK**.

      3) Select the model number of the OS/390 printer.

         If the model number is not on this list, select **IBM AFP** *nnn*, where *nnn* is the resolution of the printer. Then, change the printer characteristics as described in step 3, under "Configuring the AFP Printer Driver".

3. To add a second OS/390 printer, you must add and configure another OS/390 printer port if you installed the OS/390 Printer Port Monitor. The **Readme** file installed with the OS/390 Printer Port Monitor contains step-by-step instructions for adding another port. To find the **Readme** file:

   a. Open the **Programs** folder from the Windows Start menu.

   b. Open the **OS/390 Printer Port Monitor** folder.

   You can keep the **Readme** file open while you perform the steps that are required to add an OS/390 printer.

Configuring the AFP Printer Driver

After adding a printer, you can optionally configure the AFP Printer Driver to change default printing options and specify printer characteristics, if necessary. Follow these steps to configure the driver:

1. In the Windows **Printer** folder, highlight the icon for the printer.
2. Do one of the following, depending on your Windows system:

- In Windows 95 or Windows 98, from the File menu, select **Properties**. Then select the **Paper** and **Options** tabs of the notebook.
- In Windows NT or Windows 2000, from the File menu, select **Document Defaults** and **Properties**.

3. Specify the default printing options and printer characteristics. To specify the following printing options, select **Inline Form Definition** from either the **Options** tab (Windows 95 or 98) or from the **Document Defaults** dialog (Windows NT or 2000):
   - Duplex printing (printing on 2 sides of the paper)
   - Printing of an overlay (electronic form)
   - Paper source on the printer (input tray)

   For faster printing of large files, consider turning on the **Use substitution table** option (Windows 95 or 98) or turning off the **Print text as graphics** option (Windows NT or 2000). This causes the driver to create a smaller output file. First, ensure that your printer can perform font substitution. Also, note that if you use True-Type fonts, the document may not print with exact fidelity. For better resolution, you can try changing the **Output Fidelity** options on the driver.

   Usually, the printer characteristics, such as whether or not the printer can perform font substitution and handle compressed images, and the supported clip limits, are already set correctly. However, if the name of the AFP Printer Driver is **IBM AFP** *nnn*, where *nnn* is the resolution of your printer, you may need to change the printer characteristics to match those of the printer. Ask your system administrator for the needed information, or consult the printer documentation.

Printing and Viewing Files

After installing the print programs, adding an OS/390 printer, and configuring the AFP printer driver, you can print to OS/390 printers, including AFP printers. You can also view files in AFP format.

To print, use the standard print mechanism on any Windows application that supports printing.

If you installed the OS/390 Printer Port Monitor and selected **Prompt for attributes when printing** when you added the printer, the Infoprint Server for OS/390 Options dialog will appear whenever you print a job. In the **Job Attributes** field, you can add the attributes described in "Chapter 3. Using Job Attributes" on page 53, or change any of the default attributes that you entered when you added the printer. For example, the **Job Attributes** may display the following default:

```
duplex=yes
```

You want to print this job on only one side of the paper, and you want three copies. Change the **Job Attributes** field to read:

```
duplex=no copies=3
```

To view an AFP file with the AFP Viewer plug-in, open the file from the File menu of your Web browser. The AFP file must have a file extension of **.afp** or be an AFP file from a Hypertext Transfer Protocol (HTTP) server with a MIME type of **application/vnd.ibm.modcap**. Using the AFP Viewer plug-in, you can also print an

AFP file to an AFP printer or to a non-AFP printer. The printer must be defined to your Windows system. To print, click the print icon on the Viewer toolbar to print the entire document or selected pages.

To view AFP files that reside on the OS/390 system, first use a transfer program such as **ftp** to download the AFP file in **binary** to your Windows workstation. Give the file on your Windows workstation a file extension of **.afp**.

Chapter 8. Printing from Remote Systems in a TCP/IP Network

From workstations where Transmission Control Protocol/Internet Protocol (TCP/IP) is installed, you can use standard printing commands. Refer to the documentation for each remote system for the syntax of the commands.

Notes:

1. Infoprint Server may ignore some command options. For example, it ignores the command codes that contain information for printing on separator pages if your system administrator has not configured the separator pages to show this information.

2. Infoprint Server accepts commands that are sent from any port on the sending host.

3. If the Infoprint Server Transforms are installed, you can automatically transform jobs to the AFP data stream.

Submitting a Print Request

You can use the **lpr** command to submit a print request. From an Advanced Interactive Executive (AIX) system, you can also use the **enq** and **qprt** commands.

Ask your system administrator for the following information:

- The host name or Internet Protocol (IP) address of the OS/390 system on which Infoprint Server is running.
- The name of the printer definition that the system administrator has created for the printer. Specify this name as the name of the printer or print queue.
- The name of the printer driver for the OS/390 printer, for printing from a workstation.

After receiving a print request, Infoprint Server returns either an error message or a job identifier. The job identifier indicates that Infoprint Server has accepted the print request. You can use the job identifier to query the status of the print request or to cancel the print request.

Querying a Print Request

You can use the **lpq** command to query the names, locations, and descriptions of printers and to query the status of a print request. From an AIX system, you can also use the **qstat** command.

When you query the status of a print request, Infoprint Server returns one of the following states:

pending   The file is waiting to print.

         Note: Because JES3 cannot distinguish job states, in a JES3 environment Infoprint Server may return **pending** for files that have been selected for processing or held on the JES spool.

processing   The file has been placed on the JES spool and selected for processing. It may be:

- Being transmitted to a local area network (LAN) printer or to a print server
- Printing

held   The file is held on the JES spool and cannot print for one of these reasons:

- The user specified **hold=true** when submitting the job.

    Note: JES3 does not recognize a job that is held for this reason and returns **pending**.
- The operator held the job.

completed   The file has been processed successfully. It remains on the JES spool for one of these reasons:

- Other files in the job are still being processed. The file will be removed from the spool after all files in the job have been processed.
- Your system administrator has specified that files should be retained after transmission to a LAN printer or to a print server. The file will be removed from the spool when the retention period expires.

failed   Processing has failed. The file remains on the JES spool for one of these reasons:

- Transmission to a LAN printer or to a print server has failed. Your system administrator has specified that files should be retained after transmission. The file will be removed from the spool when the retention period expires.
- An error occurred during processing. The file is held.

purged   The file was deleted before printing.

Printing From a Windows 3.1 Workstation

To print from a Windows 3.1 system, either within a Windows application or from the DOS command line, you must configure TCP/IP on the Windows operating system. During TCP/IP configuration, specify the name or IP address of the OS/390 system and the name of the printer definition. Then, you must add the OS/390 printer to the Windows operating system.

Printing From an AIX Workstation

To print from an AIX system, you must configure a remote queue. During configuration of the remote queue, specify the host name or IP address of the OS/390 system as the host name. Specify the name of the printer definition as the queue name. Specify **BSD** as the type of print spooler.

After configuring the remote queue, specify the name of the remote queue on the **lpr** command, for example:

```
lpr -p remotequeue -o "XAOP attribute=value..." filename
```

where:

-p *remotequeue*
    Specifies the name of the remote queue.

-o "XAOP *attribute=value...*"

-o 'X *attribute=value...*'
Specifies any job attributes you want to use to print the job. If there are any spaces or special characters in the list of job attributes, surround the string with single or double quotation marks.

For a list of job attributes that you can specify, see "Chapter 3. Using Job Attributes" on page 53.

If there are errors in the list of attributes and you use the **XAOP** form of the prefix, the job is rejected. If you use the **X** form of the prefix, the job is processed without the attributes.

filename
Specifies the name of the file you want to print.

Printing from an OS/2 Workstation

You can print from an IBM Operating System/2 (OS/2) system that uses TCP/IP version 3.0, either from within an OS/2 application or by the drag-and-drop method of printing. You must first configure TCP/IP, then add an OS/390 printer. When you add a printer, specify the host name or IP address of the OS/390 system as the line printer daemon (LPD) server. Specify the name of the printer definition as the LPD printer.

To use the drag-and-drop method of printing, select a document icon and drag it to the new OS/390 printer icon to submit the job.

To print to the OS/390 printer from the command line, use the **lpr** command. For example:

```
lpr -p printerdefinition -s hostaddress filename
```

where:

-p *printerdefinition*
Specifies the name of the printer definition.

-s *hostaddress*
Specifies the IP address or host name of the OS/390 host on which Infoprint Server is running.

filename
Specifies the name of the file you want to print.

Printing From A Remote OS/390 System

To print from a remote OS/390 system, use the LPR command from a TSO session:

```
LPR 'filename' (P printerdefinition AT hostaddress
```

where:

filename
Specifies the name of the file you want to print.

P *printerdefinition*
Specifies the name of the printer definition.

AT *hostaddress*
Specifies the IP address or host name of the OS/390 host on which Infoprint Server is running.

Printing from a VM System

To print from a Virtual Machine (VM) system, use the LPR command. For example:

```
LPR filename (PRINTER printerdefinition HOST host_address
```

where:

filename
> Specifies the file name, file type, and file mode of the file you want to print.

PRINTER *printerdefinition*
> Specifies the name of the printer definition.

HOST *hostaddress*
> Specifies the IP address or host name of the OS/390 host on which Infoprint Server is running.

Printing from an AS/400 System

The most convenient way to print from an Application System/400 (AS/400) system is to perform these steps:

1. Define a remote print queue for a printer that your system administrator has defined to Infoprint Server, if the system administrator has not already done so. To do this:

    a. Enter the CRTOUTQ command on the AS/400 command line.

    b. Fill in the panels as follows:

       Output queue
       > The name you want to give to the remote output queue.

       Remote system
       > The host name or IP address of the OS/390 system on which Infoprint Server is running.

       Remote print queue
       > The name of a printer definition that your system administrator has created.

       Writers to autostart
       > 1

       Connection type
       > *IP

       Destination type
       > *OTHER

       Host print transform
       > Specify *NO to print the Advanced Function Presentation (AFP) data stream. Specify *YES to print the Systems Network Architecture (SNA) character string (SCS) data stream.

       Manufacturer type and model
       > *WSCST

       Workstation customizing object
       > QSYS/QPDEFAULT

2. Submit the file you want to print to the remote print queue exactly as you would submit it to a local print queue.

3. Enter the following command to start a remote printer writer:

```
STRRMTWTR outputqueuename
```

where *outputqueuename* is the name of the remote output queue. The remote printer writer takes files from the output queue and sends them to the printer.

4. To end the remote printer writer, enter the following command:

```
ENDWTR outputqueuename
```

You can also use the LPR command to send files to OS/390. The files must already be on the spool, in a queue that does not have a printer writer started against it. You do not define a remote output queue, but you specify many of the same options for the LPR command as you would for a remote output queue. You can also specify job attributes on the LPR command. For example:

```
LPR RMTSYS(hostname) PRTQ('printqueue') FILE(filename)
   JOB(jobid/userid/jobname) SPLNBR(n) MFRTYPMDL(*WSCST)
   WSCST(QSYS/QWPDEFAULT) TRANSFORM(*NO)
   DESTOPT('XAOP attribute=value...')
```

where:

RMTSYS(*hostname*)
Specifies the host name of the OS/390 host on which Infoprint Server is running.

PRTQ('*printqueue*')
Specifies a print queue defined in a printer definition. If the print queue name contains lower-case characters, you must surround it in single or double quotation marks.

FILE(*filename*)
Specifies the file name of the file you want to print.

JOB(*jobid/userid/jobname*)
Identifies the job by number, user ID of the job owner, and name. You can determine this information by entering the WRKOUTP command to view a list of spooled files.

SPLNBR(*n*)
Specifies the spool file number of the file you want to print. You can determine the spool file number by viewing a list of spooled files.

MFRTYPMDL(*WSCST)
Specifies that the manufacturer, type, and model of the printer are as defined in the workstation customizing object.

WSCST(QSYS/QWPDEFAULT)
Specifies the workstation customizing object as QSYS/QWPDEFAULT.

TRANSFORM({*YES|*NO})
Specifies whether to transform the data to American National Standard Code for Information Interchange (ASCII) format. Specify *YES for SCS data; *NO for AFP data.

DESTOPT("XAOP *attribute=value...*")

DESTOPT('X *attribute=value...*')
Specifies any job attributes you want to use to print the job. If there are any spaces or special characters in the list of job attributes, surround the string with single or double quotation marks.

For a list of job attributes that you can specify, see "Chapter 3. Using Job Attributes" on page 53.

If there are errors in the list of attributes and you use the XAOP form of the prefix, the job is rejected. If you use the X form of the prefix, the job is processed without the attributes.

Chapter 9. Printing from Remote Systems in a Novell Netware Network

You can use standard printing procedures to submit jobs to Infoprint Server from clients connected to a Novell NetWare 3.x, 4.x, or 5.x server. The Novell NetWare server must be connected by OS/390 LANRES to the OS/390 system where Infoprint Server is installed.

Before you can submit jobs to Infoprint Server, your system administrator must perform these tasks:

1. Create a NetWare print queue. You must know the name of this print queue in order to submit jobs to Infoprint Server.
2. Configure the LANRES Local Area Network (LAN)-to-Host print procedures data set according to the instructions in the prologue of the AOPLRXIT EXEC. Your system administrator installed this EXEC in the AOP.SAOPEXEC library on OS/390 as part of the Infoprint Server installation.

Part 6. Appendixes

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Appendix A. Job Attributes Valid for Different Printer Types

Infoprint Server supports three types of printers:

- Advanced Function Presentation (AFP) printers that use Print Services Facility (PSF) for OS/390 to print jobs (PSF for OS/390 printers)
- Local area network (LAN) printers that use IP PrintWay to transmit the print job (IP PrintWay printers)
- General printers (all other printers)

Table 3 shows which job attributes are valid for which printer types. Even if a job attribute is valid for a printer type, a given printer of that type may not support all possible values of that attribute. For some job attributes, the system administrator can define the values that each printer supports. Before accepting a job, Infoprint Server verifies that the printer supports the values of these attributes.

Table 3. Job Attributes Valid for Different Printer Types

Job Attribute	PSF for OS/390	IP PrintWay	General	Value Validated for Printer
address-text[1]	Yes	Yes	Yes	No
building-text[1]	Yes	Yes	Yes	No
carriage-control-type	Yes	Yes	Yes	No
chars	Yes	Yes[2]	Yes	No
copies	Yes	Yes	Yes	Yes
department-text[1]	Yes	Yes	Yes	No
document-codepage	Yes	Yes	Yes	No
document-format	Yes	Yes	Yes	Yes
document-type	Yes	Yes	Yes	No
duplex	Yes	No	Yes	Yes
filter-options	Yes	Yes	Yes	No
form-definition	Yes	Yes[2]	Yes	No
forms	Yes	No	Yes	Yes
hold	Yes	Yes	Yes	No
input-tray	Yes	No	Yes	Yes
jes-priority	Yes	Yes	Yes	No
name-text[1]	Yes	Yes	Yes	No
output-bin	Yes	No	Yes	Yes
overlay-back overlay-front	Yes	No	Yes	No
page-definition	Yes	Yes[2]	Yes	No
print-error-reporting	Yes	Yes[2]	Yes	Yes
print-queue-name	No	Yes	Yes	No
printer-ip-address	No	Yes	Yes	No
resource-library	Yes	No	Yes	No
room-text[1]	Yes	Yes	Yes	No

Table 3. Job Attributes Valid for Different Printer Types (continued)

Job Attribute	PSF for OS/390	IP PrintWay	General	Value Validated for Printer
shift-out-shift-in	Yes	No	Yes	No
table-reference-characters	Yes	Yes²	Yes	No
title-text¹	Yes	Yes	Yes	No
x-image-shift-back x-image-shift-front	Yes	No	Yes	No
y-image-shift-back y-image-shift-front	Yes	No	Yes	No
¹ The -**text** attributes are valid for all printers, but they are used only if the system administrator sets up the printer's separator sheet to print the appropriate field. ² This attribute is ignored by IP PrintWay printers that do not use PSF.				

Appendix B. JCL Parameters and Corresponding Job Attributes

Table 4 lists parameters of the OUTPUT and DD statements of the Job Control Language (JCL) and the Infoprint Server job attributes that correspond to them. For more information about the OUTPUT and DD JCL statements, refer to the *OS/390 MVS JCL Reference*.

Table 4. JCL Parameters and Corresponding Job Attributes

JCL Parameter	Job Attribute	See Page
ADDRESS	**address-text**	55
BUILDING	**building-text**	55
CHARS	**chars**	56
COPIES	**copies**	57
DATACK	**print-error-reporting**	65
DEPT	**department-text**	57
DEST=IP	**printer-ip-address**	66
DUPLEX	**duplex**	59
FORMDEF	**form-definition**	61
FORMS	**forms**	61
INTRAY	**input-tray**	62
NAME	**name-text**	62
OFFSETXB	**x-image-shift-back**	69
OFFSETXF	**x-image-shift-front**	69
OFFSETYB	**y-image-shift-back**	69
OFFSETYF	**y-image-shift-front**	70
OUTBIN	**output-bin**	63
OVERLAYB	**overlay-back**	64
OVERLAYF	**overlay-front**	64
PAGEDEF	**page-definition**	64
PRMODE	**shift-out-shift-in**	67
PRTQUEUE	**print-queue-name**	65
PRTY	**jes-priority**	62
ROOM	**room-text**	67
TITLE	**title-text**	68
TRC	**table-reference-characters**	68
USERLIB	**resource-library**	66

Appendix C. SCS Code Points

The NetSpool component of Infoprint Server transforms the Systems Network Architecture (SNA) character string (SCS) for a logical unit (LU) type 1 printer into a variable blocked with American Standards Association (ASA) carriage control (VBA) data set. Table 5 on page 126 describes the code points that are undefined, unsupported, supported with defaults or fully supported.

NetSpool returns the following SNA sense codes for errors found in the SCS data stream:

- SNA sense code of function error (X'10030000') for undefined and unsupported code points.
- SNA sense code of parameter error (X'10050000') for supported code points with invalid parameters or without all parameters available in the same chain.
- SNA sense code of data error (X'10010000') for invalid characters in a DBCS string.

NetSpool passes all unspecified code points to the job entry subsystem (JES) as extended-binary coded decimal interchange code (EBCDIC) data.

Refer to *SNA—Sessions Between Logical Units* for more information about SCS data streams. Refer to *IBM 3270 Kanji Data Streams* for more information about DBCS SCS data streams.

Table 5. SCS Code Points

	x0	x1	x2	x3	x4	x5	x6	x7	x8	x9	xA	xB	xC	xD	xE	xF
0x	Null	[1]	[1]	[1]	SEL[9]	HT	RNL[4]	[1]	GE[2]	SPS[3]	RPT[3]	VT	FF	CR	SO[11]	SI[11]
1x	[1]	DC1[3]	DC2[3]	DC3[3]	ENP[3]	NL	BS	POC[3]	[1]	[1]	UBS[3]	CU1[3]	IFS[4]	IGS[4]	IRS[4]	IUS[7]
2x	[1]	[1]	[1]	WUS	INP[3]	LF			SA[12]	[1]	SW[3]	CSP[10]	[1]	[1]	[1]	BEL[3]
3x	[1]	[1]	SYN[3]	IR[4]	PP	TRN	EBS[6]	[1]	SBS[3]	IT[3]	RFF[5]	CU3[3]	DC4[3]	[1]	[1]	SUB
4x		RSP[7]														
5x																
6x																
7x																
8x																
9x																
Ax																
Bx																
Cx											SHY[8]					
Dx																
Ex		ESP[7]														
Fx																

Table 5. SCS Code Points (continued)

[1] Undefined code point—function error.

[2] Unsupported code point—function error.

[3] Defaults to no operation—function ignored.

[4] Defaults to new line (NL).

[5] Defaults to form feed (FF).

[6] Defaults to backspace (BS).

[7] Defaults to space (X'40').

[8] Defaults to dash (X'60').

[9] Vertical channel select is supported. Select left/right platen is ignored. Select magnetic stripe reader/writer is unsupported.

[10] Set Horizontal Format and Set Vertical Format are supported. Start of Format is ignored if at left margin and defaults to new line (NL) if not at left margin. Set Line Density, Set Graphic Escape Action, Set Chain Image and Set Print Density are ignored.

[11] Shift Out (SO) indicates the start of a string of double-byte character set (DBCS) data. Shift In (SI) indicates the end. Valid characters in the DBCS string are X'4040' and any pair of bytes, each in the range X'41' to X'FE'. NetSpool rejects invalid characters and DBCS strings that do not complete in the same chain with an SNA sense code of data error (X'10010000').

[12] Set Attribute (SA) X'2843F8' indicates the start of double-byte character set (DBCS) data. Set Attribute X'284300', X'280000', or end-of-chain indicates the end. Valid characters in the DBCS string are X'4040' and any pair of bytes, each in the range X'41' to X'FE'. NetSpool rejects invalid characters with an SNA sense code of data error (X'10010000').

• NetSpool converts SA code points that indicate the start and end of a DBCS string into Shift Out (SO) and Shift In (SI) line-data controls.

• NetSpool converts valid SCS code points in the DBCS string to the appropriate line-data controls, delimited by SI and SO line-data controls.

• NetSpool ignores Set Attribute code points with attributes of Color, Highlighting, or Field Outlining.

Appendix D. 3270 Data Stream Code Points

The NetSpool component of Infoprint Server transforms the 3270 data streams for a logical unit (LU) type 0 or LU type 3 printer into a variable blocked with American Standards Association (ASA) carriage control (VBA) data set. Table 6, Table 7 on page 130, and Table 8 on page 131 describe the code points that are supported for 3270 data streams.

Command Codes

Only one command is allowed in each request unit (RU) chain. The command must be the first byte of the RU chain.

Table 6. 3270 Data Stream Command Codes

Command Code	EBCDIC	Comments
W	X'F1'	Write
EW	X'F5'	Erase/Write
EWA	X'7E'	Erase/Write Alternate
EAU	X'6F'	Erase All Unprotected
Other command codes		Function not supported. Return Systems Network Architecture (SNA) sense code X'1003000'.

Control Codes

The control codes have an extended-binary coded decimal interchange code (EBCDIC) value in the range of hexadecimal 00 (X'00') through hexadecimal 3F (X'3F)'.

Table 7. 3270 Data Stream Control Codes

Control Code	EBCDIC	Comments
NL	X'15'	New Line
EM	X'19'	End of Message
FF	X'0C'	Forms Feed
CR	X'0D'	Carriage Return
SF	X'1D'	Start Field
SBA	X'11'	Set Buffer Address
IC	X'13'	Insert Cursor
PT	X'05'	Program Tab
RA	X'3C'	Repeat to Address
SFE	X'29'	Start Field Extended (See Table 8 on page 131)
SA	X'28'	Set Attribute (See Table 8 on page 131)
MF	X'2C'	Modify Field (See Table 8 on page 131)
EUA	X'12'	Erase Unprotected to Address
GE	X'08'	Graphic Escape (Defaults to no operation. Function is ignored and removed from data stream.)
SO	X'0E'	Shift Out
SI	X'0F'	Shift In
SYN	X'32'	SYN Character (Defaults to no operation. Function is ignored and removed from data stream.)
Other control codes		Function not supported. Return SNA sense code X'1003000'.

Attribute Types

Table 8. 3270 Data Stream Attribute Types

Attribute Type	EBCDIC	SFE, MF Orders	SA Order	Comments
Character Attribute Reset	X'00'	N/A	X	Set character set attribute to single byte character set (default)
Character Set	X'43'	X	X	When attribute value is X'00'-X'7F', character set attribute is set to single byte. When attribute value is X'00'-X'7F', character set attribute is set to double byte.
3270 Field Attribute	X'C0'	X	N/A	Field attribute bit definitions supported: **Bit 2 = B'0'** Field is unprotected. **Bit 2 = B'1'** Field is protected. **Bits 4,5 = B'11'** Field is nonprintable. **Bits 4,5** Other settings are ignored. All other bit definitions are ignored.
Other Valid Attributes	X'41', X'42', X'45', X'46', X'C2'	X	X	Tolerated; defaults to no operation. Attributes are ignored.
Invalid Attributes		X	X	Function not supported. Return SNA sense code X'1003000'.
X The attribute type applies to the order. **N/A** The attribute type does not apply to the order.				

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Glossary

Sources

This glossary defines technical terms and abbreviations used in Infoprint Server documentation. If you do not find the term you are looking for, see the index of this publication or view *IBM Dictionary of Computing,*, located at: http://www.ibm.com/networking/nsg/nsgmain.htm

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- Definitions identified by (POSIX.2) are from *Part 2: Shell and Utilities* P1003.2.

Definitions that are specific to IBM products are so labeled; for example, "In TCP/IP," or "In Infoprint Server."

References

The following cross-references are used in this glossary:

Contrast with. This refers to a term that has an opposite or substantively different meaning.

See. This refers to multiple-word terms in which this term appears.

See also. This refers to related terms that have similar, but not synonymous, meanings.

Synonym for. This appears in the commentary of a less desirable or less specific term and identifies the preferred term that has the same meaning.

Synonymous with. This appears in the commentary of a preferred term and identifies less desirable or less specific terms that have the same meaning.

Numerics

3270 data stream. Data transferred from or to an allocated primary or tertiary device, or to the host system, as a continuous stream of data and 3270 Information Display System control elements in character form.

A

abend. Termination of a task before its completion because of an error condition that cannot be resolved by recovery facilities while the task is executing.

ACB. Access method control block.

access method control block (ACB). A control block that links an application program to VTAM.

ACIF. (1) AFP conversion and indexing facility. (2) A PSF utility program that converts a print file into AFP, MO:DCA-P, creates an index file for input data, and collects resources used by an AFP document into a separate file.

Advanced Function Presentation (AFP). A set of licensed programs, together with user applications, that use the all-points-addressable concept to print on presentation devices. AFP includes creating, formatting, archiving, retrieving, viewing, distributing, and printing information.

AFP. Advanced Function Presentation.

AFP Printer Driver for Windows. A component of Infoprint Server for OS/390 that runs on a Windows 95 or Windows NT workstation and creates output in AFP format, for printing on AFP printers.

AFP Viewer plug-in for Windows. A component of Infoprint Server for OS/390 that runs on a Windows 95 or Windows NT workstation and allows you to view files in AFP format.

AIX operating system. IBM's implementation of the UNIX operating system. The RS/6000® system, among others, runs the AIX operating system.

alphanumeric character. A letter or a number.

ASCII (American Standard Code for Information Interchange). The standard code, using a coded character set consisting of 7-bit coded characters (8-bit including parity check), that is used for information interchange among data processing systems, data communication systems, and associated equipment. The ASCII set consists of control characters and graphic characters. (A)

Note: IBM has defined an extension to ASCII code (characters 128–255).

B

banner page. A page printed before the data set is printed.

binary data. (1) Any data not intended for direct human reading. Binary data may contain unprintable characters, outside the range of text characters. (2) A type of data consisting of numeric values stored in bit patterns of 0s and 1s. Binary data can cause a large number to be placed in a smaller space of storage.

BIND. In SNA, a request to activate a session between two logical units (LUs).

broadcast. (1) Transmission of the same data to all destinations. (T) (2) Simultaneous transmission of data to more than one destination.

buffer. A portion of storage used to hold input or output data temporarily.

burst. To separate continuous-forms paper into single sheets.

C

carriage control character. An optional character in an input data record that specifies a write, space, or skip operation.

carriage return (CR). (1) A keystroke generally indicating the end of a command line. (2) In text data, the action that indicates to continue printing at the left margin of the next line. (3) A character that will cause printing to start at the beginning of the same physical line in which the carriage return occurred.

case-sensitive. Pertaining to the ability to distinguish between uppercase and lowercase letters.

catalog. (1) A directory of files and libraries, with reference to their locations. (2) To enter information about a file or a library into a catalog. (3) The collection of all data set indexes that are used by the control program to locate a volume containing a specific data set.

CICS. Customer Information Control System.

client. A functional unit that receives shared services from a server. See also *client-server*.

client-server. In TCP/IP, the model of interaction in distributed data processing in which a program at one site sends a request to a program at another site and awaits a response. The requesting program is called a client; the answering program is called a server.

code page. (1) A table showing codes assigned to character sets. (2) An assignment of graphic characters and control function meanings to all code points. (3) Arrays of code points representing characters that establish ordinal sequence (numeric order) of characters. (4) A particular assignment of hexadecimal identifiers to graphic elements.

code point. A 1-byte code representing one of 256 potential characters.

coexistence. Two or more systems at different levels (for example, software, service or operational levels) that share resources. Coexistence includes the ability of a system to respond in the following ways to a new function that was introduced on another system with which it shares resources: ignore a new function, terminate gracefully, support a new function.

connection. In TCP/IP, the path between two protocol applications that provides reliable data stream delivery service. In Internet communications, a connection extends from a TCP application on one system to a TCP application on another system.

copy group. One or more copies of a page of paper. Each copy can have modifications, such as text suppression, page position, forms flash, and overlays.

Customer Information Control System (CICS). An IBM licensed program that enables transactions entered at remote terminals to be processed concurrently by user-written application programs. It includes facilities for building, using, and maintaining databases.

D

daemon. A program that runs unattended to perform a standard service. Some daemons are triggered automatically to perform their task; others operate periodically.

data set. The major unit of data storage and retrieval, consisting of a collection of data in one of several prescribed arrangements and described by control information to which the system has access.

data stream. (1) All information (data and control commands) sent over a data link usually in a single read or write operation. (2) A continuous stream of data elements being transmitted, or intended for transmission, in character or binary-digit form, using a defined format.

DBCS. Double-byte character set.

default. A value, attribute, or option that is assumed when no alternative is specified by the user.

directory. (1) A type of file containing the names and controlling information for other files or other directories. Directories can also contain subdirectories, which can contain subdirectories of their own. (2) A file that contains directory entries. No two directory entries in the same directory can have the same name. (POSIX.1). (3) A file that points to files and to other directories. (4) An index used by a control program to locate blocks of data that are stored in separate areas of a data set in direct access storage.

DLL filter. A filter that provides one or more of these functions in a dynamic load library - init(), prolog(), process(), epilog(), and term(). See **cfilter.h** and **cfilter.c** in the **/usr/lpp/Printsrv/samples/** directory for more information. See also filter. Contrast with DLL filter.

dotted decimal notation. The syntactical representation for a 32-bit integer that consists of four 8-bit numbers written in base 10 with periods (dots) separating them. It is used to represent IP addresses.

double-byte character set (DBCS). A set of characters in which each character is represented by a two-bytes code. Languages such as Japanese, Chinese, and Korean, which contain more symbols than can be represented by 256 code points, require double-byte character sets. Because each character requires two bytes, the typing, display, and printing of DBCS characters requires hardware and programs that support DBCS. Contrast with *single-byte character set*.

download. To transfer data from one computer for use on another one. Typically, users download from a larger computer to a diskette or fixed disk on a smaller computer or from a system unit to an adapter.

Download for OS/390. A feature of PSF for OS/390 that allows the PSF program to automatically send data sets from the JES spool, without formatting them, directly to either Infoprint Manager for AIX or EDMSuite OnDemand, using the TCP/IP protocol. Infoprint Manager for AIX and EDMSuite OnDemand servers receive the data sets into files, which can be automatically formatted and printed by Infoprint Manager for AIX or loaded into EDMSuite OnDemand.

drain. An operator action to halt the flow of jobs to a printer, usually to stop the printer or to change print options.

E

EBCDIC. Extended binary-coded decimal interchange code. A coded character set consisting of 8-bit coded characters. (A)

encryption. In computer security, the process of transforming data into an unintelligible form in such a way that the original data either cannot be obtained or can be obtained only by using a decryption process.

environment variable. (1) A name associated with a string of characters, made available to the programs that you run. (2) A variable that describes the operating environment of the process and typically includes information about the home directory, command search path, the terminal in use, and the current time zone. (3) A variable included in the current software environment that is available to any called program that requests it.

F

file. (1) A set of related records treated as a unit. (2) A collection of related data that is stored and retrieved by an assigned name. (3) Linear data that can be opened, written, read, and closed. A file can also contain information about the file, such as authorization information. The name used to obtain a file includes the directories in the path to the file. (4) Strings of characters with no additional structure. Structure is assumed only by the processing programs. Files can be

located relative to the current directory or by an absolute pathname. (5) An object that can be written to, or read from, or both. A file has certain attributes, including access permissions and type. File types include regular file, character special file, block special file, FIFO special file, and directory. Other types of files may be defined by the implementation. (POSIX.1) In the OS/390 UNIX System Services implementation, the file system does not support block special files, but it does support symbolic link files. (6) A collection of information or data that is organized by some method (relative, indexed, or serial, for example) and stored on a device such as a disk.

file system. (1) A collection of files and directories. (2) The collection of files and file management structures on a physical or logical mass storage device, such as a disk or disk partition. A single device can contain several file systems. (3) A mountable subtree of the directory hierarchy. (4) A collection of files and certain of their attributes. A file system provides a name space for file serial numbers referring to those files. (POSIX.1).

filter. In Print Interface, a program that can add, delete, or modify input data before Print Interface writes the data to the JES spool. Print Interface provides support for two types of filter programs: DLL filters and UNIX filters. See also DLL filter and UNIX filter.

font. (1) A family or assortment of characters of a given size and style; for example, 9 point Bodoni Modern. (A) (2) One size and one typeface in a particular type family, including letters, numerals, punctuation marks, special characters, and ligatures. (3) A paired character set and code page that can be used together for printing a string of text characters. A double-byte font can consist of multiple pairs of character sets and code pages.

form definition. A resource used by PSF that defines the characteristics of the form, which includes such functions as overlays to be used (if any), paper source (for cut-sheet printers), duplex printing, text suppression, the position of MO:DCA-P data on the form, and the number and modifications of a page.

FSA. Functional subsystem application.

FSS. Functional subsystem.

functional subsystem (FSS). An address space uniquely identified as performing a specific function related to the JES.

functional subsystem application (FSA). The functional application program managed by the functional subsystem.

H

hexadecimal. (1) Pertaining to a selection, choice, or condition that has 16 possible different values or states. (I) (2) Pertaining to a fixed-radix numeration system, with radix of 16. (I) (3) Pertaining to a system of numbers to the base 16; hexadecimal digits range from 0 through 9 and A through F, where A represents 10 and F represents 15.

hiperspace. The space used for paging by the OS/390 operating system.

HFS data set. A hierarchical file system data set, which is used to store, and is essentially identified with, a file system.

home directory. (1) The current directory associated with the user at the time of login. (POSIX.2) (2) A directory associated with an individual user. (3) The user's current directory on login or after issuing the **cd** command with no argument.

host. In the Internet suite of protocols, an end system. The end system can be any system; it does not have to be a mainframe.

host address. See *IP address.*

host name. In the Internet suite of protocols, the name given to a machine. Sometimes, ″host name″ is used to mean *fully qualified domain name*; other times, it is used to mean the most specific subname of a fully qualified domain name. For example, if *boulder.vnet.ibm.com* is the fully qualified domain name, either of the following may be considered the host name:
- boulder.vnet.ibm.com
- boulder

I

IMS. Information Management System

Infoprint Server for OS/390. An element of OS/390 V2R8 and higher that supports printing on OS/390 printers, including local printers and remote printers in a TCP/IP network. Infoprint Server lets users submit print requests from remote workstations in a TCP/IP network, from OS/390 UNIX System Services applications, from batch applications, and from VTAM applications, such as CICS or IMS applications. Infoprint Server consists of the following components:
- IP PrintWay
- NetSpool
- Print Interface
- Printer Inventory Manager
- Transform Manager and Infoprint Server Transforms for OS/390
- SNMP subagent
- Windows client
  - IBM AFP Printer Driver for Windows

- IBM AFP Viewer plug-in for Windows
- OS/390 Printer Port Monitor for Windows

Information Management System (IMS). A database/data communication system that can manage complex databases and networks.

inline resource. A resource contained in the print data set.

Internet. A wide area network connecting thousands of disparate networks in industry, education, government, and research. The Internet network uses TCP/IP as the protocol for transmitting information.

Internet Printing Protocol (IPP). An application-level protocol that enables distributed printing on the Internet. IPP uses a client/server architecture and defines the interactions between IPP clients (typically work-stations) and IPP servers.

Internet Protocol (IP). A protocol used to route data from its source to its destination in an Internet environment.

IP. Internet Protocol.

IP address. (1) In the Internet suite of protocols, the 32-bit address of a machine, expressed in dotted decimal notation, for example, 9.99.9.143. (2) Host name.

IPP. Internet Printing Protocol.

IP PrintWay. A component of Infoprint Server for OS/390 that transmits output data sets from the JES spool to printers in a TCP/IP network. Also called PrintWay.

J

JCL. Job control language.

JES. Job entry subsystem.

JES2. An OS/390 subsystem that receives jobs into the system, converts them to internal format, selects them for execution, processes their output, and purges them from the system. In an installation with more than one processor, each JES2 processor independently controls its job input, scheduling, and output processing.'

JES3. An OS/390 subsystem that receives jobs into the system, converts them to internal format, selects them for execution, processes their output, and purges them from the system. In complexes that have several loosely coupled processing units, the JES3 program manages processors so that the global processor exercises centralized control over the local processors and distributes jobs to them via a common job queue.

job control language (JCL). A language of control statements used to identify a computer job or describe its requirements to an operating system.

job entry subsystem (JES). An OS/390 subsystem that receives jobs into the system, converts them to internal format, selects them for execution, processes their output, and purges them from the system.

K

Kanji. A Japanese ideographic alphabet. In Kanji, each character is represented by 2 bytes.

kilobyte (KB). (1) For processor storage, real and virtual storage, and channel volume, 1024 bits. (2) For disk storage capacity and communications volume, 1000 bytes.

L

LAN. local area network.

line data. Data prepared for printing on a line printer such as a 3800 Model 1 Printing Subsystem. Line data is usually characterized by carriage-control characters and table reference characters. Contrast with *MO:DCA-P data*.

line printer daemon (LPD). The printer server that allows other hosts to access its printer.

line printer requester (LPR). A client that allows the local host to submit a data set for printing on a remote printer server.

local area network (LAN). A computer network located on a user's premises within a limited geographical area. Communication within a local area network is not subject to external regulations; however, communication across the LAN boundary may be subject to some form of regulation.

locale. (1) A description of a cultural environment. (POSIX.0). (2) The definition of the subset of a user's environment that depends on language and cultural conventions. (POSIX.2).

logical printer. In NetSpool, the target of the VTAM print data, which acts as the secondary LU (SLU) on the session.

logical unit (LU). A type of VTAM network accessible unit that enables end users to gain access to network resources and communicate with each other.

logon mode. In VTAM, a subset of session parameters specified in a logon-mode table for communication with a logical unit. See also session parameters.

logon-mode table. In VTAM, a set of entries for one or more logon modes. Each logon mode is identified by a logon mode name.

LPD. line printer daemon

LPR. line printer requester

LU. Logical unit.

LU type. The classification of an LU in terms of the specific subset of SNA protocols and options it supports for a given session, namely:
- The mandatory and optional values allowed in the session activation request
- The usage of data stream controls, function management headers, request unit parameters, and sense data values
- Presentation services protocols such as those associated with FMH usage

LU types 0, 1, 2, 3, 4, 6.1, 6.2, and 7 are defined.

M

Management Information Base (MIB). A logical database made up of the configuration, status, and statistical information stored at a device.

megabyte (MB). (1) For processor storage, real and virtual storage, and channel volume, 1 048 576 bytes. (2) For disk storage capacity and communications volume, 1 000 000 bytes.

MIB. See *Management Information Base.*

migration. Activities that relate to the installation of a new version or release of a program to replace an earlier level. Completion of these activities ensures that the applications and resources on your system will function correctly at the new level.

MO:DCA-P data. Print data that has been composed into pages. Text formatting programs can produce composed text data consisting entirely of structured fields.

MVS/ESA™. Multiple Virtual Storage/Enterprise System Architecture.

N

NCP. Network Control Program.

NetSpool. A component of Infoprint Server for OS/390 that allows an installation to automatically direct VTAM application data targeted for a network printer to the JES spool, without changing the VTAM applications. From the JES spool, the data set can be printed on a JES or PSF for OS/390 printer or sent to another location for printing.

network. A collection of data processing products that are connected by communication lines for information exchange between locations.

Network Control Program (NCP). An IBM licensed program that provides communication controller support for single-domain, multiple-domain, and interconnected network capability.

Network Print Facility (NPF). In OS/390 eNetwork™ Communications Server, a feature that routes VTAM, JES2, or JES3 printer output to printers in a TCP/IP network.

NPF. Network Print Facility.

| **NPM.** Network Printer Manager.

| **Network Printer Manager (NPM) for the Web.** IBM
| Network Printer Manager (NPM) for the Web lets
| network administrators monitor, control, and configure
| IBM network printers. NPM also lets network
| administrators monitor some aspects of printers
| controlled by PSF for OS/390 and other manufacturers'
| network printers that comply with RFC 1759.

O

OnDemand. A client/server application that you can use to replace hard copy reports and microfiche, and provide fast, online access to information. An OnDemand server manages electronic archives of reports and documents. You can use an OnDemand client program to search for information and view, print, and FAX copies of reports and documents.

OpenEdition®. See *OS/390 UNIX System Services.*

options data set. In IP PrintWay prior to OS/390 V2R8, a VSAM data set containing one or more options entries. Each options entry contains transmission options used by IP PrintWay. to transmit data sets to a print queue in a TCP/IP network. Each options entry can also contain NetSpool parameters that specify data-set characteristics for use by NetSpool.

output writer. A part of the job entry subsystem that receives job output from the system spool.

OS/390 Print Server. A feature of OS/390 V2R5 through V2R7. The second version of the Print Server is called Infoprint Server for OS/390 and runs on OS/390 V2R8 and higher. The OS/390 Print Server supports printing on OS/390 printers, including local printers and remote printers in a TCP/IP network. The OS/390 Print Server allows you to submit print requests from remote workstations in a TCP/IP network, from OS/390 UNIX System Services applications, from batch applications, and from VTAM applications, such as CICS or IMS applications. The OS/390 Print Server consists of the following components:
- OS/390 Print Interface

- NetSpool
- IP PrintWay
- Printing commands for OS/390 UNIX System Services
- IBM AFP Printer Driver for Windows
- IBM AFP Viewer plug-in for Windows
- OS/390 Printer Port Monitor for Windows

OS/390 Printer Port Monitor for Windows. A component of Infoprint Server for OS/390 that runs on a Windows 95 or Windows NT workstation and sends a file for printing to Print Interface running on the OS/390 system.

OS/390 UNIX System Services. OS/390 services that support an environment within which operating systems, servers, distributed systems, and workstations share common interfaces. OS/390 UNIX System Services supports standard application development across multivendor systems. It is required if you want to create and use applications that conform to the POSIX standard. OS/390 UNIX System Services combines the personal power of the workstation, the flexibility of open systems, and the strength of MVS. It supports and fosters a superenvironment of larger operating systems or servers and of distributed systems and workstations that share common interfaces. Users can switch back and forth between the traditional TSO/E interface and the OS/390 UNIX System Services interface. UNIX-skilled users can interact with the system, using a familiar set of standard commands and utilities. MVS-skilled users can interact with the system, using familiar TSO/E commands and interactive menus to create and manage hierarchical file system files and to copy data back and forth between MVS data sets and files. Application programmers and users have both sets of interfaces to choose from and, by making appropriate tradeoffs, can choose to mix these interfaces.

output data set. (1) A data set that a program opens so that it can write to that file. (2) A file that contains the results of processing.

output writer. A part of the job entry subsystem that receives job output from the system spool.

P

page definition. A resource used by PSF that defines the rules of transforming line data into MO:DCA-P data and text controls.

page-format table. In NetSpool prior to OS/390 V2R8, a table that defines page-formatting values NetSpool uses for SCS data streams that do not contain SHF (Set Horizontal Format) or SVF (Set Vertical Format) commands. The table can contain several entries, each entry containing a different set of page-formatting values.

parameter. Information that the user supplies to a panel, command, or function.

partitioned data set (PDS). A data set in direct access storage that is divided into partitions, called members, each of which can contain a program, part of a program, or data. Synonymous with program library.

pathname. (1) A filename specifying all directories leading to the file. (2) A filename specifying all directories leading to a file plus the filename itself. (3) A string that is used to identify a file. A pathname consists of, at most, (PATH_MAX) bytes, including the terminating null character. It has an optional beginning slash, followed by zero or more filenames separated by slashes. If the pathname refers to a directory, it may also have one or more trailing slashes. Multiple successive slashes are considered to be the same as one slash. A pathname that begins with two successive slashes may be interpreted in an implementation-defined manner, although more than two leading slashes shall be treated as a single slash. (POSIX.1). In the OS/390 UNIX System Services implementation, the C/370™ functions **fopen()**, **freopen()**, **remove()**, and **rename()** interpret names with exactly two leading slashes, no leading blanks or other characters, and the third character not a slash to mean that the rest of the name refers to a traditional MVS data set.

pel. Picture element.

Picture element (pel, pixel). (1) In computer graphics, the smallest element of a display surface that can be independently assigned color and intensity. (T). (2) The area of the finest detail that can be reproduced effectively on the recording medium. (3) An element of a raster pattern about which a toned area on a photoconductor can appear. (4) The addressable unit on a 3800 Printing System Model 3 or 8.

PIDU. Printer Inventory Definition Utility.

PLU. Primary logical unit.

port. (1) A part of the system unit or remote controller to which cables for external devices (display stations, terminals, or printers) are attached. The port is an access point for data entry or exit. (2) A specific communications end point within a host. A port is identified by a port number.

POSIX. Portable Operating System Interface for Computer Environments, an interface standard governed by the IEEE and based on UNIX. POSIX is not a product; rather, it is an evolving family of standards describing a wide spectrum of operating system components ranging from C language and shell interfaces to system administration.

PostScript. A page description language with graphics capabilities that was developed by Adobe Systems, Incorporated.

primary logical unit (PLU). In SNA, the logical unit (LU) that sends the BIND to activate a session with its partner LU. Contrast with *secondary logical unit.*

print queue. A list of items waiting to be printed.

Print Services Facility (PSF). A licensed program that manages and controls the input data stream and output data stream required by supported IBM page printers. PSF combines print data with other resources and printing controls to produce AFP output.

Print Interface. A component of the OS/390 Print Server that accepts input from remote workstations that have TCP/IP access and from OS/390 UNIX System Services printing commands and creates output data sets on the JES spool.

Print Server. See *OS/390 Print Server.*

printer definition. In Infoprint Server for OS/390, an entry in the Printer Inventory that contains information about an OS/390 printer or set of printers that share the same characteristics. A printer definition contains information that Infoprint Server uses to print files.

Printer Inventory. In Infoprint Server for OS/390, a set of files that contain printer definitions for OS/390 printers. Each printer definition is identified with a unique printer name; the job submitter selects the printer name when printing a file. The printer definitions contain information that Infoprint Server for OS/390 uses to print files.

Printer Inventory Definition Utility. In Infoprint Server for OS/390, a utility program that creates objects in the Printer Inventory.

Printer Port Monitor. See *OS/390 Printer Port Monitor for Windows.*

PrintWay. See *IP PrintWay.*

protocol. A set of semantic and syntactic rules that determines the behavior of functional units in achieving communication.

PSF. Print Services Facility.

PSF/6000. An intelligent printer driver that provides AFP capabilities for the AIX operating system on the RS/6000 system. AFP capabilities include electronic forms, images, graphics, and typographical fonts. Also called PSF for AIX.

R

RACF®. Resource Access Control Facility

Request for Comments (RFC). In Internet communications, the document series that describes a part of the Internet suite of protocols and related experiments. All Internet standards are documented as RFCs.

request unit (RU). A message unit that contains control information, end-user data, or both.

resource. A collection of printing instructions used by Print Services Facility in addition to the print data set, to produce the printed output. PSF resources include coded fonts, font character sets, code pages, page segments, overlays, form definitions, and page definitions.

Resource Access Control Facility (RACF). An IBM-licensed product that provides for access control by identifying and verifying users to the system, authorizing access to protected resources, logging detected unauthorized attempts to enter the system, and logging detected accesses to protected resources.

response unit (RU). A message unit that acknowledges a request unit. It may contain prefix information received in a request unit. If positive, the response unit can contain additional information (such as session parameters in response to BIND SESSION). If negative, the response unit contains sense data defining the exception condition.

Restructured Extended Executor (REXX). A general-purpose, procedural language for end-user personal programming, designed for ease by both casual general users and computer professionals. It is also useful for application macros. REXX includes the capability of issuing commands to the underlying operating system from these macros and procedures. Features include powerful character-string manipulation, automatic data typing, manipulation of objects familiar to people, such as words, numbers, and names, and built-in interactive debugging.

retain time. In IP PrintWay, the length of time to keep a data set on the JES spool after either a successful transmission to the destination or a failed transmission, after retrying the transmission the number of times specified in the retry limit. You can specify a retain time for 2 different situations:
- Retain time for data sets that have been successfully transmitted
- Retain time for data sets whose transmission has failed

retry limit. In IP PrintWay, the maximum number of retries that IP PrintWay is to attempt.

retry time. In IP PrintWay, the time between two attempts to send the data set to its destination.

REXX. Restructured Extended Executor

RFC. Request for Comments.

routing data set. In IP PrintWay prior to OS/390 V2R8, a VSAM data set containing a routing entry for each print queue to which IP PrintWay can transmit output data sets. Each entry contains the name of the remote print queue, the IP address or name of the print queue's host system, the name of an options entry, and other routing information. Each routing entry can also define a NetSpool logical printer.

RU. Request/response unit.

S

SBCS. Single-byte character set.

SCS. SNA Character String.

SDSF. System Display and Search Facility.

secondary logical unit (SLU). In SNA, the logical unit (LU) that receives the BIND request to establish a session with its partner LU. Contrast with *primary logical unit.*

sense code. In SNA, the data sent with a negative response, indicating the reason for the response.

sequential data set. (1) A data set whose records are organized on the basis of their successive physical positions, such as on magnetic tape. (2) A data set in which the contents are arranged in successive physical order and are stored as an entity. The data set can contain data, text, a program, or part of a program. Contrast with *partitioned data set (PDS).*

server. (1) On a network, the computer that contains the data or provides the facilities to be accessed by other computers on the network. (2) A program that handles protocol, queuing, routing, and other tasks necessary for data transfer between devices in a computer system.

| **Server Message Block (SMB).** (1) A protocol for
| remote file and print access used by Windows clients.
| This protocol is also known as Common Internet File
| System (CIFS). (2) A program that handles protocol,
| queuing, routing, and other tasks necessary for data
| transfer between devices in a computer system.

session. A logical connection between two network accessible units that can be activated, tailored to provide various protocols, and deactivated, as requested.

session parameters. In SNA, the parameters that specify or constrain the protocols, for a session between two network addressable units (NAUs).

| **shell script.** A file of shell commnds. If the file is
| executable; a user can run it by specifying the file's
| name as a shell command or as an operand on **sh** or on
| the TSO/E OMVS command. A shell script is like a
| TSO/E REXX program.

shift-out, shift-in (SOSI). Special EBCDIC or ASCII characters in the data stream that indicate switches between double-byte and single-byte fonts.

Simple Network Management Protocol (SNMP). A protocol that enables a management station to configure, monitor, and receive trap messages from network devices.

single-byte character set (SBCS). A set of characters in which each character is represented by a one-byte code. Contrast with *double-byte character set.*

SLU. Secondary logical unit.

| **SMB.** Server Message Block.

SMF. System Management Facilities.

SNA. Systems Network Architecture.

SNA Character String (SCS). In SNA, a character string composed of EBCDIC controls, optionally intermixed with end-user data, that is carried within a request/response unit.

SNMP. See *Simple Network Management Protocol.*

SNMP agent. Software that enables a device to respond to manager requests to view or update Management Information Base (MIB) data, and send traps reporting problems or significant events.

SNMP Manager. In SNMP, software in a network management station that enables the station to send requests to view or update MIB variables, to send and receive inform-requests, and to receive traps from an agent.

SOSI. See *shift-out, shift-in.*

spool. Simultaneous peripheral operation online.

startup procedure. JCL for a procedure to start an application (or, NetSpool and IP PrintWay).

superuser. A system user who operates without restrictions. A superuser has the special rights and privileges needed to perform administrative tasks.

syntax. The grammatical rules for constructing a command,

System Display and Search Facility (SDSF). An IBM-licensed program that provides a menu-driven full screen interface to obtain detailed information about the jobs and resources in an MVS/JES2 system.

System Management Facilities (SMF). An optional control program feature of OS/390 that provides the means for gathering and recording information that can be used to evaluate system usage.

Systems Network Architecture (SNA). The description of the logical structure, formats, protocols, and operational sequences for transmitting information units through, and controlling the configuration and operation of, networks.

T

table reference character (TRC). A numeric character corresponding to the order in which font character sets have been specified with the **chars** job attribute or in the page definition used to print a job. It is used to select a font character set during printing.

TCP. Transmission Control Protocol.

TCP/IP. Transmission Control Protocol/Internet Protocol.

Telnet. In the Internet suite of protocols, a protocol that provides remote terminal connection service. It allows users of one host to log on to a remote host and interact as directly attached terminal users of that host.

Time Sharing Option (TSO). An operating system option that provides interactive time sharing from remote terminals.

trace. A record of the execution of a computer program. It exhibits the sequences in which the instructions were executed. (A)

transform. A program that converts a data stream from one format to another, for example, from PCL to AFP, PDF to AFP, and so on. The IBM-provided transforms are implemented as DLL filters.

Transmission Control Protocol (TCP). A communications protocol used in Internet and in any network that follows the U.S. Department of Defense standards for inter-network protocol. TCP provides a reliable host-to-host protocol between hosts in packet-switched communications networks and in interconnected systems of such networks. It assumes that the Internet protocol is the underlying protocol.

transmission-queue data set. In IP PrintWay, a data set containing an entry for each data set that IP PrintWay is to transmit to the remote system or that IP PrintWay is retaining on the JES spool.

transparent data. (1) Data that is of no significance to the receiver. (2) Data that can contain any hexadecimal value.

trap. A message that reports a problem or a significant event.

TRC. Table reference character.

U

UCS. Universal character set.

universal character set (UCS). A printer feature that permits the use of a variety of character arrays. Synonymous with *font*.

UNIX. A highly portable operating system originally developed by Bell Laboratories that features multiprogramming in a multiuser environment. UNIX is implemented in the C language. UNIX was originally developed for use on minicomputers but has been adapted on mainframes and microcomputers. It is especially suitable for multiprocessor, graphics, and vector-processing systems. Many of the commands in the OS/390 UNIX System Services shell are based on similar commands available with UNIX System V.

UNIX filter. A filter that accepts input via **stdin**, and returns the output via **stdout**. Options and positional arguments can be specified. UNIX filters may be any shell executable, for example, a shell script, a REXX exec, a C program, and so on. See also filter. Contrast with DLL filter.

UNIX System Services. See *OS/390 UNIX System Services*.

user port. In IP PrintWay, a port address that is outside the range of addresses defined in RFC 1179 for the LPR source port.

V

Virtual Telecommunications Access Method (VTAM). An IBM licensed program that controls communication and the flow of data in an SNA network. It provides single-domain, multiple-domain, and interconnected network capability.

VTAM. Virtual Telecommunications Access Method.

W

Workbench for OS/2 and Windows. An application that runs under Windows or WIN-OS/2® that enables you to browse and print AFP documents and resources on your workstation.

Bibliography

This section lists publications that may be helpful to you as you configure and use Infoprint Server for OS/390.

Infoprint Server for OS/390

Title	Order Number
OS/390 Infoprint Server Customization	G544-5694
OS/390 Infoprint Server Introduction	G544-5696
OS/390 Infoprint Server Messages and Diagnosis	G544-5690
OS/390 Infoprint Server Migration	G544-5697
OS/390 Infoprint Server Operation and Administration	S544-5693
OS/390 Infoprint Server User's Guide	S544-5692

Print Services Facility for OS/390

Title	Order Number
AFP Conversion and Indexing Facility: User's Guide	S544-5285
PSF for OS/390: Customization	S544-5622
PSF for OS/390: Diagnosis	G544-5623
PSF for OS/390: Download for OS/390	S544-5624
PSF for OS/390: Introduction	G544-5625
PSF for OS/390: Messages and Codes	G544-5627
PSF for OS/390: User's Guide	S544-5630

Advanced Function Presentation (AFP)

Title	Order Number
AFP: Printer Information	G544-3290
AFP: Printer Summary	G544-3135
AFP: Programming Guide and Line Data Reference	S544-3884
IBM AFP Fonts: Font Summary	G544-3810
IBM AFP Fonts: Font Summary for AFP Font Collection	S544-5633
IBM Data Stream and Object Arcitectures: Bar Code Object Content Architecture Reference	S544–3766

OS/390 Version 2 Release 8

Title	Order Number
OS/390 C/C++ Programming Guide	SC09-2362
OS/390 Distributed File Service SMB Administration Guide and Reference	SC24-5882
OS/390 ISPF Dialog Developer's Guide and Reference	SC28-1273
OS/390 JES2 Commands	GC28-1790
OS/390 JES2 Initialization and Tuning Guide	SC28-1791
OS/390 JES2 Initialization and Tuning Reference	SC28-1792
OS/390 JES3 Commands	*OS/390 JES3 Commands*
OS/390 JES3 Initialization and Tuning Guide	SC28-1802
OS/390 JES3 Initialization and Tuning Reference	SC28-1803
OS/390 MVS JCL Reference	GC28-1757
OS/390 MVS Product Management	GC28-1730
OS/390 MVS Programming: Authorized Assembler Services Reference ALE-DYN	GC28-1764
OS/390 MVS Programming: Authorized Assembler Services Reference ENF-IXG	GC28-1765
OS/390 MVS Programming: Authorized Assembler Services Reference LLA-SDU	GC28-1766
OS/390 MVS Programming: Authorized Assembler Services Reference SET-WTO	GC28-1767
OS/390 Planning for Installation	GC28-1726
OS/390 SDSF Guide and Reference	SC28-1622
OS/390 SecureWay Security Server RACF General User's Guide	SC28-1917
OS/390 SecureWay Security Server RACF Security Administrator's Guide	SC28-1915
OS/390 Summary of Message Changes	GC28-1499
OS/390 UNIX System Services Command Reference	SC28-1892
OS/390 UNIX System Services User's Guide	SC28-1891

OS/390 SecureWay Communications Server

Title	Order Number
OS/390 eNetwork Communications Server: SNA Programming	SC31-8573
OS/390 SecureWay Communications Server: IP Application Programming Interface Guide	SC31-8516
OS/390 SecureWay Communications Server: IP Configuration	SC31-8513
OS/390 SecureWay Communications Server: IP Migration	SC31-8512
OS/390 SecureWay Communications Server: SNA Diagnosis V1 Techniques and Procedures	LY43-0079
OS/390 SecureWay Communications Server: SNA Diagnosis V2 FFST Dumps and the VIT	LY43-0080
OS/390 SecureWay Communications Server: SNA Messages	SC31-8569

Title	Order Number
OS/390 SecureWay Communications Server: SNA Network Implementation	SC31-8563
OS/390 SecureWay Communications Server: SNA Operation	SC31-8567
OS/390 SecureWay Communications Server: SNA Resource Definition Reference	SC31-8565
Systems Network Architecture: Sessions Between Logical Units	GC20–1868

CICS for OS/390

Title	Order Number
CICS Customization Guide	SC34-5706
CICS Diagnosis Reference	LY33-6097
CICS Resource Definition Guide	SC34-5722
CICS Supplied Transactions	SC34-5724

IMS/ESA® Release 5

Title	Order Number
IMS/ESA Application Programming: EXEC DLI Commands for CICS and IMS	SC26-8726
IMS/ESA Administration Guide: System	SC26-8730

3270 Data Stream

Title	Order Number
IBM 3270 Kanji Data Streams	GA18–2980

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Special Characters

Numerics

A

B

C

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