

# Implementing an Enterprise Print Server Using VM/ESA

WAVV 2000

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## Credits

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The information contained in this presentation was developed as a result of a residency at the ITSO Poughkeepsie in the summer of 1999 which resulted the IBM Redbook, TCP/IP Solutions for VM/ESA, SG24-5459-00

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VM Development
- Erich Amrehn, Roy Costa, Mike Schwartz  
ITSO Poughkeepsie

This presentation is a follow-on to one give at WAVV 1999.

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# Topics

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Print server consolidation

Concepts

Configuring Windows

Configuring TCP/IP for VM/ESA

Configuring RSCS

Printing from VM/ESA

Printing from Windows

Conclusions and action plan

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## VM/ESA Print Server Before Consolidation

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Multiple network print servers  
managing network printers

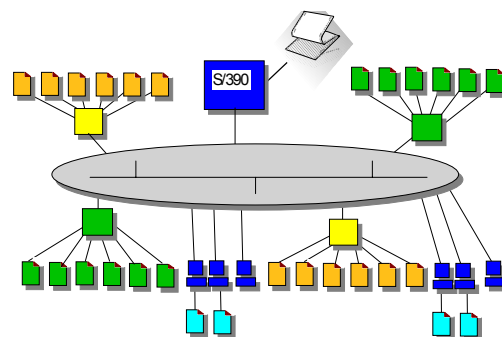
PC workstations with attached  
printers

Individually managed print  
servers

Additional printing capacity  
requires more printers and  
servers

High speed printers only  
available to S/390 applications

PC to/from S/390 printing  
requires file transfer



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## VM/ESA Print Server After Consolidation

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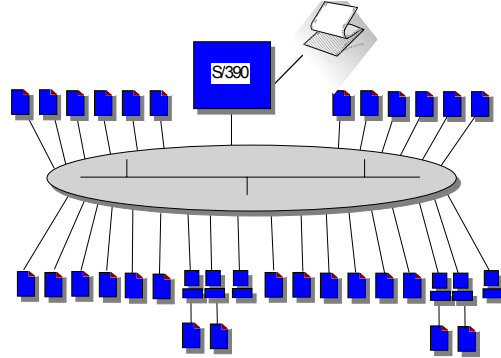
Network print servers  
eliminated

Queue management  
function is provided by  
VM/ESA

Print queues reside on large,  
reliable S/390 attached  
disk

Any TCP/IP LPR client can  
print to any printer

All printers managed  
centrally



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## Enterprise Printing For VM/ESA

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CMS users can print to any IP printer

- Printing via domain name or IP address
- Postscript printing via the LPR or PPS command

Host creation of Postscript files using the Document Composition Facility (DCF, aka SCRIPT)

Workstation users can print to any desired printer using the VM system as the print server

- Host attached printers
- IP printers

Single point of management for any and all printers:

- Mainframe line printers
- High capacity quality printers
- LAN printers
- Workstation attached printers

IBM Redbook TCP/IP Solutions for VM/ESA, SG24-5459

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# Concepts

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## Configuration of both TCP/IP and RSCS required

- Use RSCS LPD not TCP/IP LPSERVE function

## LPD serves workstation print requests

- Local printers on VM/ESA
- Remote printers through RSCS
- TCP/IP printers
- PSF printers

## VM/ESA print requests

- LPR synchronous direct to the LPD which controls the printer
- LPR asynchronous through RSCS
- PPS asynchronous through RSCS

## TCP/IP printers are not dedicated to VM/ESA

## Dedicated links in RSCS or pool of links

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# Required Documentation

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Title	Source
VM RSCS Planning and Installation, SH24-5219-03	<a href="http://www.vm.ibm.com/pubs/pdf/">http://www.vm.ibm.com/pubs/pdf/</a> Hardcopy also available
VM RSCS Operation and Use, SH24-5220-03	<a href="http://www.vm.ibm.com/pubs/pdf/">http://www.vm.ibm.com/pubs/pdf/</a> Softcopy ONLY
VM RSCS Exit Customization, SH24-5222-03	<a href="http://www.vm.ibm.com/pubs/pdf/">http://www.vm.ibm.com/pubs/pdf/</a> Softcopy ONLY
VM RSCS Program Directory, GI10-4655-02	<a href="http://www.vm.ibm.com/pubs/pdf/">http://www.vm.ibm.com/pubs/pdf/</a> Hardcopy also available
PCL5e/PostScript Technical Reference, S544-5344-03	<a href="http://www.printers.ibm.com/R5PSC.NSF/Web/nprefm/">http://www.printers.ibm.com/R5PSC.NSF/Web/nprefm/</a> Hardcopy also available
PostScript Language Reference, by Adobe Systems, Inc. ISBN 0-201-37922-8	Adobe Systems, Inc. May be available in some book stores
Technical Reference Bundle, by Hewlett-Packard, Inc. part number 5021-0377	Hewlett-Packard, Inc.

A short reference to PCL Commands, Basic Page Formatting, and Font Selection is available on the Hewlett-Packard Web site at:

<http://www.interactive.hp.com/cgi-bin/cspt/ljxxx/dyndocwrap.pl?lid=general&fid=bpl02705>

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## Configuring Windows To Receive Print

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Windows 95/98 does not include an LPD

Windows NT 4 LPD "TCP/IP Print Server" less than robust

- If used, printer queues must be renamed to conform to LPD rules

3rd party LPD server recommended, many available

- We used NIPrint from Network Instruments, Inc. during residency
- Maps selected installed printers to a printer name for use with LPR

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## Windows NT As A Print Client

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Windows NT/2000 includes a LPR port monitor

Provides for seamless Windows NT network printing

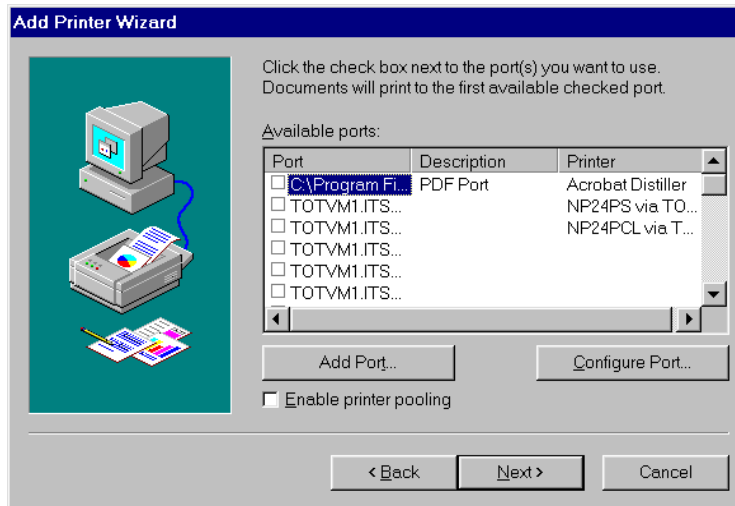
Port monitor configured using the Add Printer Wizard

LPR command also provided in Windows NT 4

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## Windows NT As A Print Client ...

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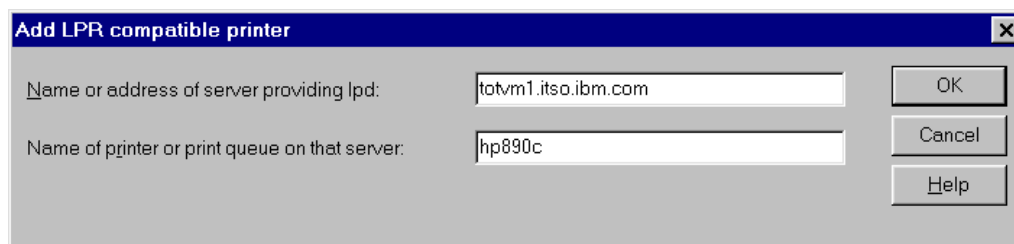


Using the Add Printer Wizard on the port selection menu, click "Add Port...", then select "LPR Port" and click "New Port..."

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## Windows NT As A Print Client ...

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Enter the name or address of the VM/ESA system providing the LPD server and the printer queue name as defined in LPDXMANY CONFIG

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## Windows 95/98 As A Print Client

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The IBM LPR Remote Printing Client utility provides a TCP/IP print monitor port driver for seamless Windows 95/98 network printing

This package also includes a command line LPR, RFC 1179, executable program for printing jobs directly from DOS

Available at no charge from the IBM Printing Systems web site for use with IBM Network Printers and IBM InfoPrint printers

ACITS LPR Remote Printing Windows 95/98 and NT 4.0 available from the University of Texas at Austin for non-IBM printers for a charge

Other 3rd party LPR port monitors or clients available

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## Configuring TCP/IP For VM/ESA

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Changes required to PROFILE TCPIP on TCPMAINT's 198

- Comment out LPSERVE in the AUTOLOG section  
; LPSERVE           PASSWORD           ; LP Server
- Comment out LPSERVE and add RSCS in the PORT section  
; 515    TCP LPSERVE                   ; LP Server  
515    TCP RSCS                         ; LP Server

Install the latest RSU to get any fixes for LPR

Install the PTF for APAR PQ29745 to correct a problem with the LPR command not uppercasing the FORM, PREFIX and SUFFIX data

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## Configuring RSCS

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Install the latest RSU to get any fixes for LPR and LPD

- Must be at RSU 9803 or higher

Install PTF UV60455 for APAR VM62277 to correct several problems in LPR printing discovered during the residency

Change RSCS's PROFILE GCS on P684096K's 401

```
GLOBAL LOADLIB RSCS RSCSEXIT
```

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## RSCSDNS Server

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RSCSDNS provide an interface to the domain name server for use by LPR links in RSCS

Should be pre-defined if installing VM/ESA 2.4.0

If running VM/ESA 2.3.0 or earlier, RSCSDNS userid must be defined and a PROFILE EXEC created

```
/* RSCSDNS PROFILE EXEC */
'ACCESS 403 B'           /* access GETHOSTC MODULE */
'ACCESS 592 C'           /* access TCPMAINT disk   */
'GLOBAL LOADLIB SCEERUN' /* LE runtime library     */
'GETHOSTC'              /* invoke DNS interface    */
```

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## RSCSDNS Server ...

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### RSCSDNS userid definition

```
USER RSCSDNS XXXXXXXX 8M 16M G
  IPL CMS PARM AUTOCR
  MACHINE ESA
  OPTION SVMSTAT LANG AMENG
  XAUTOLOG GCS
  CONSOLE 001F 3215 T OPERATOR
  SPOOL 000C 2540 READER A
  SPOOL 000D 2540 PUNCH A
  SPOOL 000E 1403 A
  LINK P684096K 0403 0403 RR
  LINK MAINT 0190 0190 RR
  LINK MAINT 019E 019E RR
  LINK TCPMAINT 0592 0592 RR
  MDISK 0191 3390 2798 001 240RES MR
```

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## Setting Up LPD In RSCS

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### Add to RSCS's PROFILE GCS on P684096K's 401

```
FILEDEF LPD DISK LPDXMANY CONFIG
```

### Define LPD-type links in RSCS CONFIG (same disk)

```
LINKDEFINE LPD1 TYPE LPD
LINKDEFINE LPD2 TYPE LPD
  PARM LPD1 EXIT=LPDXMANY EP='C=LPDXMANY'
TIMEOUT=300
  PARM LPD2 EXIT=LPDXMANY EP='C=LPDXMANY'
TIMEOUT=300
```

Multiple LPD links should be defined so that workstation users can always connect

Increase timeout to allow for network response time problems

### Add to RSCS's PROFILE GCS after 'RSCS INIT' to start LPDs

```
START LPD1
START LPD2
```

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## Setting Up LPD In RSCS ...

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Copy LPDXMANY CONFSAMP from P684096K's 406 to 401 as LPDXMANY CONFIG

This file can be quite confusing to set up, check the Redbook for more information

Define a DEFAULT entry for the most common configuration of printer in your installation

Define additional entries for every other printer OR pool of printers in your installation, i.e. every print queue

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## Setting Up LPR In RSCS

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Add to RSCS's PROFILE GCS on P684096K's 401

```
FILEDEF LPR DISK LPR CONFIG
FILEDEF LPRP DISK LPRP CONFIG
FILEDEF LPRXFORM DISK LPRXFORM CONFIG
```

Define the LPRXFORM exit in RSCS CONFIG (same disk)

```
EXIT 0 ON LPRXFM00
EXIT 1 ON LPRXFM01
```

Create an LPRXFORM CONFIG (same disk)

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## Setting Up LPR In RSCS ...

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### LPRXFORM CONFIG (partial)

```
FORM=HP890C
HOSTNAME=TOT48.ITSO.IBM.COM
PRINTER=HP890C
SEP=YES
PREFIX=1B45
PREFIX=1B28733050
PREFIX=1B2873313248
PREFIX=FF04
PREFIX=1B45
SUFFIX=1B45
*
FORM=NPPS
FORMSUB=P+ASCII
SEP=YES
PREFIX=252150532D41646F62650D0A
PREFIX=7374617475736469637420626567696E2066616C7365207365746475706C
PREFIX=65786D6F646520322073657470617065727472617920656E640D0A
PREFIX=FF04
PREFIX=252150532D41646F62650D0A
PREFIX=7374617475736469637420626567696E2074727565207365746475706C65
PREFIX=786D6F646520332073657470617065727472617920656E640D0A
```

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## Setting Up LPR In RSCS ...

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### LPRXFORM CONFIG (partial)

```
FORM=NP
SEP=YES
PREFIX=252150532D41646F62650D0A
PREFIX=7374617475736469637420626567696E2066616C7365207365746475706C
PREFIX=65786D6F646520322073657470617065727472617920656E640D0A
PREFIX=FF04
PREFIX=252150532D41646F62650D0A
PREFIX=7374617475736469637420626567696E2074727565207365746475706C65
PREFIX=786D6F646520332073657470617065727472617920656E640D0A
*
FORM=STANDARD
SEP=YES
PREFIX=252150532D41646F62650D0A
PREFIX=7374617475736469637420626567696E2066616C7365207365746475706C
PREFIX=65786D6F646520322073657470617065727472617920656E640D0A
PREFIX=FF04
PREFIX=252150532D41646F62650D0A
PREFIX=7374617475736469637420626567696E2074727565207365746475706C65
PREFIX=786D6F646520332073657470617065727472617920656E640D0A
```

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## Setting Up LPR in RSCS ....

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Define the LPR-type links in RSCS CONFIG (same disk)

Definition for a pool of IBM Network Printer 24s

```
LINKDEFINE NP24PSA TYPE LPR FORM * AST
LINKDEFINE NP24PSB TYPE LPR FORM * AST
LINKDEFINE NP24PSC TYPE LPR FORM * AST
PARAM NP24PSA EXIT=LPRXPSE ITO=0 US=Y SYS=Y EP='S=Y EH=N C=LPRP'
        HOST=9.12.2.5 PR=PASS
PARAM NP24PSB EXIT=LPRXPSE ITO=0 US=Y SYS=Y EP='S=Y EH=N C=LPRP'
        HOST=9.12.2.6 PR=PASS
PARAM NP24PSC EXIT=LPRXPSE ITO=0 US=Y SYS=Y EP='S=Y EH=N C=LPRP'
        HOST=9.12.2.8 PR=PASS
ROUTE GROUP NP24PS TO LINK NP24PSA NP24PSB NP24PSC
```

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## Setting Up LPR In RSCS ...

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Generic printers are mapped to real printers via  
LPRXFORM

Generic PostScript printer definitions

```
LINKDEFINE LPRP1 TYPE LPR FORM * AST
...
LINKDEFINE LPRP8 TYPE LPR FORM * AST
PARAM LPRP1 EXIT=LPRXPSE ITO=0 US=Y SYS=Y EP='S=Y EH=N C=LPRP'
...
PARAM LPRP8 EXIT=LPRXPSE ITO=0 US=Y SYS=Y EP='S=Y EH=N C=LPRP'
ROUTE GROUP LPRP TO LINK LPRP1 ... LPRP8
```

Generic non-PostScript printer definitions

```
LINKDEFINE LPR1 TYPE LPR FORM * AST
...
LINKDEFINE LPR8 TYPE LPR FORM * AST
PARAM LPR1 EXIT=LPRXONE ITO=0 US=Y SYS=Y EP='S=Y FF=N C=LPR'
...
PARAM LPR8 EXIT=LPRXONE ITO=0 US=Y SYS=Y EP='S=Y FF=N C=LPR'
ROUTE GROUP LPR TO LINK LPR1 ... LPR8
```

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## Setting Up LPR In RSCS ...

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### EXECs in Redbook to transform EBCDIC to ASCII HEX

### PCL prefix and suffix strings defined in LPRXFORM

```
FORM=HP890C
HOSTNAME=TOT48.ITSO.IBM.COM
PRINTER=HP890C
SEP=YES
PREFIX=1B45
PREFIX=1B28733050
PREFIX=1B2873313248
PREFIX=FF04
PREFIX=1B45
SUFFIX=1B45
```

Hex value	ASCII value	Description
1B45	<sup>esc</sup> E	Reset
1B28733050	<sup>esc</sup> (s0P	Monospace font
1B2873313248	<sup>esc</sup> (s12H	Pitch 12 CPI
FF04		Separator placement

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## Setting Up LPR In RSCS ...

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### PostScript prefix and suffix strings defined in LPRXFORM

```
FORM=NPPTS
FORMSUB=P+ASCII
SEP=YES
PREFIX=252150532D41646F62650D0A
PREFIX=7374617475736469637420626567696E2066616C7365207365746475706C
PREFIX=65786D6F646520322073657470617065727472617920656E640D0A
PREFIX=FF04
PREFIX=252150532D41646F62650D0A
PREFIX=7374617475736469637420626567696E2074727565207365746475706C65
PREFIX=786D6F646520332073657470617065727472617920656E640D0A
```

Hex value	ASCII value	Description
252150532D41646F62650D0A	%!PS-Adobe <sup>CRLF</sup>	PostScript header
7374617475736469637420626567696E2066616C7365207365746475706C65786D6F646520322073657470617065727472617920656E640D0A	statusdict begin false setduplexmode 0 setpapertray end <sup>CRLF</sup>	Paper tray 0, duplex off
7374617475736469637420626567696E2074727565207365746475706C65520312073657470617065727472617920656E640D0A	statusdict begin true setduplexmode 1 setpapertray end <sup>CRLF</sup>	Paper tray 1, duplex on
FF04		Separator placement

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# Printing From VM/ESA

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## LPRSET, LPR and PPS commands utilized

### LPRSET used to set defaults for LPR

```
lprset (perm asynch rscs np24ps,totvm1
Ready; T=0.03/0.04 11:32:10
lprset (query
Printer and host values have not been defined
Server is defined as: RSCS (Default)
Printer is connected on link: NP24PS
Printer is connected on node: TOTVM1
LPR mode: ASYNCHRONOUS
Ready; T=0.03/0.03 11:32:12
```

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# Printing To A PostScript Printer

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## Printing an EBCDIC file to our Network Printer pool

```
PPS filename filetype (PRINTER NP24PS FORM NP
PPS filename filetype (PRINTER NP24PS
LPR filename filetype (RSCS NP24PS,TOTVM1 FORM NP
LPR filename filetype (RSCS NP24PS,TOTVM1
LPR filename filetype
```

## Printing a PostScript file to our Network Printer pool

```
PPS filename filetype (PRINTER NP24PS FORM NPPS
LPR filename filetype (RSCS ASCII,NP24PS FORM NPPS
LPR filename filetype (RSCS NP24PS,TOTVM1 FORM NPPS
LPR filename filetype (FORM NPPS
```

PostScript file created by DCF (Script), uploaded from a workstation, or created by a utility program

It is NOT possible to print an ASCII (including PCL) file using the PostScript printer exit (LPRXPSE)

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## Printing To A Non-PostScript Printer

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Can print non-Postscript ASCII (including PCL) and EBCDIC through LPRXONE exit

Use LPR command (not PPS)

To print an EBCDIC file on our HP890C

LPR filename filetype (FORM HP890C

To print an ASCII (including PCL) file on our HP890C

LPR filename filetype (FORM HP890C RSCS ASCII, LPR

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## i-data Print Subsystem For VM

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Product of i-data international

ida PSS transforms AFP into PCL and PostScript

- Dynamic scaling to 300 pel

Runs as a GCS service machine support PSF syntax

Binary files (formatted PCL or PostScript) can be printed transparently

Direct interface to TCP/IP printers

- Program available for "batch" conversion, a utility to convert AFP or EBCDIC "line" data into PostScript or PCL

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## PSF/VM Support Of TCP/IP For VM/ESA

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Support for TCP/IP attached IPDS printers in PQ39895

Supports Group 4 PDM

- PSF/VM performs error recovery, interventions, messages like SNA printers

Tested with VM/ESA 2.4.0 service level 990

- VM/ESA TCP/IP function level 310 RSU 9801

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## Printing From Windows

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Printing to a network printer

- Just select a printer you defined on a TCP/IP port and print to it
- Print output will be routed to VM/ESA through TCP/IP
- Print output will be routed from VM/ESA by RSCS through TCP/IP to the selected printer

Printing to a host printer

- For non-AFP printers, the host printer should be defined in LPDXMANY CONFIG with the TRAN option to translate the file to EBCDIC
- For AFP printers use the IBM AFP printer driver for Windows and define the printer in LPDXMANY CONFIG as a PSF printer

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## Sources Of Information On The Internet

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[VM/ESA](#)

[ibm.com/s390/vm/](http://ibm.com/s390/vm/)

[VM/ESA TCP/IP](#)

[ibm.com/s390/vm/related/tcpip/](http://ibm.com/s390/vm/related/tcpip/)

[VM/ESA RSCS](#)

[ibm.com/s390/vm/related/rscs/](http://ibm.com/s390/vm/related/rscs/)

[S/390 Server Consolidation on the web](#) [ibm.com/s390/sc/](http://ibm.com/s390/sc/)

- ITG Management Brief Business Value of Consolidation GF22-5034  
<http://www.ibm.com/s390/sc/consult.html>

[IBM Printing Systems - LPR Client](#) [ibm.com/printers/](http://ibm.com/printers/)

- Select "Support", then "Fixes, printer drivers and updates", then "Network Printers Utilities and Microcode" then follow the instructions under "IBM LPR Remote Printing Client Version 2.30 for Windows 95"

[IBM Printing Systems - AFP Printer Drivers for Windows](#)

- Select "Support", then "Fixes, printer drivers and updates", then "IBM AFP printer drivers for Windows" and follow the instructions

[TCP/IP Solutions for VM/ESA Redbook SG24-5459](#)

[ibm.com/redbooks/](http://ibm.com/redbooks/)

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## Sources Of Information On The Internet ...

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[ACITS LPR Remote Printing for Windows](#)

- [www.utexas.edu/academic/otl/software/lpr/](http://www.utexas.edu/academic/otl/software/lpr/)

[NIPrint from Network Instruments, Inc.](#)

- [www.netinst.com/](http://www.netinst.com/)

[ida PSS from i-data international](#)

- [www.i-data.com/](http://www.i-data.com/)

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