iSeries Network Printing

Michigan User Groups

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Topics - Putting the Pieces Together

- **Printer Datastream primer.**
- **iSeries 400 Print Flow.**
- **Implementing an Output Concept.**
- **Attaching printers to the iSeries 400.**
- **Print drivers available on iSeries 400?**
- **Describe the Network configuration methods:**
  - **LPR/Remote Outqueue, PJL, and SNMP (Host Print Transform)**
  - **Understand the differences between Host Print Transform and Print Services Facility/400**
  - **LAN IPDS Configuration**
  - **Integrated e-Output (PDF- AFP Stream Files)**
- **Configuring PSF/400 for TCP/IP Support:**
  - **Problem solving**
  - **Performance considerations**
- **Conclusions**

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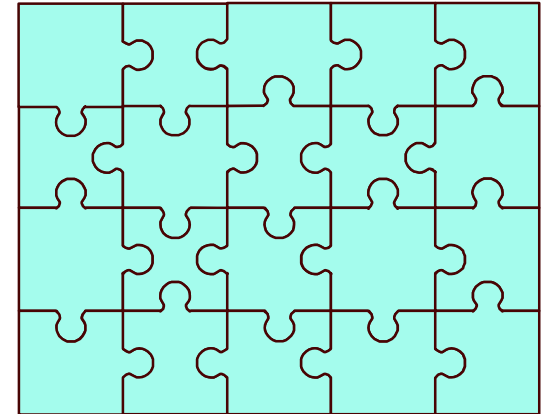
Printer Datastreams /Languages/etc.

- **IPDS: Intelligent Printer Data Stream (IBM AFP, MO:DCA, *AFPDS - Device independent)**
- **IBM S/370 Line Data: 1403, 3211, 3800**
- **SCS: VTAM-attached printers: (S/370 and AS/400)**
- **DSC: 3270 Data Stream Compatibility (S/370)**
- **ASCII: Basic printer datastream in PC and Unix**
- **Postscript: Adobe-developed publishing data stream**
- **PDF: Portable Document Format: paginated PostScript**
- **PCL: HP-developed laser data stream**
- **Code V, IPG: graphics & barcodes for IBM 64xx printers**
- **PPDS, ProPrinter: IBM 40xx, 42xx, Lexmark 23xx**
- **troff, ditroff: Unix printer data streams**
- **Xerox Metacode, LCDS (codes imbedded in data stream)**
- **OTF and ABAP: SAP print datastreams**

Printer Datastreams /Languages/etc.

- **Binary Data with two possible meanings**
- **Two ways of representing text or character data**
1. **EBCDIC: IBM Mainframes.   8-bits, max. 256 characters**
2. **ASCII: PC, UNIX, non-IBM. Early Systems, 7-bits, max.**

   128 characters, 8-bits, max. 256 characters

Character	EBCDIC	ASCII
"A"	X'C1' = B'1100 0001	X'41' = B'0100 0001'
"a"	X'81' = B'1000 0001'	X'61' = B'0110 0001'
"1"	X'F1' = B'1111 0001'	X'31' = B'0011 0001'
space	X'40' = B'0100 0000'	X'20' = B'0010 0000'

EBCDIC - Extended Binary Coded Decimal Interchange Code
ASCII - American National Standard Code for Information Interchange

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Choosing a Output Philosophy

1. **Business Critical print and e-Output?**
2. **Print/e-Output print/delivery requirements**
3. **Application Formatting Options**
4. **DDS, Spool Re-formatters (printer file device type)**
5. **Writer/Spooling Subsystem**
6. **Printer requirements/features, sharing**
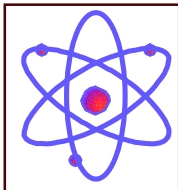7. **Printer attachment - LAN, CA print session, etc.**

PSF/400
vs. PJL / SNMP with HPT
vs. Remote Outqueue (HPT)

➤ **Performance**
➤ **Recoverability**
➤ **Fidelity**

Data Stream Contents

To date, you have taken sixteen lessons. You have completed standard maneuverability training and are ready to begin solo instrument flying at night and in bad weather. Keey up the good work!

TEXT

IMAGE

FLIGHT CONTROL

ACCOUNT NUMBER 7-0693-238-455-700-5-4
John Scott
816 Home Avenue

Billing Date: 5/5/92
Usage Dates: 4/3 to 4/19
Total Days: 17
Service: Flight Lessons
Ratings: RG-1   R
Readings: 5357   75745
Usage: 195 CCF   975 aa

To date, you have taken sixteen lessons. You have completed standard maneuverability training and are ready to begin solo instrument flying at night and in bad weather. Keey up the good work!
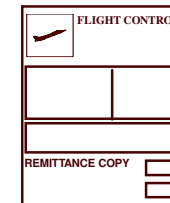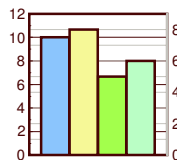
REMITTANCE COPY
ACCOUNT NUMBER 7-0693-238-455-700-5-4
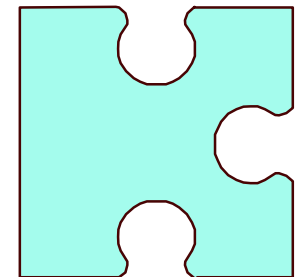
Total Due $379.84

Amount Enclosed

W

FONTS

FLIGHT CONTROL

REMITTANCE COPY

OVERLAY

GRAPHIC

BARCODE

Plus controls i.e. Color, Dynamic Pages, etc.

iSeries 400 as a Print Server

Twinax

SCS (emulate 3812)

iSeries 400 Writers, IPP

PW

Twinax

PW

PSF

IPDS AFP(*YES)

IPDS AFP(*NO)

AS/400 NetServer

ASCII w/s ctlr

ASCII

ASCII

Network Station

TCP/IP

HPT

N I C

LPR / Outq PJL Print Driver

PSF

Network Printers and some others TCP/IP only

N I C

IPDS AFP(*YES)

PCL

HPT

LAN Token Ring or Ethernet

Infoprint Manager

HPT

PCL

Netware Server

IPX protocol

HPT

Client Access/400

parallel or serial

PW or HPT

PSF

HPT

PSF

TCP/IP only

twinax or coax

i-data 7913

IPDS

ASCII

PC

TCP/IP or SNA

Lexlink Protocol

HPT

HPT

twinax or coax

PC PSF/2

IPDS or PCL

channel, coax or parallel

Marknet or INA

Lexmark ASCII ptr

NPS

ASCII

I N A

IPDS

PCL, PS

PW=Standard OS/400 Print Writer, HPT=Host Print Transform, PSF=Print Services Facility/400

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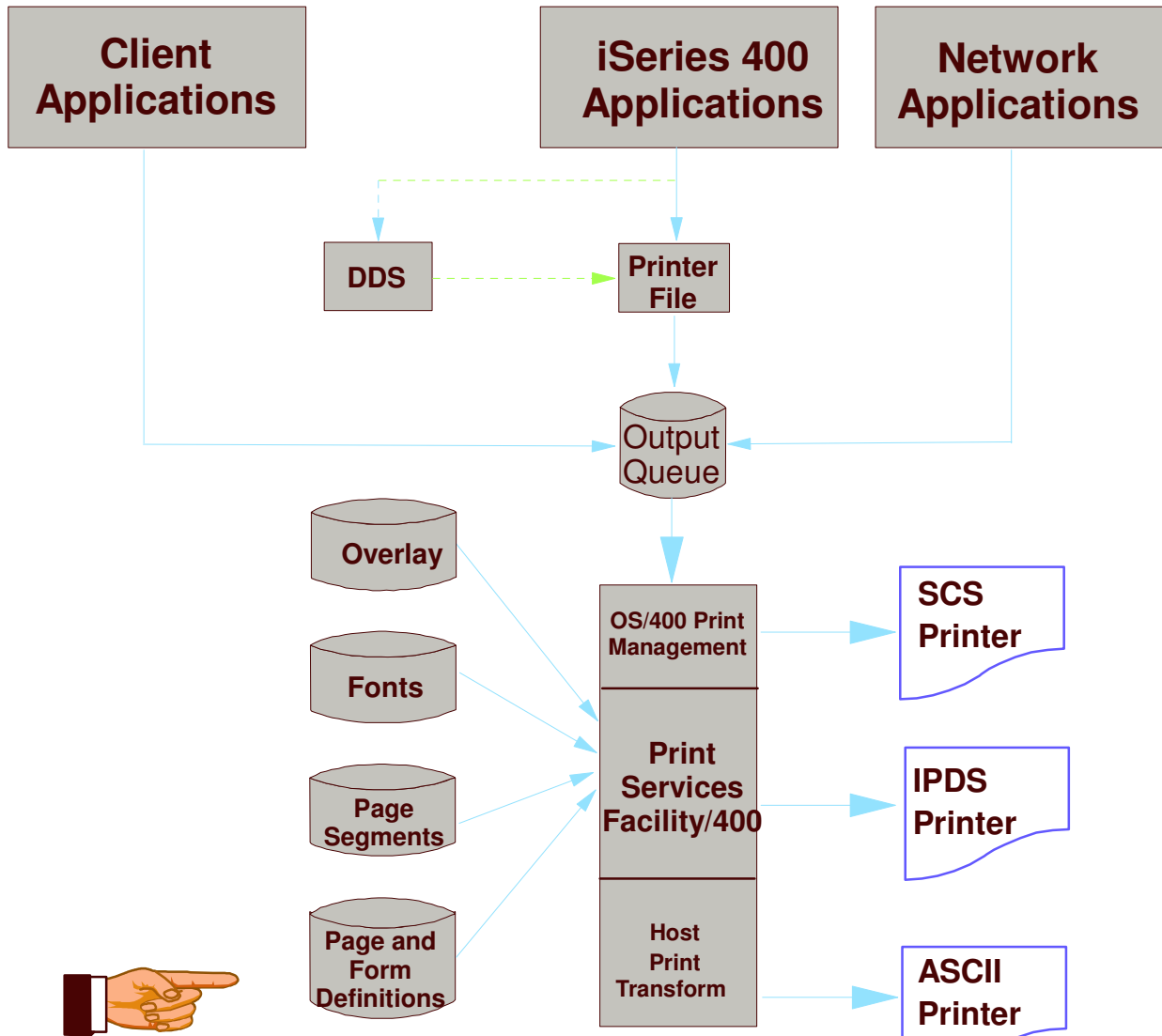
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AS/400 Print Drivers

- **Original OS/400 printing subsystem**
  - **Supports SCS printers**
  - **Supports subset of IPDS printers and print functions**
- **Host Print Transform**
  - **AFPDS to PCL/PPDS**
  - **SCS to ASCII**
  - **AFPDS to TIFF (Image Transforms)**
- **Print Services Facility - PSF/400**
  - **Full support of IPDS printers**
  - **defined as DEVTYPE(*IPDS) and AFP(*YES)**
  - **AFP printing subsystem**
- **Infoprint Server (5722-ID1)**
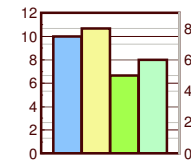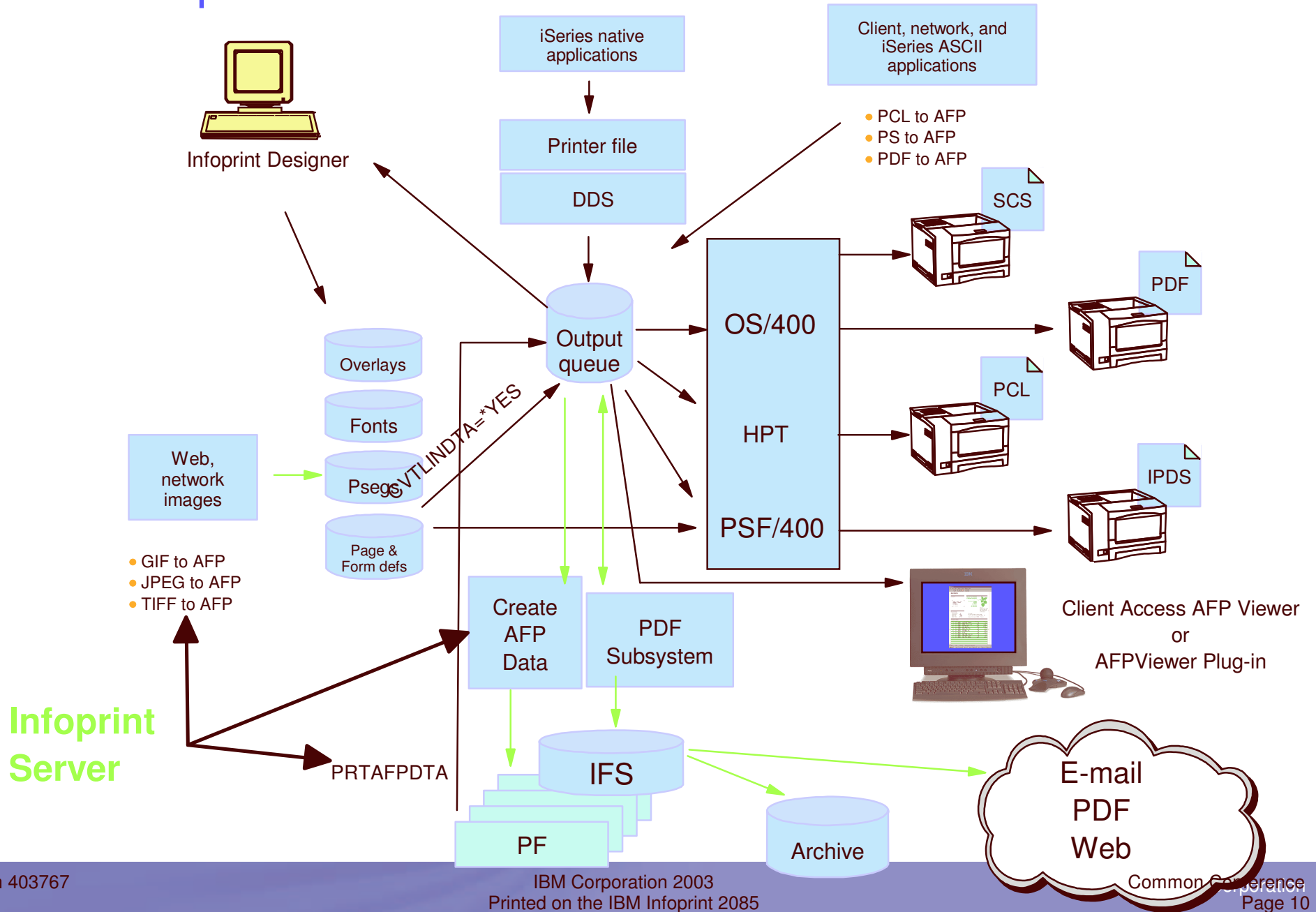 - **PDF Creation**
  - **Additional Transforms**

AS/400 Print Flow - V4R5

Client Applications
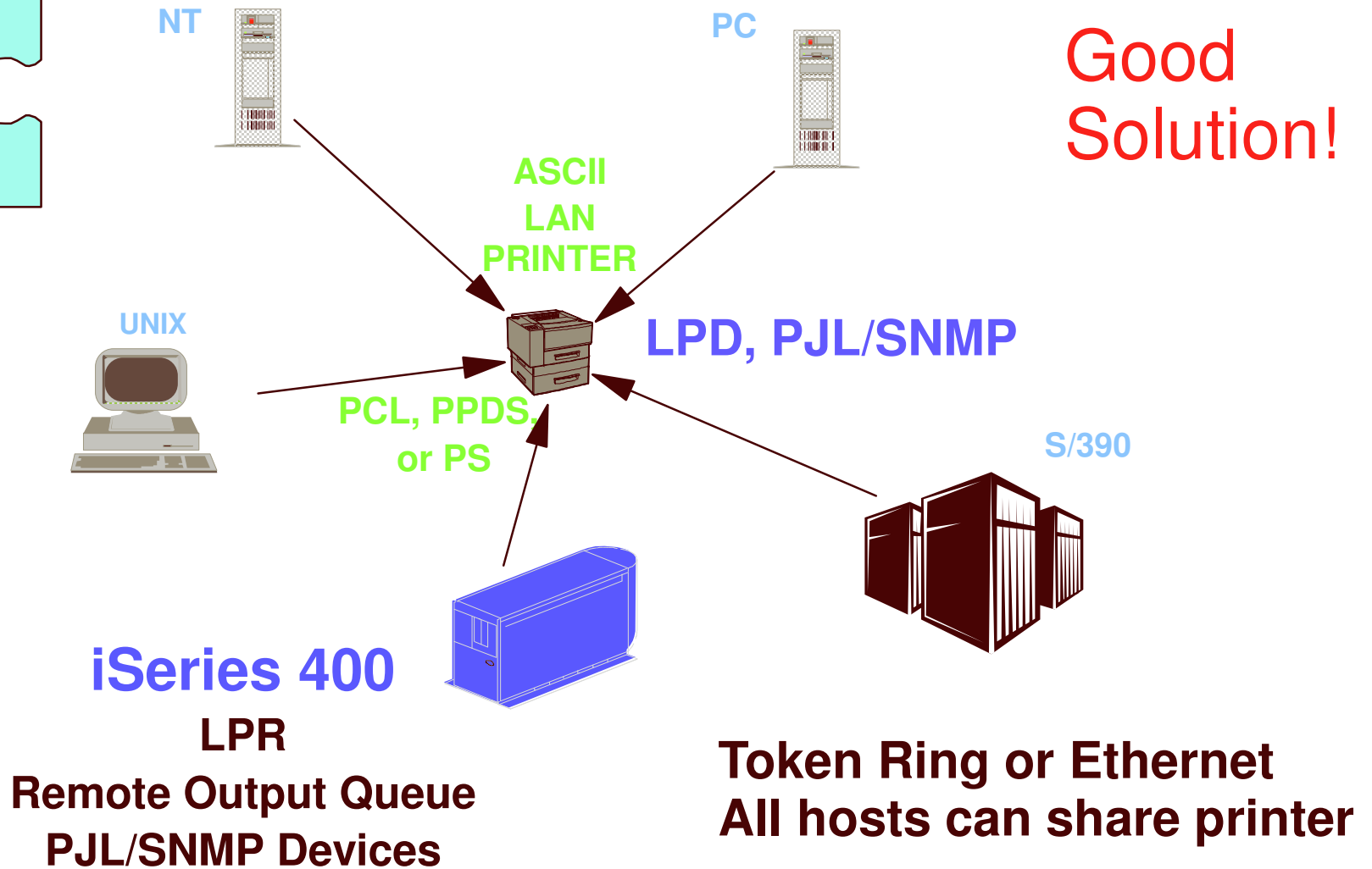
iSeries 400 Applications

Network Applications

DDS

Printer File

Output Queue

Overlay

Fonts

Page Segments

Page and Form Definitions

OS/400 Print Management

Print Services Facility/400

Host Print Transform

SCS Printer

IPDS Printer

ASCII Printer

Native Writer with PSF/400

Output

9876

Print only through PSF/400

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iSeries Output Architecture

iSeries native applications

Client, network, and iSeries ASCII applications

Infoprint Designer

Printer file

DDS

- PCL to AFP
- PS to AFP
- PDF to AFP

SCS

PDF

Overlays

Fonts

Psegs

VTLINDTA=*YES

Output queue

OS/400

HPT

PSF/400

PCL

IPDS

Web, network images

Page & Form defs

- GIF to AFP
- JPEG to AFP
- TIFF to AFP

Infoprint Server

Create AFP Data

PDF Subsystem

Client Access AFP Viewer or AFPViewer Plug-in

PRTAFPDTA

IFS

PF

Archive

E-mail
PDF
Web

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LAN Printing with Host Print Transform

NT

PC

Good Solution!

ASCII
LAN
PRINTER

UNIX

LPD, PJL/SNMP

PCL, PPDS,
or PS

S/390

iSeries 400

**LPR
Remote Output Queue
PJL/SNMP Devices**

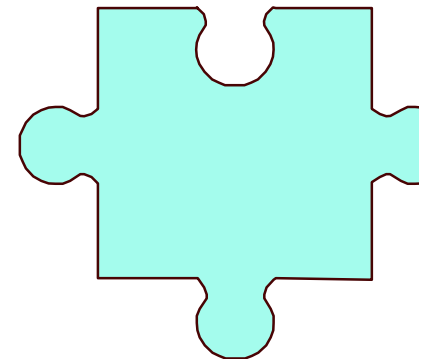**Token Ring or Ethernet
All hosts can share printer**
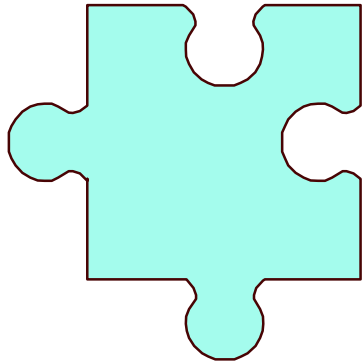
LPR Configuration

LPR or SNDTCPSPLF command

- **LPR RMTSYS(9.99.94.25) PRTQ(PASS) FILE(MYREPORT) JOB(043994/USERID/QPADEV0008) SPLNBR(3) MFRTYPMDL(*IBM4332)**

Remote output queue automates LPR

- **CRTOUTQ OUTQ(IP21LPR) RMTSYS(*INTNETADR) RMTPRTQ(PASS) AUTSTRWTR(1) CNNTYPE(*IP) DESTTYPE(*OTHER) TRANSFORM(*YES) MFRTYPMDL(*IBM4321) INTNETADR('128.99.12.134') TEXT(IBM Network TCP/IP Printer)**

- **TCP/IP prerequisite, Very basic printing**
- **If Data is *USERASCII, it is just a pass through**
- **If not ASCII, a Host Print Transform is used**
- **Outqueue has very limited error recovery**
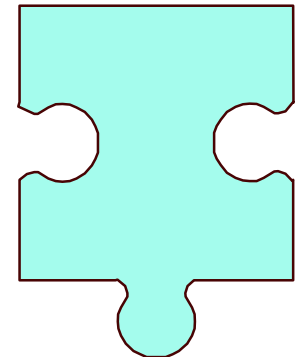
"A GOOD Solution for Casual Print"

PJL - SNMP Driver Configuration

- **SNMP in V4R3 and above, PJL from V3R7**
- **New Field in CRTDEVPRT**
  - **System Driver Program**
  - ***IBMPJLDRV or *HPPJLDRV or *NETSTNDRV or *IBMSNMPDRV**
- **Specify #copies, page range, may print sooner**
- **Still using Host Print Transform**
- **Printer must support PJL /SNMP - limited SNMP support for matrix (impact) printers, no PJL support**
- CRTDEVPRT DEVD(IP21PJL) DEVCLS(*LAN) TYPE(3812) MODEL(1) LANATTACH(*IP) PORT(2501) FONT(11) FORMFEED(*AUTOCUT) PARITY(*NONE) INACTTMR(*SEC15) TRANSFORM(*YES) MFRTYPMDL(*IBM4321) RMTLOCNAME('128.9.12.134') SYSDRVPGM(*IBMPJLDRV) TEXT('PJL / SNMP SAMPLE')

- **"A BETTER Solution for Casual and Business Printing"**

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Host Print Transform - WHY?

- **Consistent output for most ASCII printers attached via various methods (PC, Terminal, ASCII controller, LAN)**
- **iSeries 400 does transform, not 5250 emulators**
- **HPT conversions**
  - AFPDS to ASCII
  - SCS to ASCII
  - AFPDS to TIFF or IOCA
- **Allows iSeries 400 applications to print to PCL or PPDS printers**
- **Allows printing to ASCII printers attached directly to the LAN (IBM, Lexmark, HP, etc.)**
- **Based on Workstation Customization Object (WSCST)**
- **Customized printer support (static)**
- **Data stream determined by customization object, based on printer - impact vs page**

LPR (Remote OUTQ) Considerations

- **No messages for out of paper, jams, no restart at page boundary***
- **Printer/spool file parameters**
  - ▶ **Many not supported/recognized - copies, page range, etc.**
    - – **Note: # copies may be achieved with XAIX in destination options**
    - – **Note: QUSRTOOL ILE C program may be used to specify page range - TSPRWPR exit program**
- **Font fidelity**
  - ▶ **Substitution for *SCS**
  - ▶ **Customized fonts only supported for *AFPDS Spool Files**
- **Commands different - Locating output**
  - ▶ **Route print to output queue not device description (Can create a device description over a remote outq - Has advantages)**
  - ▶ **Remote writer not print writer**
- **Performance**
  - ▶ **Resource retention, LAN traffic, CPU, time to first page in AFPDS**
  - ▶ **Large jobs sometimes time out**
- **Need technical skills to customize workstation object**
  - ▶ **Tag language**
 - ▶ **Need hexadecimal values for printer functions supported**

SCS Host Print Transform

- SCS Transform - 3812 SCS printer emulation
- Text applications supported pretty well
- Orientation and COR supported
- OV/400 Graphic Instruction support
- Very Limited Color Support (basic IOCA only)
- Overlays specified in printer file for SCS and OV/400 NOT supported
- Edge to edge not supported
- Multi-up not supported
- Good for text , convenience, low volume printing
- Reasons to use a customize workstation object
  - ► Fonts, drawers, paper sizes, duplex, COR, etc.
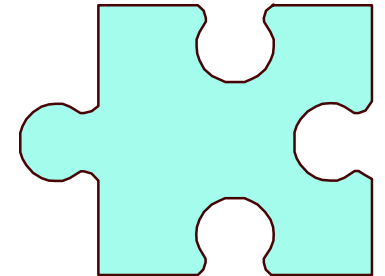 - ► Unique Vendor Functions

AFPDS Host Print Transform

- **Supported**
  - ► **AFP text (240 and 300dpi)**
  - ► **Bar codes, COR Like Tags**
  - ► **Page Segments, Overlays**
  - ► **IOCA images**
- **Not supported**
  - ► **AFP graphic commands**
  - ► **BGU or GDF files**
  - ► **CHRSIZE keyword**
  - ► **COR, Multi-up, Extended Color**
  - ► **Edge to edge not supported, Lines, boxes may move**
  - ► **New PDF 417 and UPS Maxicode**
  - ► **etc. - New print function not supported or in later releases**
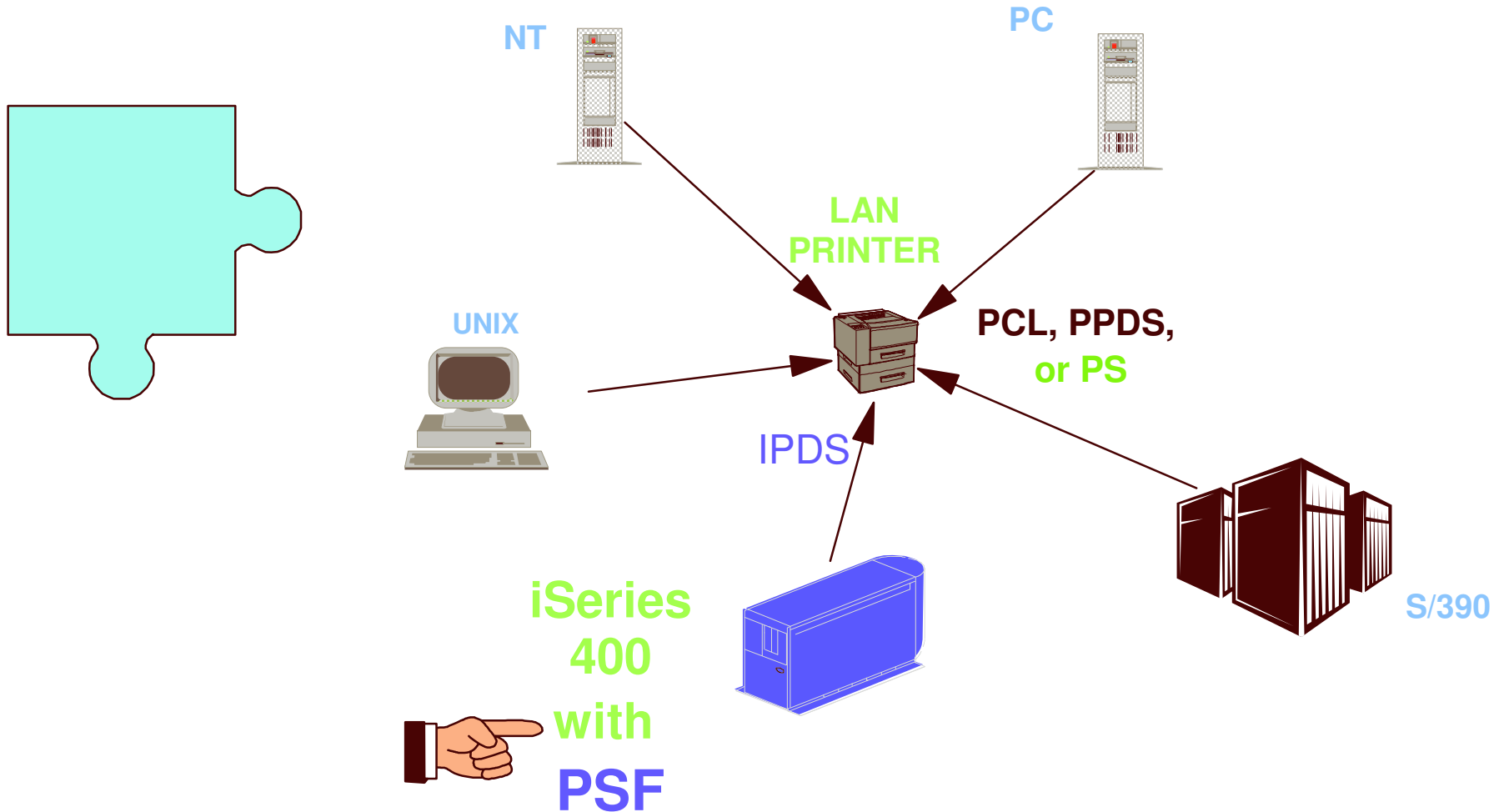- **Two modes of transform**
  - ► **Mapping**
  - ► **Raster**

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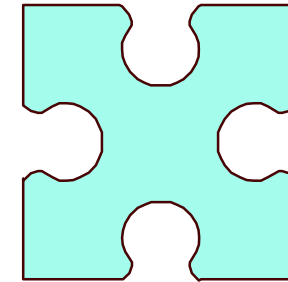
Other Print Transforms

➤ ASCII Data Streams Converted

➤ Supports many file typesTIFF, GIF, BMP & PostScript and PDF files.

➤ Converts to Printer required format, i.e., PDF to AFP

➤ IMGCFG Keyword in CRTDEVPRT or CRTOUTQ

➤ Data Stream Sniffing, (Infoprint Server required) start transform engine that runs in the PASE environment

➤ Examples in Printing Redbooks V & VI

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TCP/IP LAN Printing with IPDS

NT

PC

**LAN
PRINTER**

UNIX

**PCL, PPDS,
or PS**

IPDS

**iSeries
400
with
PSF**

S/390

**Token Ring or Ethernet
All can share printer**

This is the BEST!

IPDS Configuration

- **V5Rx, V4Rx example (all possible parameters not shown)**

- **CRTDEVPRT DEVD(IP70IPDS) DEVCLS(*LAN) TYPE(*IPDS) MODEL(0) LANATTACH(*IP) AFP(*YES) PORT(5001) FONT(416 12) FORMFEED(*AUTOCUT)   ACTTMR(*NOMAX) RMTLOCNAME('128.9.12.134') USRDFNOBJ(QGPL/IP70PSF *PSFCFG) TEXT('IBM Infoprint 70')**

- **Can share the a PSFCFG object with multiple printers**

- **If printer is to be shared (PCL, PS, IPDS) the PSFCFG object sets the release timer - Newer Printers may have hardware timeouts**

- **CRTPSFCFG PSFCFG(QGPL/IP20IPDS) IPDSPASTHR(*NO) RLSTMR(*SEC15) TEXT('PSFCFG for IP70IPDS)**

- **TCP/IP prerequisite**
- **PSF/400 feature is a prerequisite**

"BEST!"
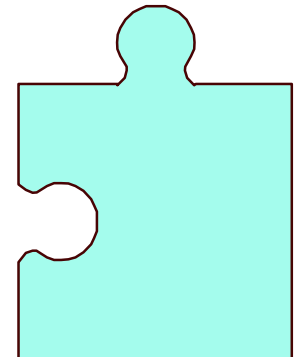
The output of e-business

## E-business is changing business communications

- **Traditional output methodology has been "print and distribute"**

- **Networks, Internet, and electronic documents are transforming output**

- **Electronic documents mean:**
  - Tie to preprinted form is broken
  - Flexibility in content
  - Flexibility in delivery

- **Networks and Internet drives e-business process reengineering**
  - Printing, if required, must take place later in the flow
  - Electronic documents and reports can flow as the process requires
  - The Questions? How, What is Best, etc.

The output of e-business - "e-Output"

- **Ability to create fully electronic pages of information and deliver them to the desired destination in the desired format**

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PDF Printer for Infoprint Server

- **Virtual Printer for Creating PDF Output**
  - **Uses *IP Connection to Loopback 127.0.0.1**
  - **Release timer set to *NOMAX**
  - **Uses PSFCFG for determining PDF destination**
- **Additional Parameters in PSFCFG**
  - **PDF Output - Default is *NONE**
  - **Options are - *MAIL, *STMF, and *OUTQ**
    - ○ ***MAIL outputs to QSNADS for e-Mail**
    - ○ ***STMF outputs to IFS**
    - ○ ***OUTQ outputs to Output queue for PDF Printer or for another system**
  - **Each of these cause unique parameter list**
- **New Operations Navigator Tools**
  - **GUI for PSF Configuration Object**
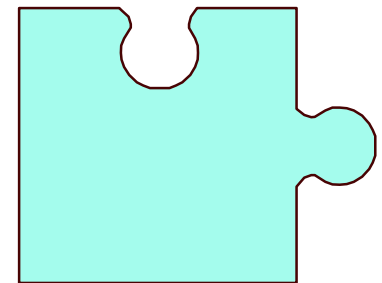
PSF/400 - Industrial Strength Printing

- **No Customization Required, PSFCFG provides flexibility**
  - Native print support, Printer Sharing, PDF Generation
- **Reliability/Error Recovery**
  - Error messages (out of paper, paper jam, etc.)
  - System managed print process - two way conversation
  - All printer file parameters honored
  - All data streams supported - AFPDS, IPDS, SCS, LINE
- **Performance**
  - Less CPU processing compared to HPT
  - Time to first page if using AFPDS
  - Resource retention (overlays and page segments)
- **Document Fidelity**
  - Fonts, Overlays, Page Segments, Color
- **Printer flexibility, scalability, backup**
  - Compatible family of IPDS printers (12 IPM to >1220 IPM Duplex)

Configuring iSeries 400 for TCP/IP Support

If a TCP/IP network is not set up, then

- **Create a Token Ring or Ethernet line description,**
  - **CRTLINTRN or CRTLINETH**
- **Vary on the line description**
  - **VRYCFG**
- **Add a TCP/IP interface**
  - **ADDTCPIFC**
- **Start the TCP/IP interface**
  - **STRTCPIFC**
- **Add a router definition if necessary**
  - **ADDTCPRTE**
- **Start TCP/IP**
  - **STRTCP**
- **Create Outqueue or**
- **Create printer device description - TCP/IP support**
  - **CRTDEVPRT - PJL, SNMP, IPDS**
- **Create a PSF configuration object for AFP=*YES (optional)**
  - **CRTPSFCFG.**
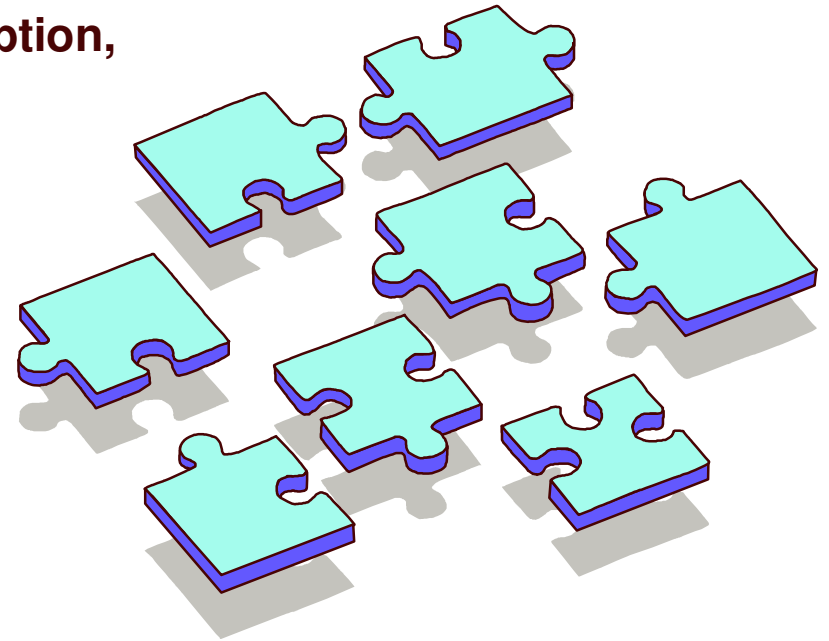
Verifying Your Configuration

PING 'ip_address' or PING host_name

If PING successful, Vary on the Printer

VRYCFG CFGOBJ(printer_dev) CFGTYPE(*DEV) STATUS(*ON)
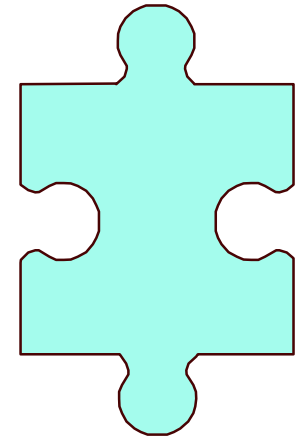
STRPRTWTR DEV(printer_dev)

If either the PING fails or you are unable to print, then you are in troubleshooting mode.

Common Problems - Symptoms

Printer cannot be PING'ed

File remains in PND status

File remains in PRT status

Writer not ending, ENDWTR XXXX *IMMED or

CALL PGM(QSPENDWA) PARM(printer_devd)

If PJL, (or ASCII) may need to put printer into Hex Mode to debug custom WSCST

Remember - Do not reboot printer to recover from a paper jam - LPR, PJL, SNMP connections

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V5Rx Print Enhancements

Internet Printing Protocol (IPP) Server/Client

- **IPP Server for IBM eServer iSeries**
  - An IPP Version 1.0 "server side only" implementation integrated in OS/400
  - Any AS/400-attached printer can be configured as an "IPP" printer
  - Any IPP-enabled client can interact with IPP Server for iSeries over the Internet to perform the following:
    - ▸ Submit print job to specified AS/400-attached printer
    - ▸ Inquire about the capabilities of a selected AS/400 printer
    - ▸ Inquire about a print job status
    - ▸ Manage a print job submitted to a specified AS/400 printer
  - Provides security features for user authentication and encryption of print jobs using Secured Sockets Layer 3 (SSL)
  - A GUI-based configuration utility to configure AS/400 printers as IPP printers

Operations Navigator - AFP Print Manager

- **Resource Manager**
- **PSF Configuration GUI**

OS/400 PTFs - Up to Date

- ## Online Access to Latest List
  - ► **Select the "Search Software Knowledge Base" pull down from AS/400 Service home page. (http://as400service.rochester.ibm.com/).**
  - ► **You will see a search box and a list of categories**
  - ► **Enter in the search box - 'ptf'**
  - ► **Select the category of PRINT**

- ## All of the PTF documents for current releases are updated frequently.

- ## Remember - Not All PTF's are on CUM
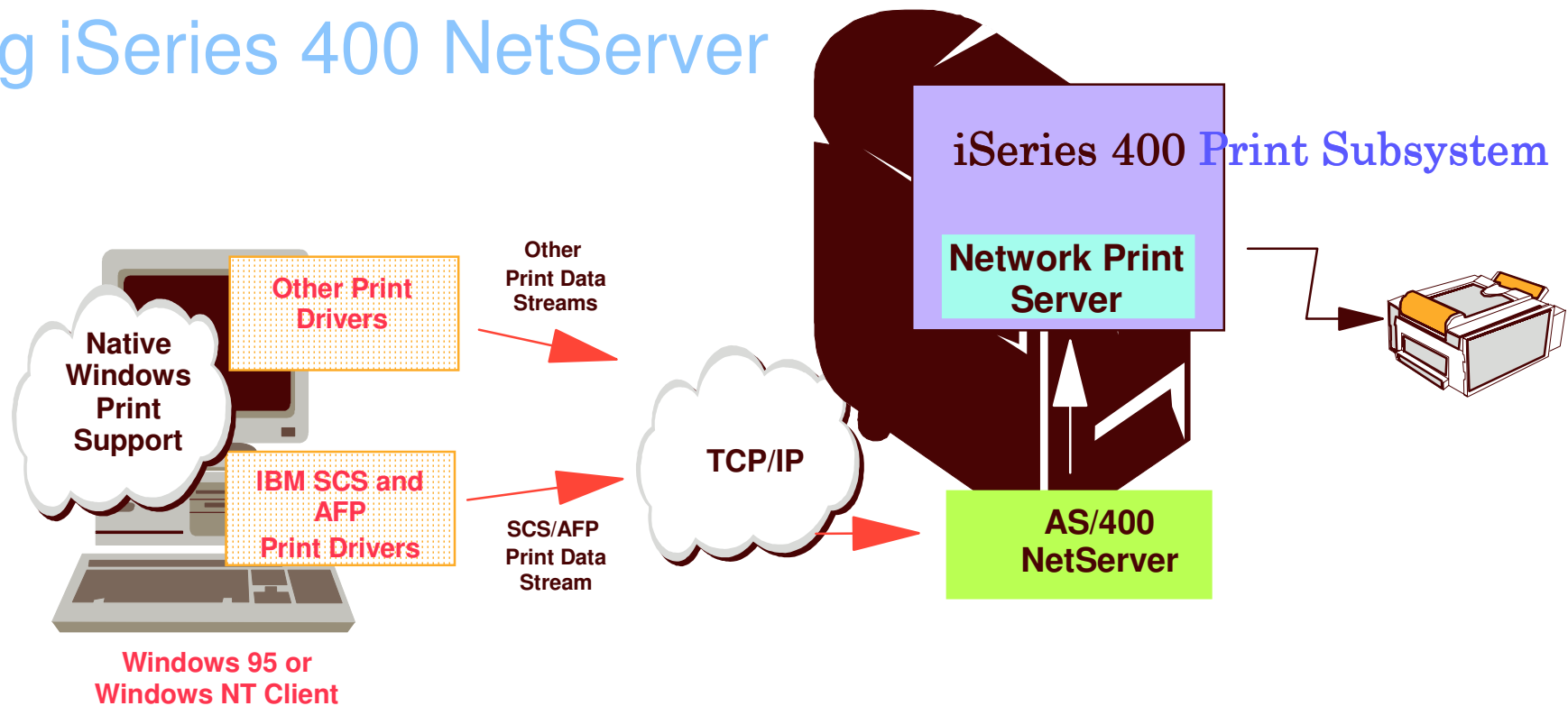
- ## Can also get Host Print Transform Info.

Conclusions

- **iSeries device configuration has not been changing significantly between releases**
- **A little more stable (Fewer new parameters, printer port numbers - mfg. option)**
- **Printers have more capabilities**
- **Some new challenges - Multi-function machines**
- **Output Archiving - Viewing in final form**
- **e-Output Challenges - Color**
- **IPP Print Server/Client - new options**
- **Being All Things to All Applications and All Printers is still a challenge!**

IBM

Reference Information

- **The following charts contain reference information on printer connectivity, systems interconnect, and other print related issues**

Using iSeries 400 NetServer

iSeries 400 Print Subsystem

Network Print Server

Native Windows Print Support

Other Print Drivers

Other Print Data Streams

IBM SCS and AFP Print Drivers

SCS/AFP Print Data Stream

TCP/IP

AS/400 NetServer

Windows 95 or Windows NT Client

★ PC applications can take advantage of IBM and non-IBM printers attached to the iSeries 400 using native Windows client print support for Windows Network Neighborhood

★ CA/400 Express **redbook** - SG24-5191

★ AS/400 NetServer Advantage **redbook** -SG24-5196

Other Transforms

Windows transforms for GIF, TIFF, and JPEG image files

- Transform to iSeries image format
  - IOCA (Image Object Content Architecture)
  - OS/400 page segment object

- Can be run dynamically via STRPCCMD (Start PC Command)

Transforms from PS, PCL and PDF to AFP

- Infoprint Server, 5722-ID1 required

- Print PC jobs to IPDS printers

- Uses PASE environment

Requires Application to be started and Printer defined

- New parameters in V5R1 Device Description

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Interoperability Issues - AS/400 to _____

- **Infoprint Manager and PSF for AIX**
  - ➤ **Use LPR to pass thru AFPDS (Transform= *NO)**
    - AFP resources must be in reslib on AIX (FTP)
    - CRTAFPDTA can bundle all resources
  - ➤ **Use LPR & HPT to transform SCS to ASCII line data or PCL**
    - IPM can apply page def/form def to reformat or pass thru PCL
  - ➤ **Other iSeries 400 device types not supported (I.E.: *LINE)**

- **OS/390 Print Server**
  - ➤ **SNA or TCP/IP supported (SCS &AFPDS only)**
  - ➤ **AFP resources must be sent separately (FTP or SNADS)**
  - ➤ **LPR & HPT to IP Printway**
  - ➤ **CRTAFPDTA on iSeries or ACIF on OS/390 to Bundle Resources**

- **Infoprint 2000 (RPS)**
  - ➤ **Direct using LPR and HPT to PCL (SCS &AFPDS only)**
  - ➤ **Pass thru AFPDS to IPM to IP2000 DSS**

Information Sources

▸ **AS/400 Guide to Output (S544-5319-04)**

▸ **Ethernet and Token Ring Configuration Guide (S544-5711)**

▸ **IBM AS/400 Printing II (GG24-3704)**

▸ **IBM AS/400 Printing III (GG24-4028)**

▸ **IBM AS/400 Printing IV (GG24-4389)**

▸ **IBM AS/400 Printing V (SG24-2160)**

▸ **IBM iSeries Printing VI (SG24-6250)**

▸ **AS/400 System API Reference (SC41-4801)**

▸ **AS/400 Printer Device Programming (SC41-5713)**

▸ **AS/400 Guide to Programming for Printing (SC41-8194)**

▸ **AS/400 TCP/IP Configuration and Reference (SC41-5420)**

▸ **AS/400 Workstation Customization Programming (SC41-3605)**

▸ **IBM Publication order number - 1-800-879-2755**

▸ **IBM Printer Support Line - 1-800-358-6661**

▸ **Home Pages (a moving target):**

  ● **IBM Printing Systems - www.ibm.com/printers (Access to online manuals for printing and IBM Printers)**

  ● **AS/400 - www.as400/ibm.com or www.ibm.com/iseries**

  ● **AS/400 Service and Knowledge Base- www.as400service.ibm.com**

  ● **Redbooks - www.redbooks.ibm.com**

Glossary

- **AFP - Advanced Function Presentation**
- **AFCCU - Advanced Function Common Control Unit**
- **AFPDS - Advanced Function Printing Data Stream**
- **API - Application Program Interface**
- **ASCII - American National Standard Code for Information Exchange**
- **BGU - Business Graphics Utility**
- **BMP - OS/2 and Windows Bitmap**
- **BRMS - Backup Recovery Management System**
- **COR - Computer Output Reduction**
- **DJDE - Dynamic Job Datastream Entry (Xerox)**
- **DSS - Device Support Systems (AIX IpM)**
- **EBCDIC - Extended Binary Coded Decimal Interchange Code**
- **GDF - Graphical Display File**
- **GIF - Graphics Interchange Format**
- **HPT - Host Print Transform**
- **IOCA - Image Object Content Architecture**
- **IPDS - Intelligent Printer Data Stream**
- **IPxxxx - IBM's Infoprint printers**

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Glossary - Continued

- **IPM - Infoprint Manager - AIX, NT and 2000**
- **IPP - Internet Print Protocol**
- **LCDS - Line Conditioned Data Stream (Xerox)**
- **LPR/LPD - Line Printer Requestor/Line Printer Daemon**
- **MO:DCA - Mixed Object: Data Content Architecture**
- **MTU - Maximum Transmission Unit (Internet protocols)**

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