iSeries Output Flow and Architecture
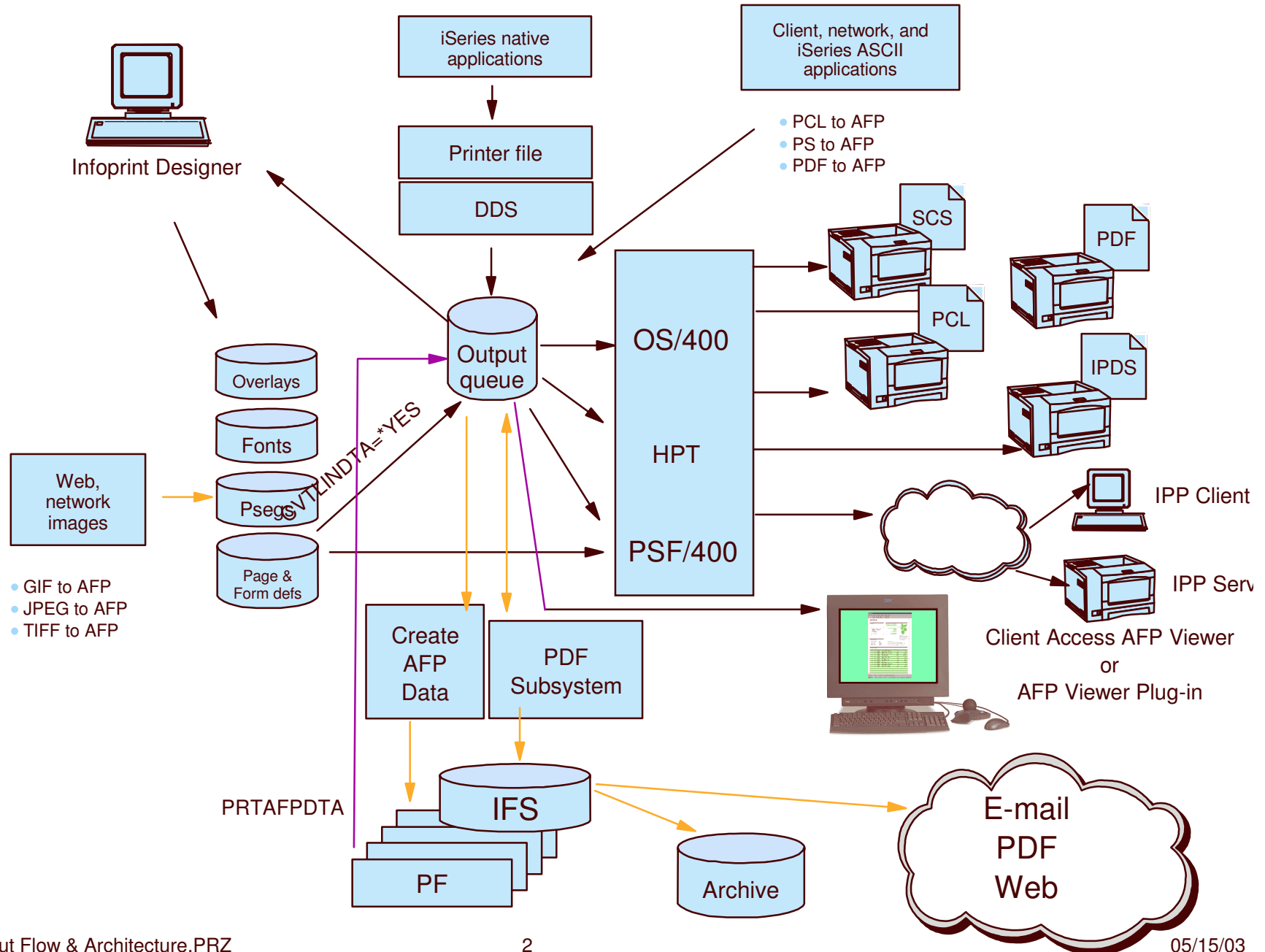
Glenn Rose

Printing Systems Division

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iSeries Output Architecture

Infoprint Designer

iSeries native applications

Client, network, and iSeries ASCII applications

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

Printer file

DDS

Overlays

Fonts

Psegs

Web, network images

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

Page & Form defs

VTLINDTA=*YES

Output queue

OS/400

HPT

PSF/400

SCS

PCL

PDF

IPDS

IPP Client

IPP Serv

Client Access AFP Viewer
or
AFP Viewer Plug-in

Create AFP Data

PDF Subsystem

PRTAFPDTA

IFS

PF

Archive

E-mail
PDF
Web

Why so "complex"

- Merging of different architectures
  - Original or "Native" iSeries application platform
    - Printer Files & DDS
  - AFP architecture used on other platforms.
    - Form Definitions, Page Definitions, Overlays, Page Segments, Font objects
  - Challenges of dealing with other pervasive data streams
    - PCL, PostScript, PDF
    - Images such as TIFF, GIF, JPEG
- Variety of Application Development tools for print
- Variety of connectivity methods
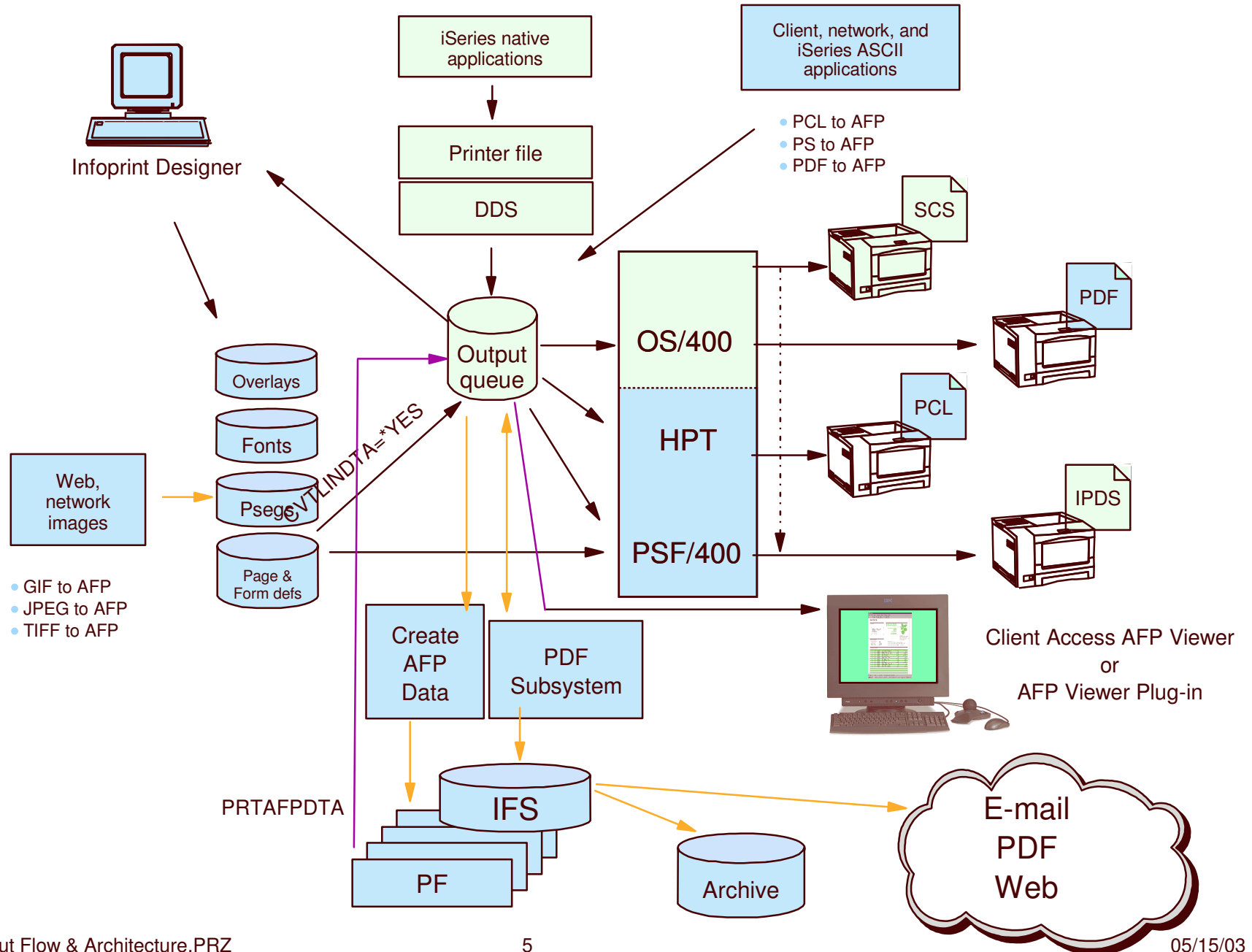 - twinax, ethernet or token ring, SNA or TCP/IP

Do you remember when?

AS/400 Print Architecture, circa 1988

iSeries Printer File

Printer Files

- Every AS/400 application uses a printer file
- Printer file determines printing characteristics for entire spool file
- Printer Files are easily created, overridden, or changed
- Achieve some AFP or electronic print functions
- Part of the native AS/400 print process
- No modification to application program
- No programming skill required

AS/400 Application → Printer File → Spool → Writer applies → Printer

DDS and Printer File format data and specify AFP resources

Limited Formatting on Page

Writer applies:
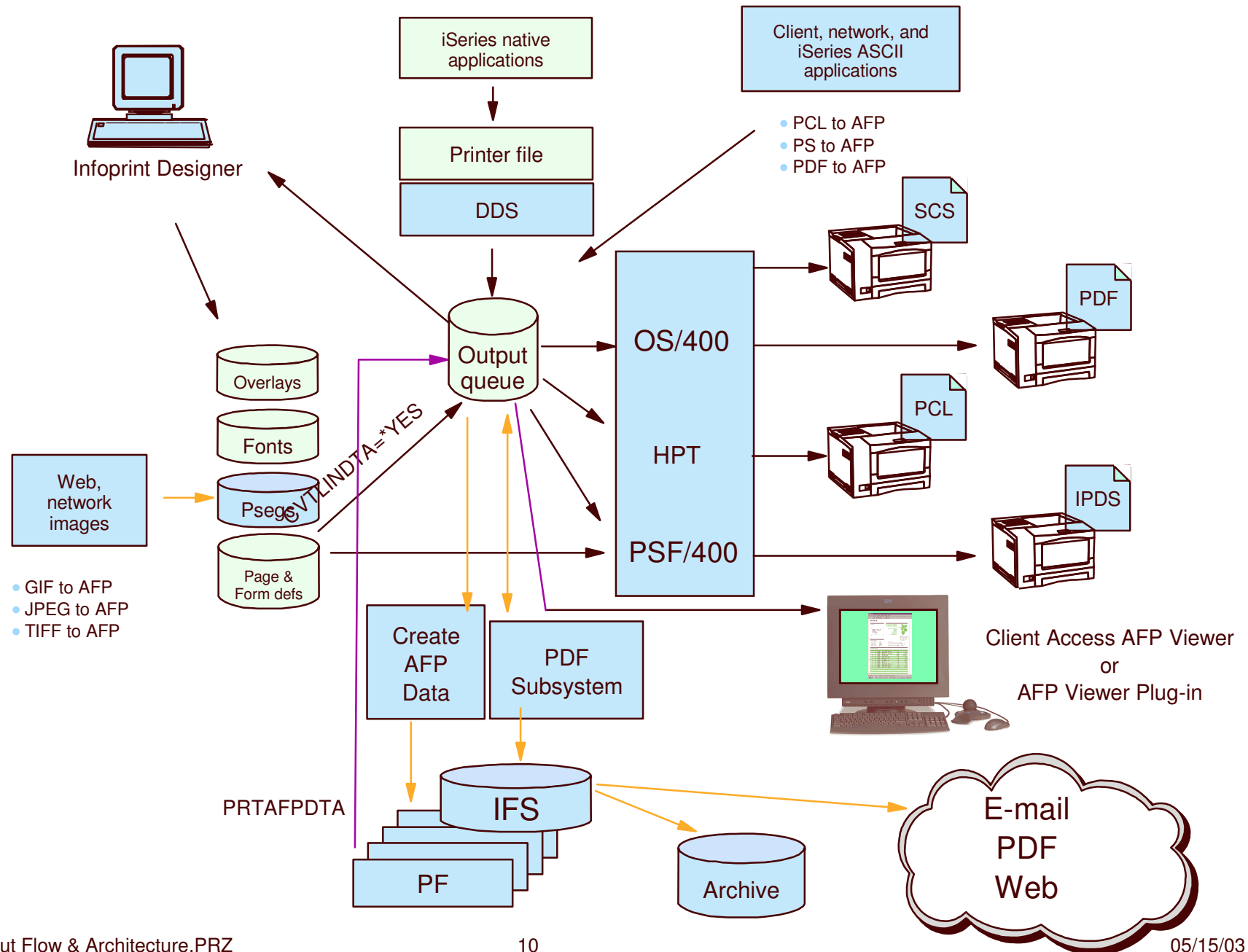Overlays,
Page Segments,
Fonts,
Form Def,
Page Def
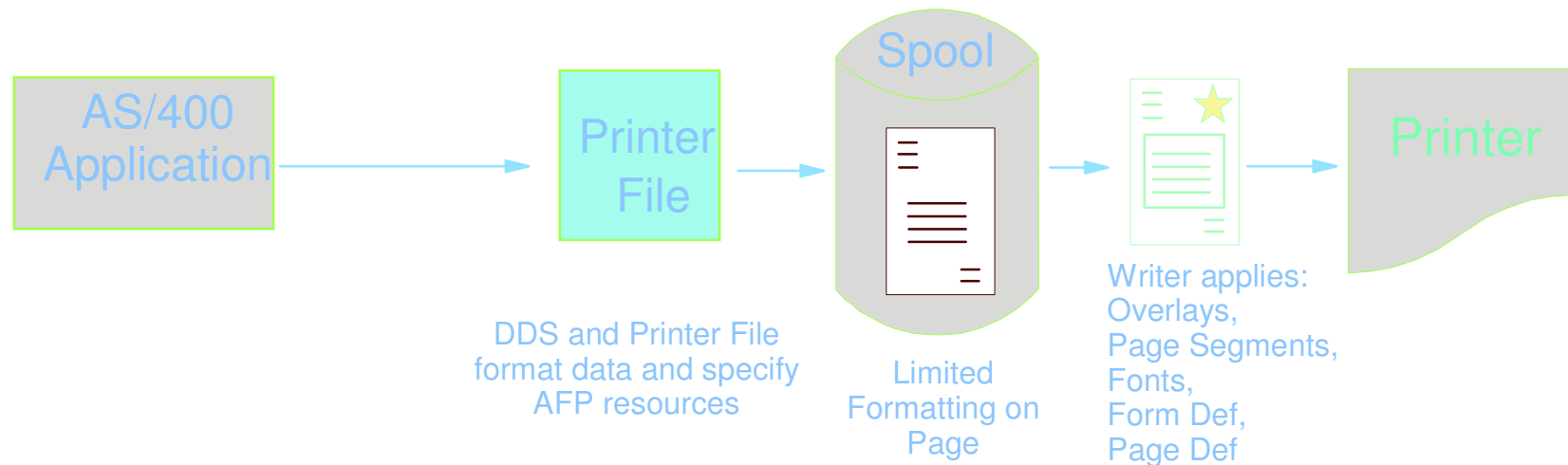
Common Printer File Options

- Change CPI and LPI
- Change font
- Add overlays (front and back)
- Implement duplex (standard and tumble)
- Use multi-up (2, 3, 4)
- Use COR
- Change to specific printer or output queue
- Page size/rotation
- Select input/output bin
- Stapling
- Add Page Definition
- Add Form Definition
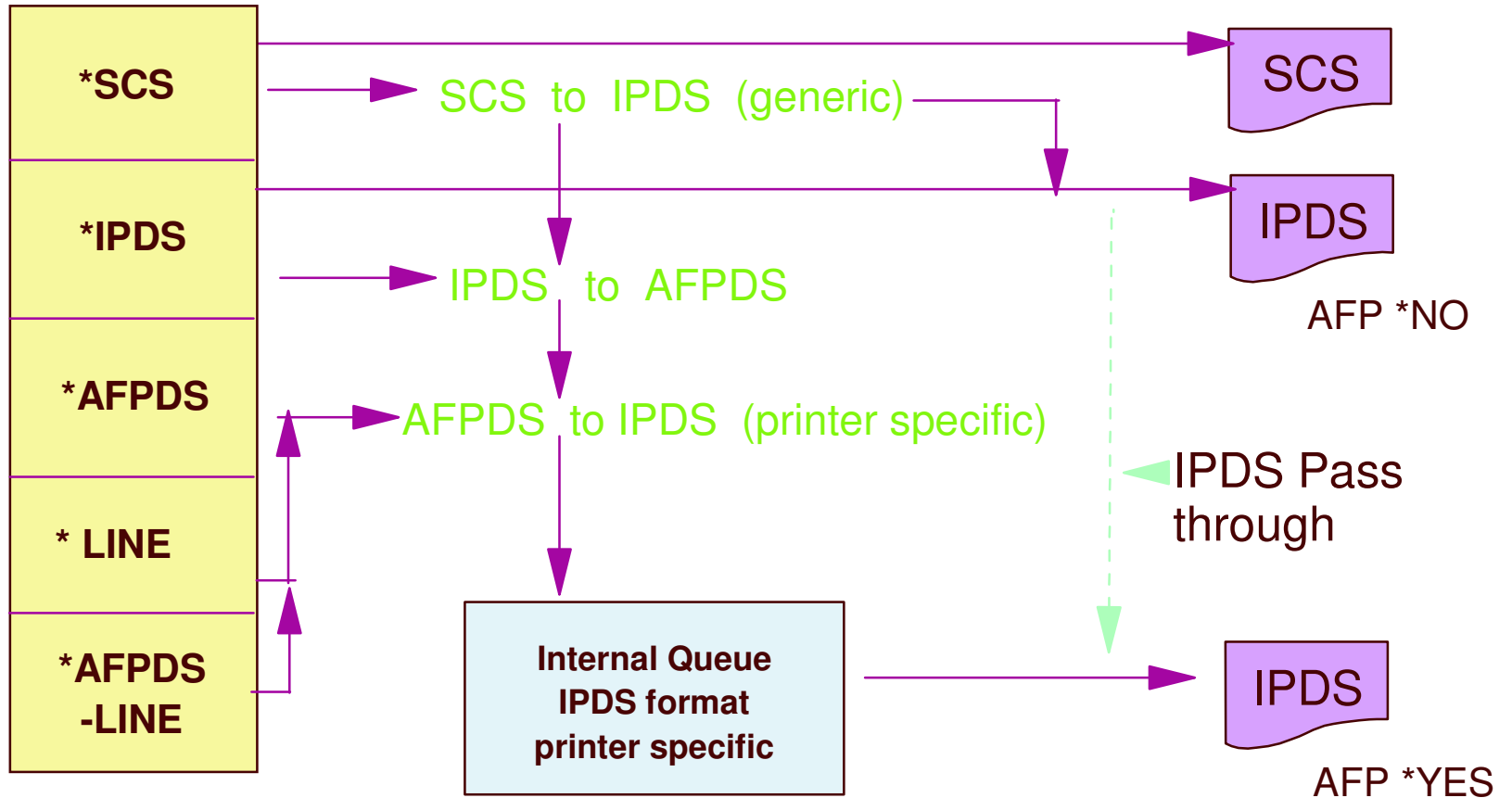- **Device Type**

Printer File - Device Type

- Function available depend on Device Type (DEVTYPE)
  - *SCS - SNA Character Stream
    - Simple line data - few controls (CPI, LPI)
    - Extensions for text (fonts & image)
  - *IPDS - Intelligent Printer Data Stream
    - Bar Codes and more
  - *AFPDS - Advanced Function Presentation Data Stream
    - Full function page oriented
  - *USERASCII - used for output to PCL or PS printers
    - iSeries not aware of its contents
  - *LINE - similar to SCS - no formatting
    - formatting done using page definition object
    - First Character Forms Control
  - *AFPDSLINE - add some AFP controls to Line data

iSeries - Printer File Architecture

Infoprint Designer

iSeries native applications

Client, network, and iSeries ASCII applications

Printer file

DDS

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

SCS

PDF

Overlays

Fonts

Output queue

OS/400

HPT

PSF/400

PCL

IPDS

CVTLINDTA=*YES

Web, network images

Psegs

Page & Form defs

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

Create AFP Data

PDF Subsystem

Client Access AFP Viewer
or
AFP Viewer Plug-in

PRTAFPDTA

IFS

PF

Archive

E-mail
PDF
Web

Printing Systems

The output of e-business™

iSeries SCS/IPDS/AFPDS Print Flow

iSeries Output Queue

*SCS	SCS to IPDS (generic)
*IPDS	IPDS to AFPDS
*AFPDS	AFPDS to IPDS (printer specific)
* LINE	
*AFPDS -LINE	

SCS

IPDS

AFP *NO

IPDS Pass through

**Internal Queue
IPDS format
printer specific**

IPDS

AFP *YES

For Spooled Files going to an IPDS AFP (*YES) Printer:

   Job WTR in QSPL Does Conversion

   Job PDJ in QSPL Does Writing

   Job BCH in QSPL Does PDF Conversion

NOTE: *USERASCII Spooled Files do not go through this process. They are sent to the printer untouched by OS/400.

DDS
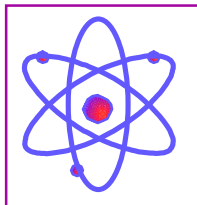# (Data Description Specifications)

DDS

- DDS allows formatting of application output
- Field and page level formatting
- Works in conjunction with application program
- Requires unique Printer File
- AFP capabilities include dynamic selection and positioning of:
- Image (page segments)
- Boxes
- Lines
- Electronic forms
- Text
- Graphics
- Bar code
- Color

Application Program

```
F DDSPF     O   E   Printer

Do some moves/calcs

C Write CUSTREC
```

DDSPF Printer File

```
FONT (11)

DDS:
 A  R  CUSTREC
 A     NAME      6  10  HIGHLIGHT
 A     ADDRESS  7  10
 A     CITY      8  10  UNDERLINE
```

Output:

Chris Smith
812 North Street
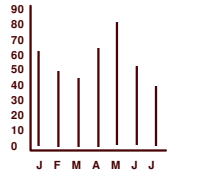Boulder

Document Elements

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.
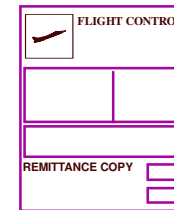Keey up the good work!

REMITTANCE COPY

ACCOUNT NUMBER 7-0693-238-455-700-5-4

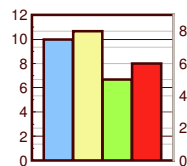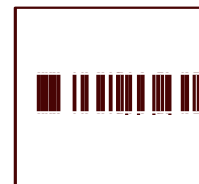**Total Due** $379.84

Amount Enclosed

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

W

FONT

FLIGHT CONTROL

REMITTANCE COPY

OVERLAY

GRAPHIC

BARCODE

DDS - Program to System fields
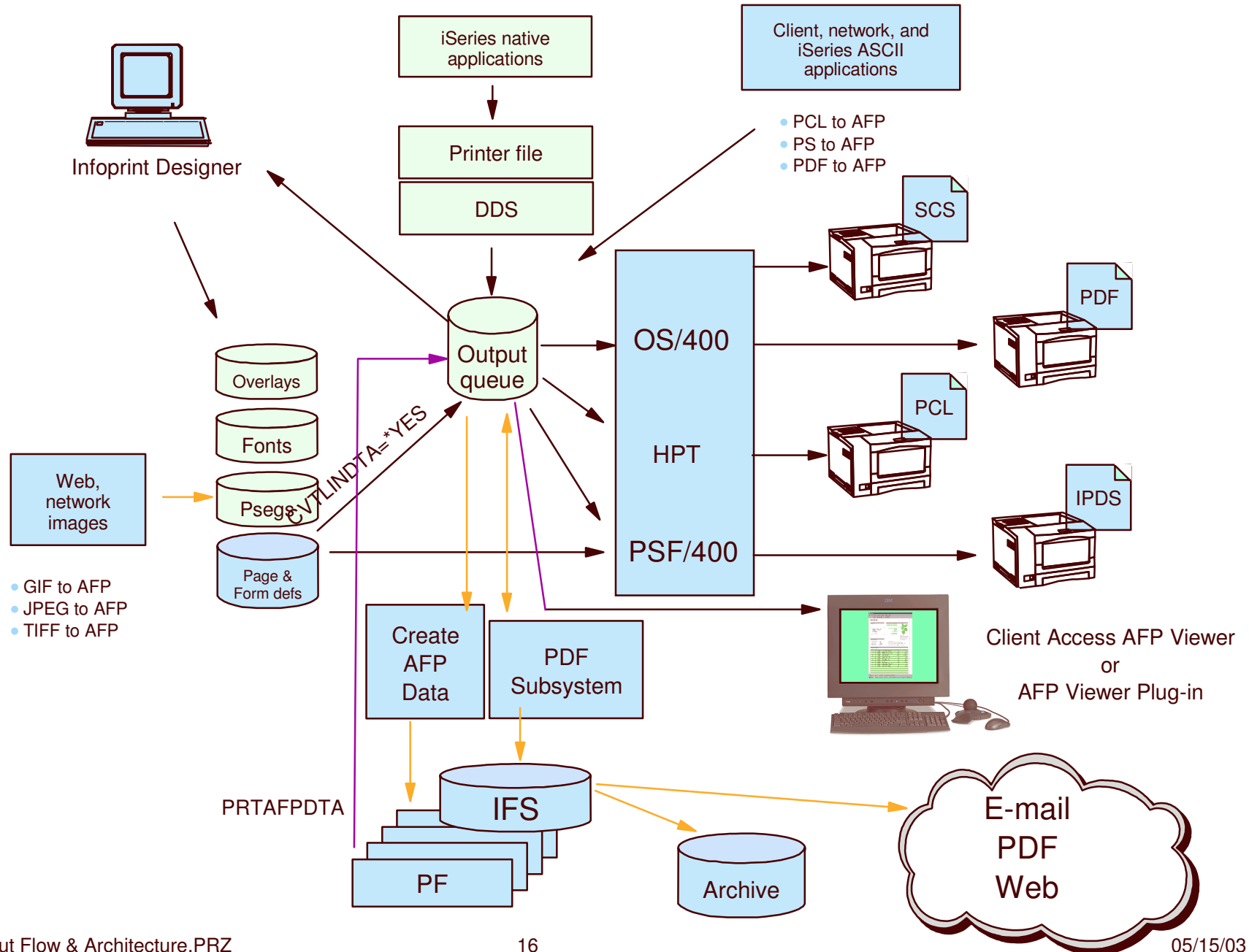
```
|...+....1....+....2....+....3....+....4....+....5....+....6....+....7....+....8
    A*
    A           R REC1                              OVERLAY(MYLIB/OVL04 1.234 14.62)
    A*
    A           R REC2                              OVERLAY(&LIB/&OVLS &POSD &POSA);
    A             LIB          10A  P
    A             OVLS          8A  P
    A             POSD          5S 3P
    A             POSA          5S 3P
    A*
```

- "P" in position 38 means value supplied by program
- Variable name & position of elements
- Use for many AFP elements such as Overlay, Page Segment, Line, Box

iSeries - DDS Architecture

Infoprint Designer

iSeries native applications → Printer file → DDS

Client, network, and iSeries ASCII applications

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

SCS
PDF
PCL
IPDS

Overlays
Fonts
Psegs
Page & Form defs

Web, network images

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

CVTLINDTA=*YES

Output queue

OS/400
HPT
PSF/400

Create AFP Data
PDF Subsystem

Client Access AFP Viewer or AFP Viewer Plug-in

PRTAFPDTA

IFS
PF
Archive

E-mail
PDF
Web

Printing Systems

The output of e-business™

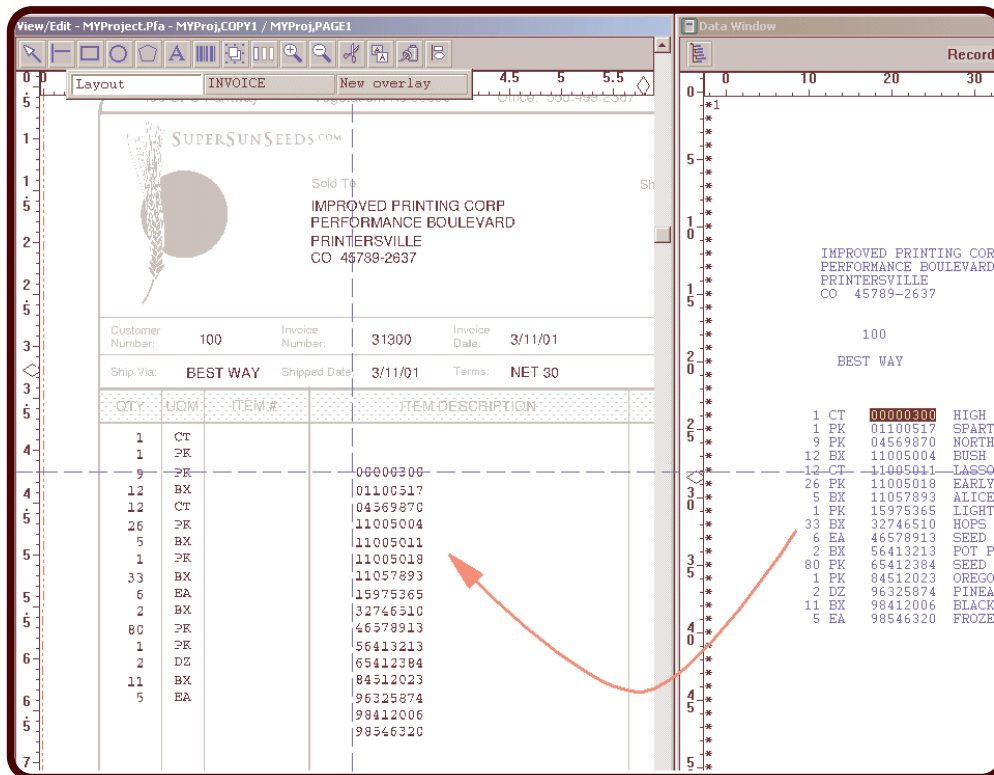# Infoprint Designer for iSeries

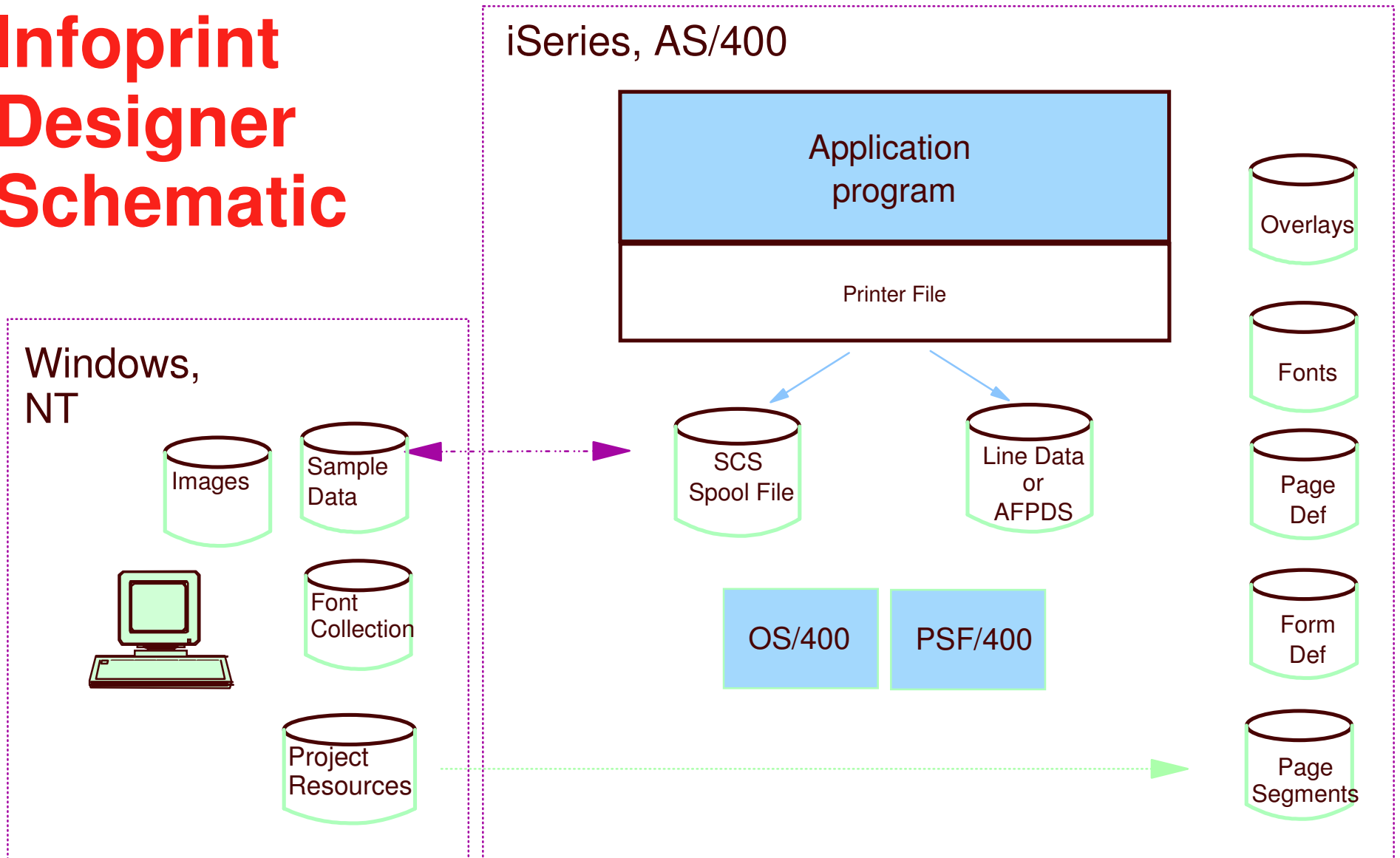# Infoprint Designer

Product Summary

- State of the art design front-end to the robust, integrated AFP/IPDS print/presentation subsystem on iSeries-AS/400, geared for the non-technical user
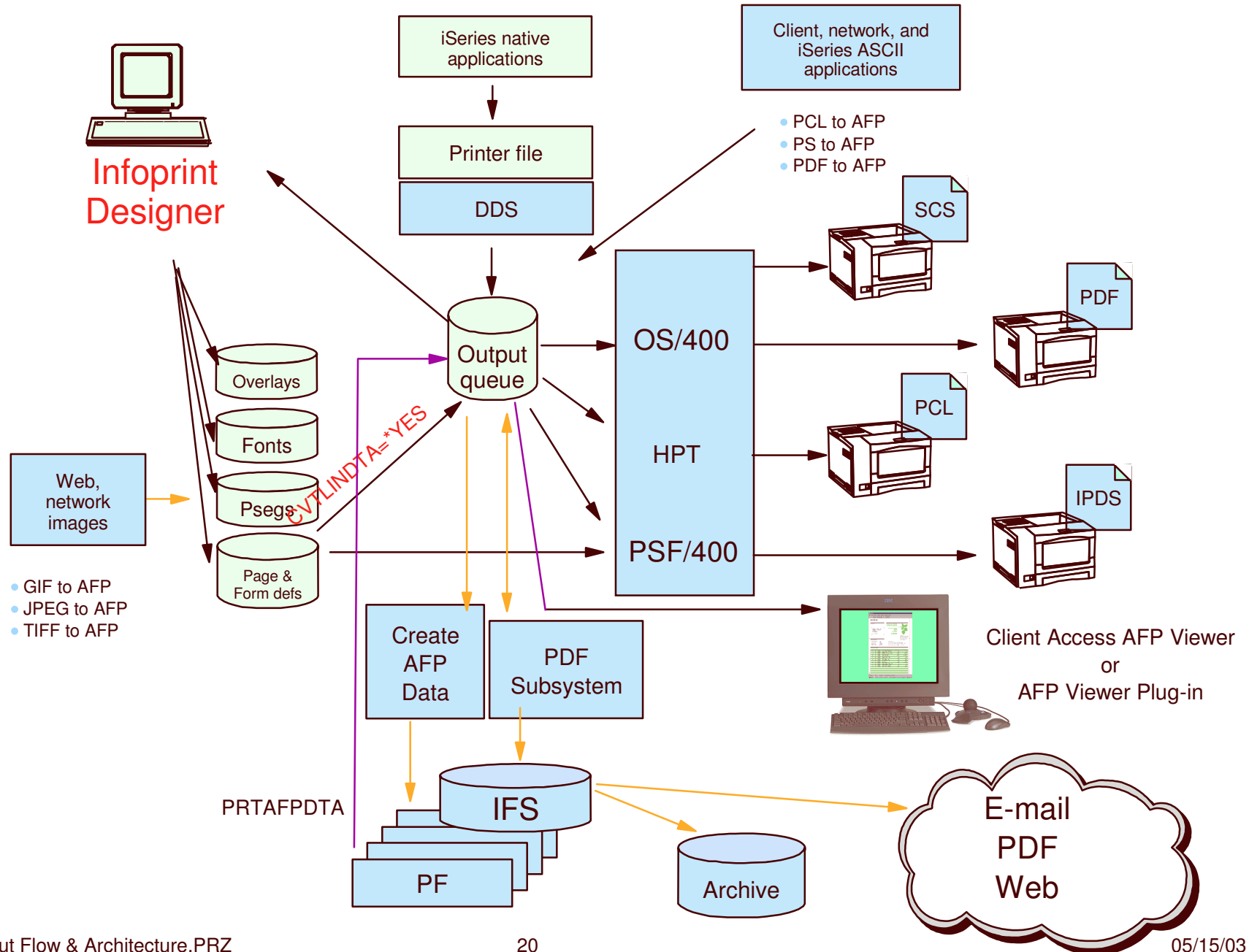

Key Features

- Integrated for design operations
- Integrated for print and e-output operations
- Overlay Design editor for designing electronic forms
- Image Design editor for designing images
- Layout Design editor for designing the entire print application
- Creates standard OS/400 print resources
- Windows design functions integrated with upload/download for ease of design and production
- Professional, high-precision system geared to the demands of business communications
- Existing applications can be redesigned without application changes
- Entire AFP Font Collection integrated into Infoprint Designer

Infoprint Designer Schematic

iSeries, AS/400

Application program
Printer File

Overlays

Fonts

Windows, NT

Images

Sample Data

Font Collection

Project Resources

SCS Spool File

Line Data or AFPDS

OS/400

PSF/400

Page Def

Form Def

Page Segments

iSeries-Infoprint Designer Architecture

Page and Form Definitions

Page Definition Architecture

Before Version 5

Application	Printer File	Spool		Page Def	Form Def	Printer

HLL Application

Specifies Line Data output, Names Page and Form Def

Line Data

Page Def: Formats, Applies fonts

Form Def: Applies overlays, page segments
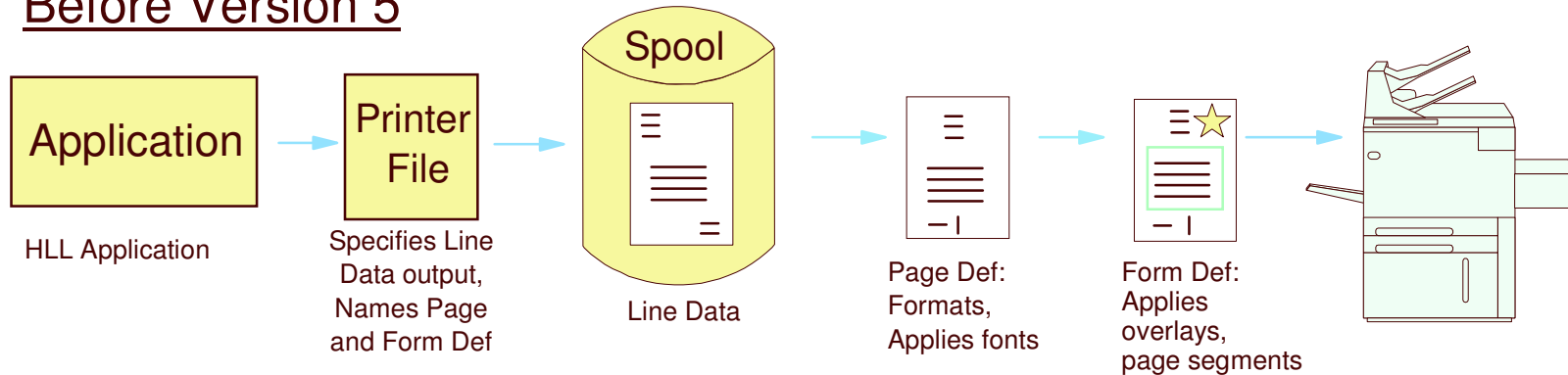
With Version 5.1 or higher

Application	Printer File	Spool	Printer

HLL or Java Application

Line Data Record Format
or
DDS Record Format
or
Java Object Class

AFPDS
(Using new CVTLINDTA   Function)
Page Definition rules already applied
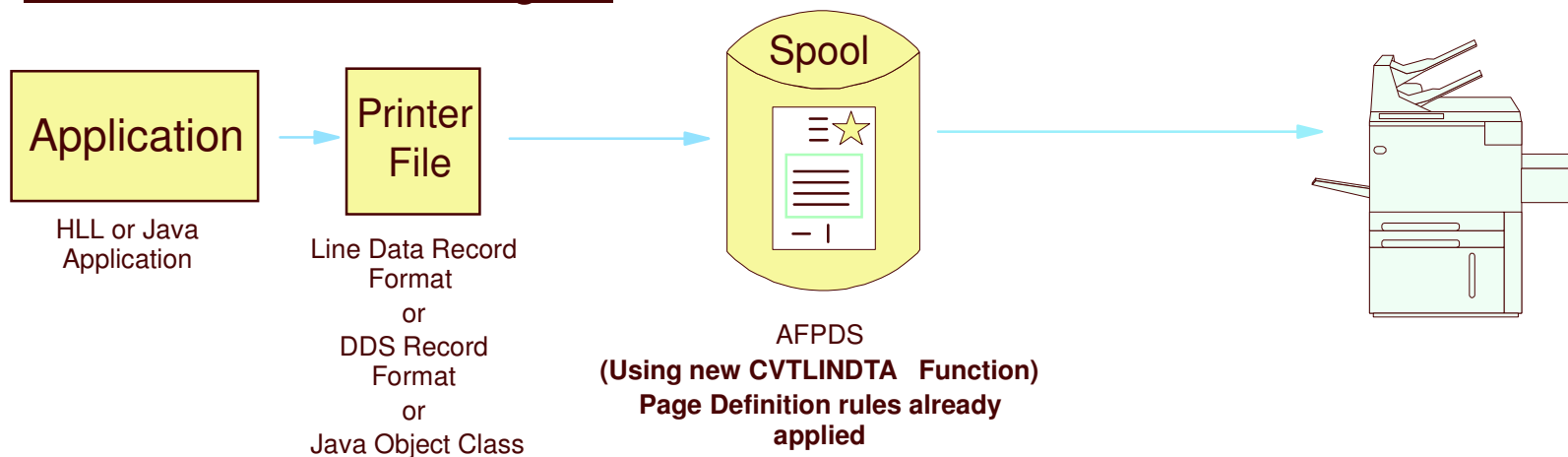
Page Definition Record Format Architecture

- Extend page definition architecture to record formats
  - Simplify page formatting to records of data
  - Separate page formatting from application program logic
  - Support Java print architecture with object classes
  - Enables page definition to function for formatting like DDS
- Additional functions with record format architecture
  - Add shaded boxes, graphics, and lines
  - Add right text alignment
  - Add automatic generation of page headers, footers, and table headers

Record Format Line Data

Other Application Development Tools

- AFP Utilities/400
  - Green screen interface for overlay creation
  - Includes utility which easily generated multiup bar code labels
- Advanced Print Utility/400
  - Format your variable data without changing your application
  - Multiple copies of pages and multiple formats
  - Monitors your output queues for eligible files
- AFP Toolbox
  - Series of API's to generate AFP from "scratch"
  - Highest degree of application sophistication
  - Word wrap
- See Application Development Presentation for more details

Printing AFP
to an IPDS printer
with Print Services Facility

Three Elements of AFP

Image   **Fonts**

Forms   **Indexing**

Graphics   **Barcode**

AFP Print Subsystem

Print Services Facility (PSF)
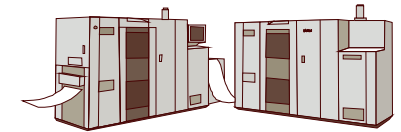
Job, resource and printer management

2-way dialogue

Objects merged at printer

Independent of system & network

Page Architecture (AFPDS)

Systems Architecture

Printing Architecture (IPDS)

IPDS: A dialogue between iSeries and printer

What are you?

Are you ready to go?

What resources do you currently have?

You're missing this font - here it is.

Here are the job parameters for the first job . . .

Here's page 1.

Here's page 2.

IBM Infoprint 1130

Yes

The following fonts, images, and overlays . . .

OK. I got it.
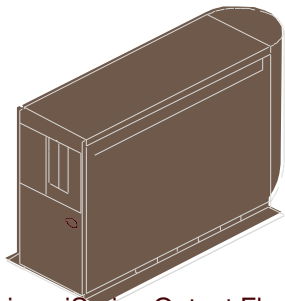
Got it. I know the paper size, drawer, bin, etc.

Got it

Wait a second, I have a problem with page 2. Please tell a human that I need more paper.
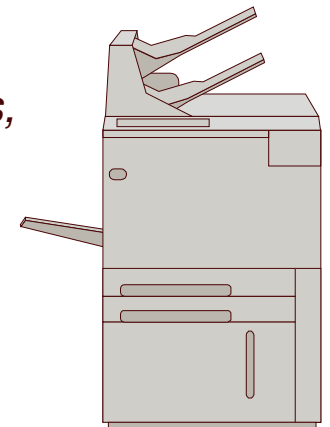
iSeries - AFP/IPDS Print Architecture
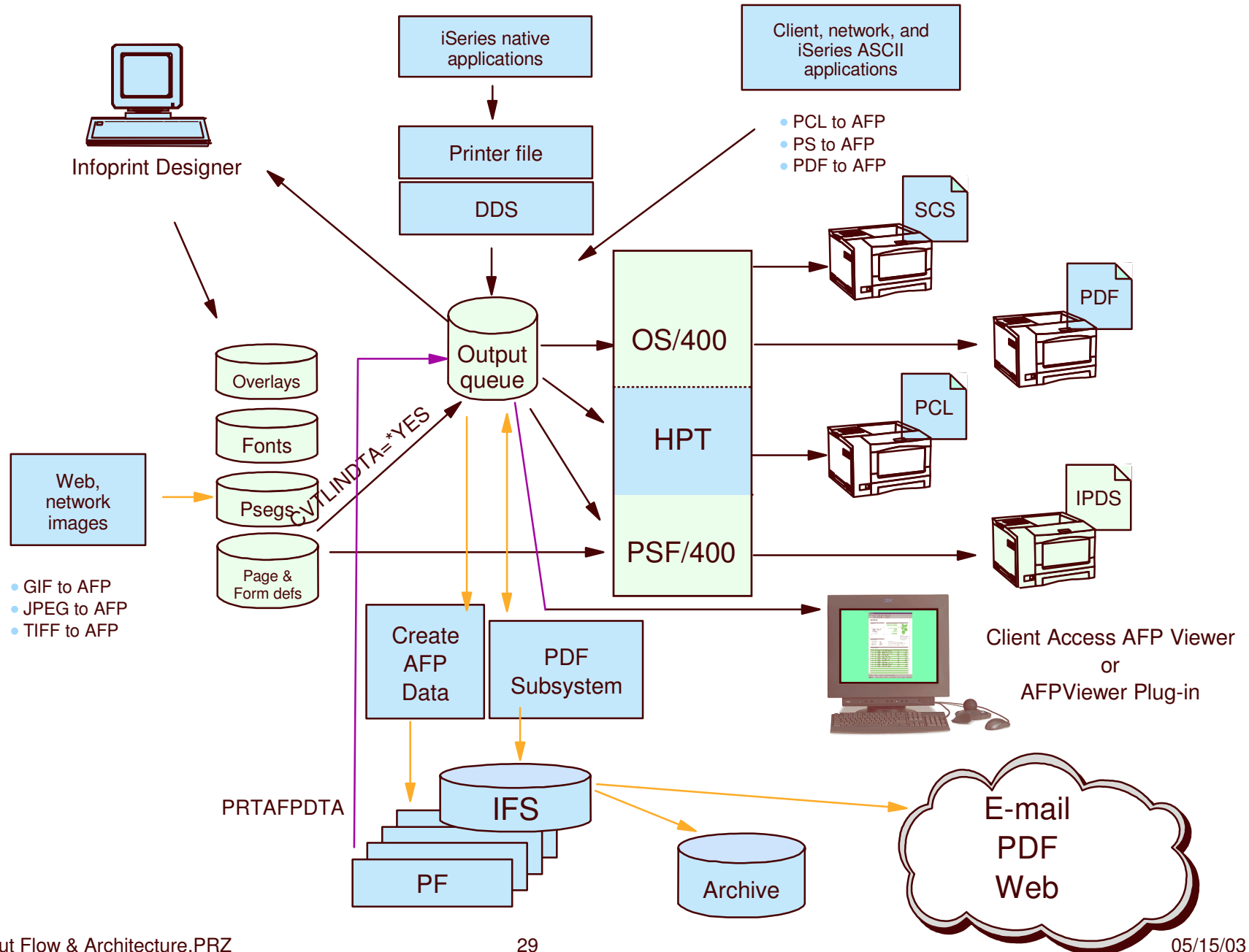
Printing SCS and AFPDS to an ASCII printer using Host Print Transform

Host Print Transform

- Consistent output for most ASCII printers attached various methods (PC, Terminal, ASCII controller, LAN)
- AS/400 does transform instead of 5250 emulators
- HPT allows for two conversions
  - AFPDS to ASCII (PCL or PPDS)
  - SCS to ASCII   (many ASCII data streams)
- Allows AS/400 applications to print to PCL or PPDS printers
- Allows printing to ASCII printers attached directly to the LAN (IBM, HP, Lexmark, Xerox, etc.)
- Based on Workstation Customization Object (WSCST)
- Customized printer support
- PJL and SNMP provide page range selection

iSeries - ASCII Print Architecture
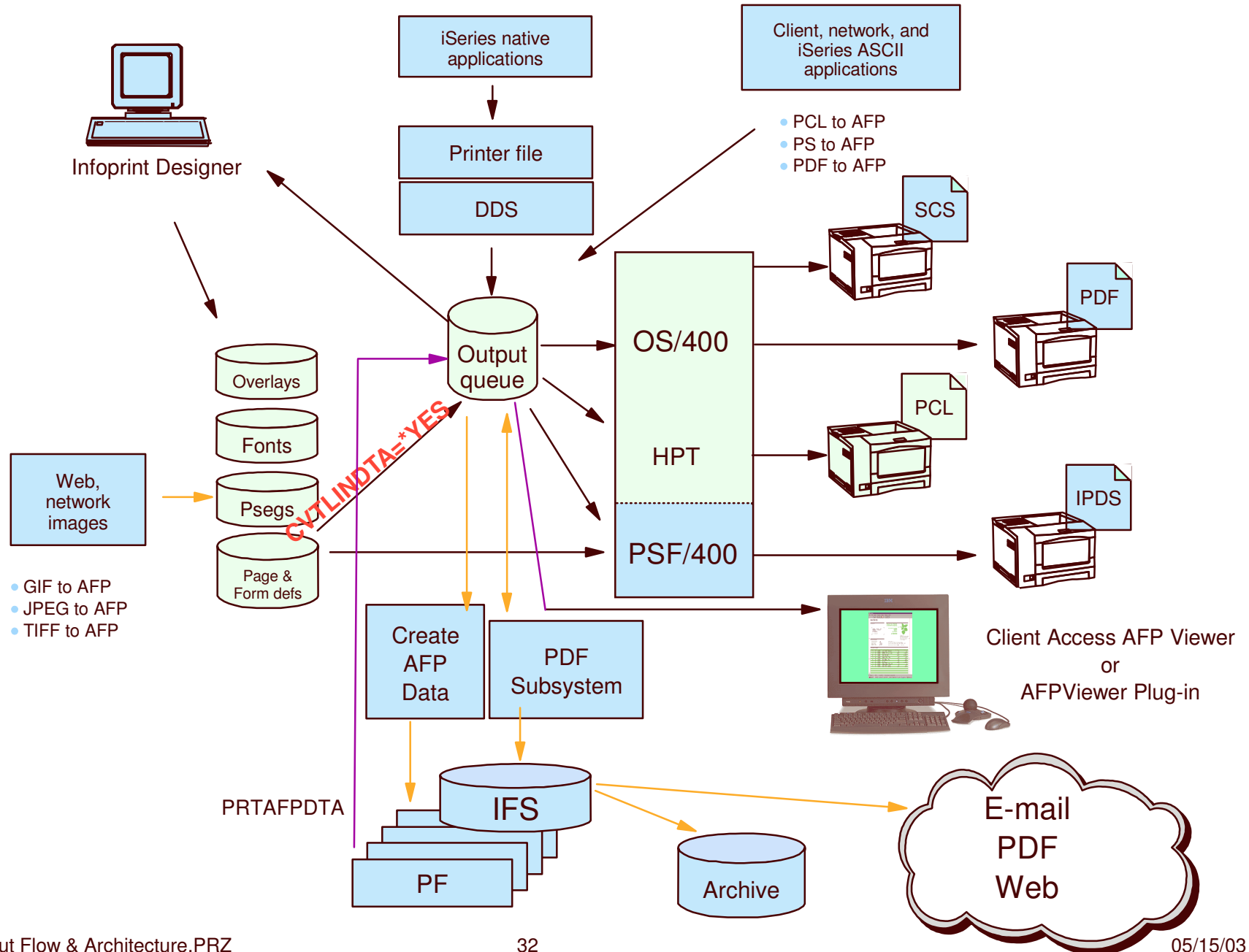
Infoprint Server

iSeries - PDF Architecture

iSeries native applications

Client, network, and iSeries ASCII applications

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

Printer file

DDS

Infoprint Designer

Overlays

Fonts

Web, network images

Psegs

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

Page & Form defs

CVTLINDTA=*YES

Output queue

OS/400

HPT

PSF/400

SCS

PDF

PCL

IPDS

Create AFP Data

PDF Subsystem

Client Access AFP Viewer or AFPViewer Plug-in

PRTAFPDTA

IFS

PF

Archive

PDF Web

PDF and E-Mail
Infoprint Server

Infoprint Server - E-mail

iSeries native applications

↓

Printer file

DDS — STRPAGGRP('513')

↓

Overlays

Fonts

Psegs

Page & Form defs → Output queue

↓

e-mail Mapping Program ↔ PDF DEVD PSFCFG ↔ OS/400 PSF/400

↕

File: LOOKUP

513 → shnier@ca.ibm.com
701 → rose@us.ibm.com
842 → shaffer@us.ibm.com

513	shnier@ca.ibm.com
701	rose@us.ibm.com
842	shaffer@us.ibm.com

PDF
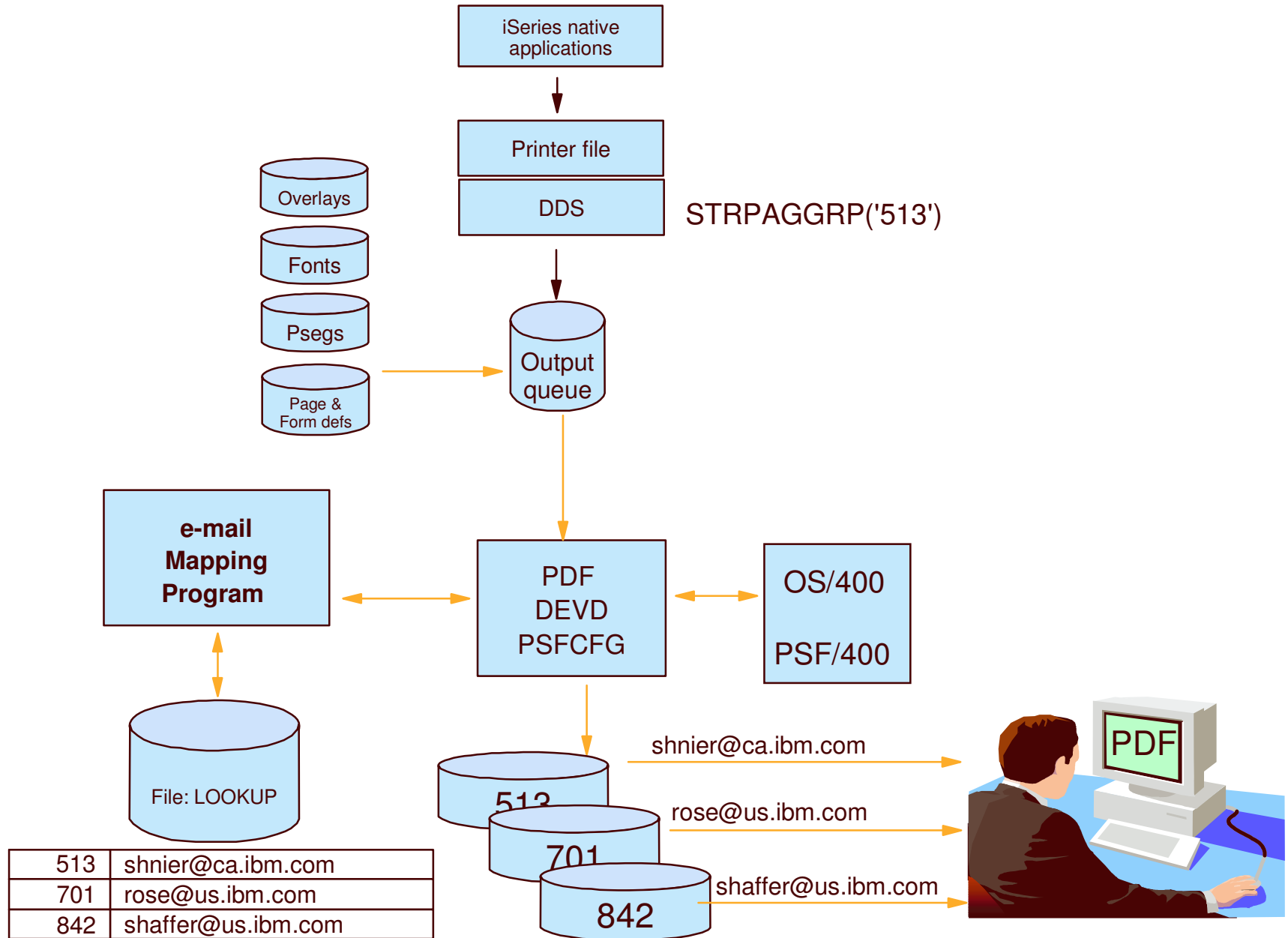
iSeries - PDF E-mail Architecture

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

PCL

IPDS

Overlays

Fonts

Psegs

Page & Form defs

Web, network images

CVTLINDTA=*YES

Output queue

OS/400

HPT

PSF/400

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

Create AFP Data

PDF Subsystem

Client Access AFP Viewer or AFPViewer Plug-in

PRTAFPDTA

PF

IFS

Archive

E-mail PDF

Printing Systems

The output of e-business™

Portable AFP
(Infoprint Server)

Infoprint Server - Portable AFP

- iSeries application
- Printer file
- Output queue
- OS/400
- Overlays
- Fonts
- Psegs
- Page & Form defs
- Create AFP Data
- PRTAFPDTA
- IFS
- PF
- Client Access AFP Viewer or AFP Viewer Plug-in

iSeries - Portable AFP Architecture

Infoprint Designer

iSeries native applications

Client, network, and iSeries ASCII applications
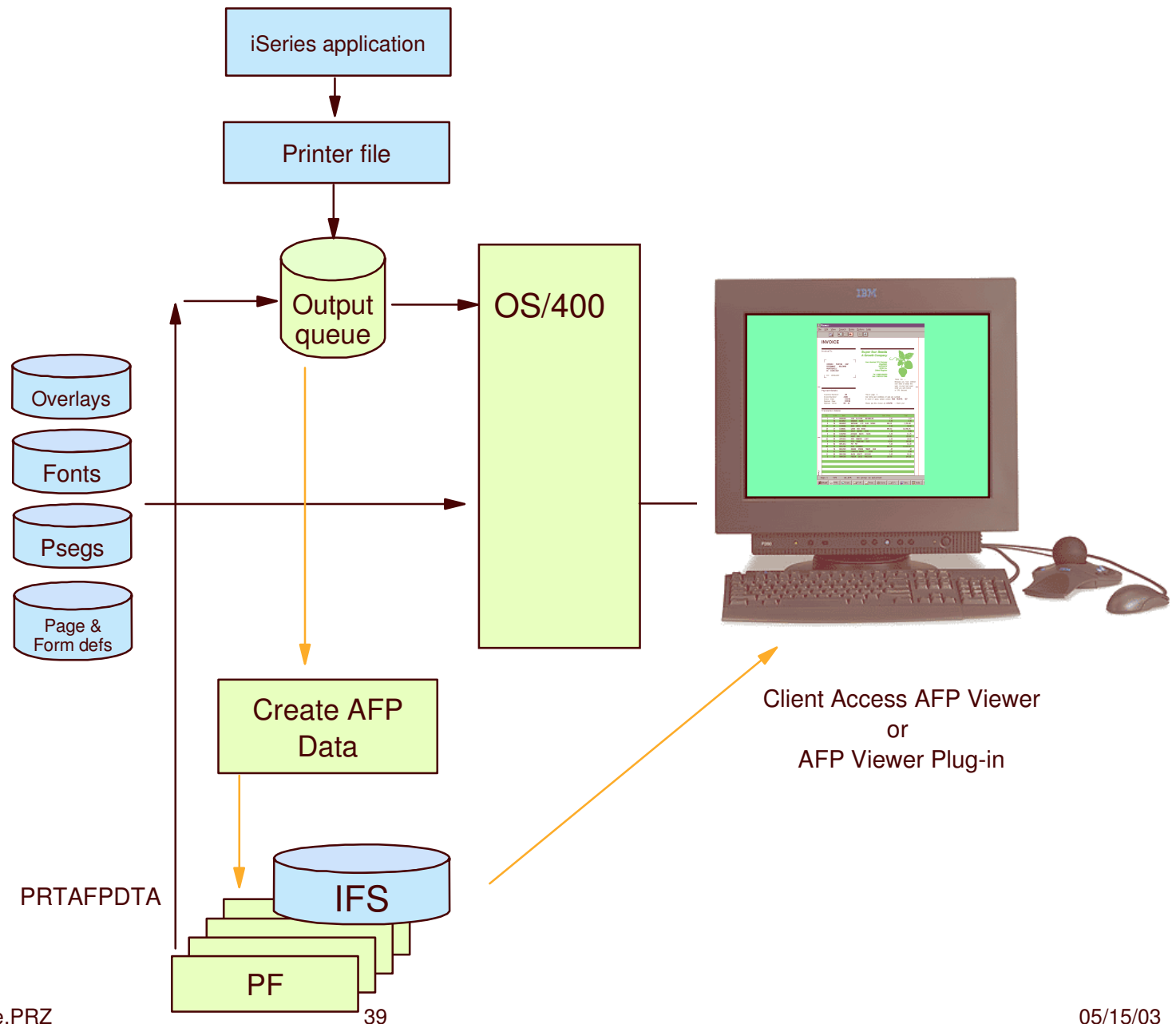
- PCL to AFP
- PS to AFP
- PDF to AFP

Printer file

DDS

Overlays

Fonts

Web, network images

Psegs

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

Page & Form defs

CVTLINDTA=*YES

Output queue

OS/400

HPT

PSF/400

SCS

PDF

PCL

IPDS

Create AFP Data

PDF Subsystem

Client Access AFP Viewer or AFPViewer Plug-in

PRTAFPDTA

IFS

PF

Archive

Web
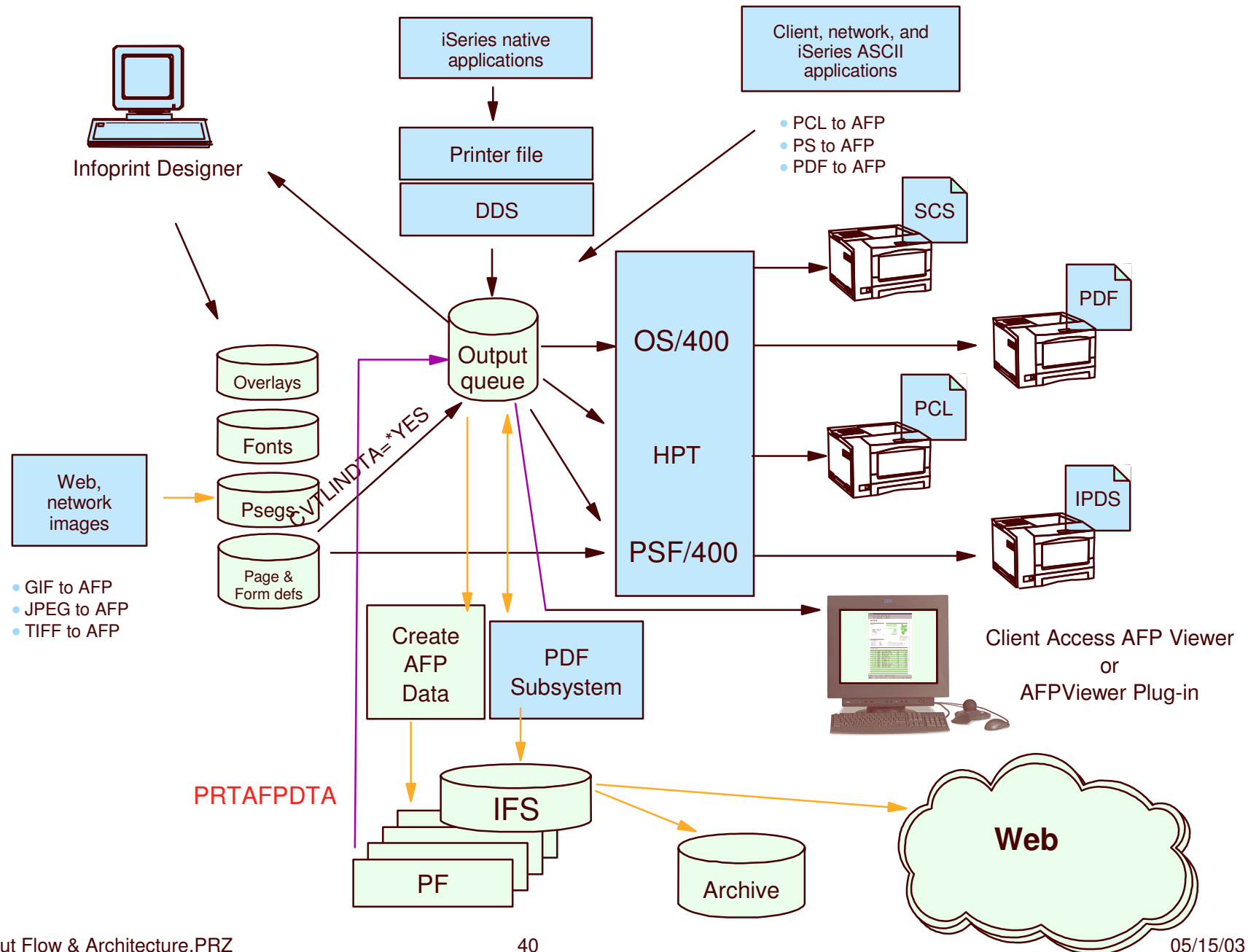
Printing Systems

The output of e-business™

ASCII to AFP/IPDS Transforms
Infoprint Server

iSeries Transforms

	SCS	LINE	AFP	PCL	PS	PDF	Web AFP
SCS	-	Y	Y	HPT	-	IPS	IPS
LINE	Y	-	OS400 V5R1	HPT V5R1	-	IPS	IPS
AFP	-	-	-	HPT	-	IPS	IPS
PCL	-	-	IPS	-	API	-	-
PS	-	-	IPS	-	API	-	-
PDF	-	-	IPS	-	API	-	-
Web AFP	-	-	-	-	-	IPS	-
GIF TIFF BMP			IPS		API		

IPS = Infoprint Server   API = Application Program Interface

HPT = Host Print Transform

iSeries - ASCII Transforms
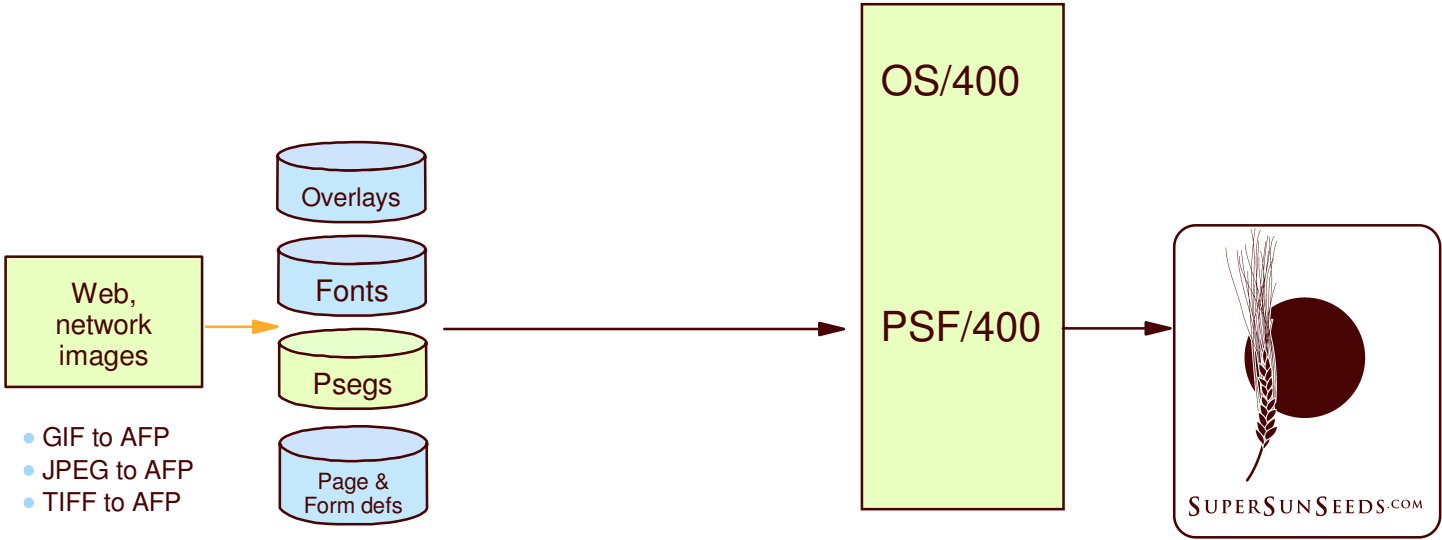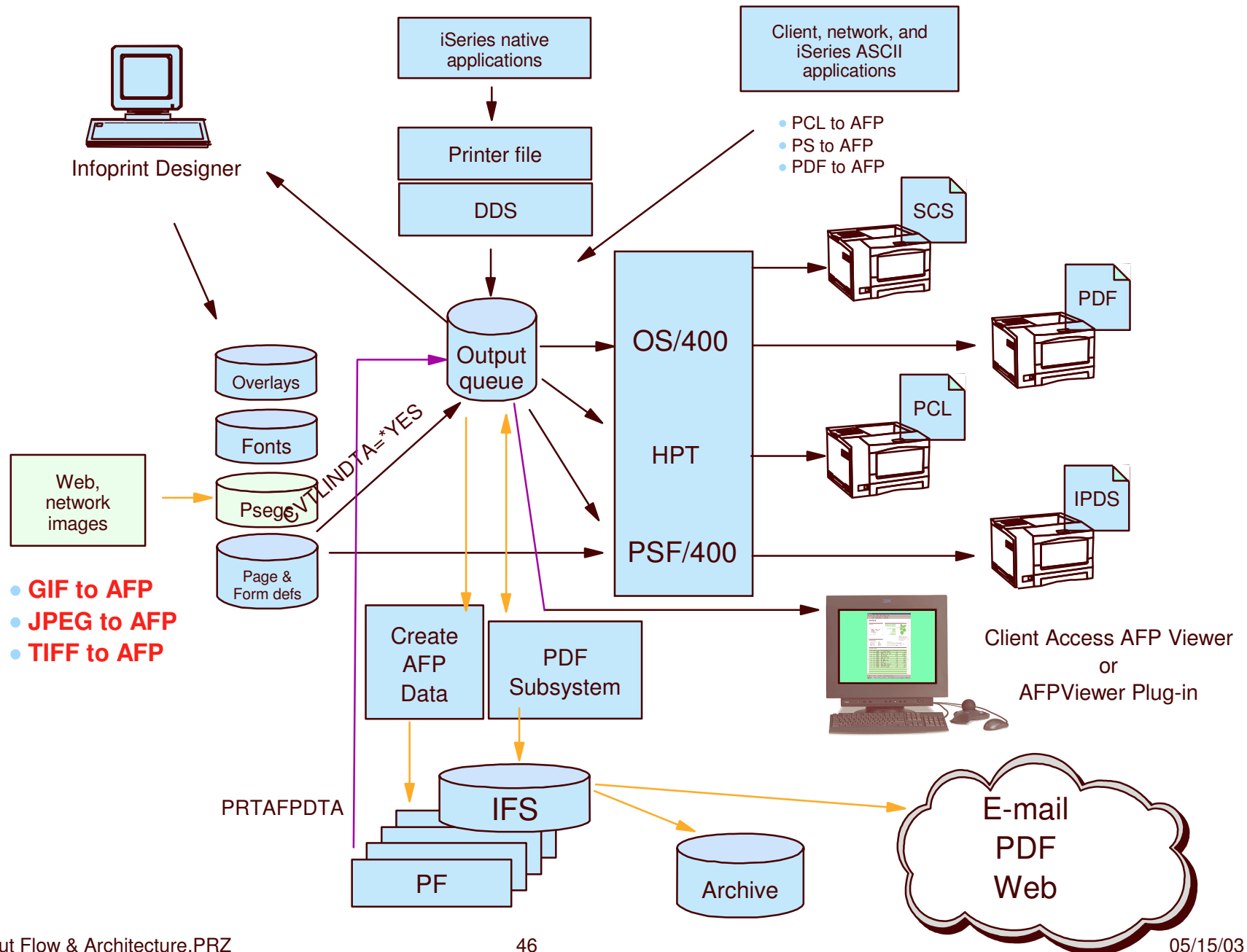

Infoprint Designer

iSeries native applications → **Printer file** → **DDS**

Client, network, and iSeries ASCII applications
- PCL to AFP
- PS to AFP
- PDF to AFP

Overlays
Fonts
Psegs
Page & Form defs

Web, network images

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

CVTLINDTA=*YES

Output queue

OS/400
HPT
PSF/400

SCS
PDF
PCL
IPDS

Create AFP Data
PDF Subsystem

Client Access AFP Viewer or AFPViewer Plug-in

PRTAFPDTA

PF
IFS
Archive

E-mail PDF Web

Image Transforms
(Infoprint Server)

Infoprint Server - Image Conversion

Web, network images

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

Overlays

Fonts

Psegs

Page & Form defs

OS/400

PSF/400

S u p e r S u n S e e d s .com

iSeries Image Conversion Architecture

Internet Print Protocol (IPP)

iSeries IPP Architecture

IPP Client

HTTP

IPP Server

iSeries IPP Server
(V5R1)

iSeries IPP Client
(V5R2)

Output queue

OS/400

HPT

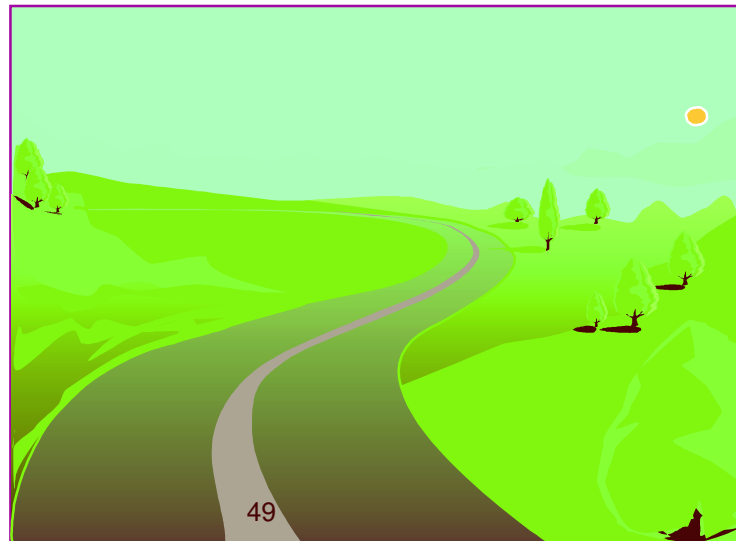PSF/400

SCS

PDF

PCL

IPDS
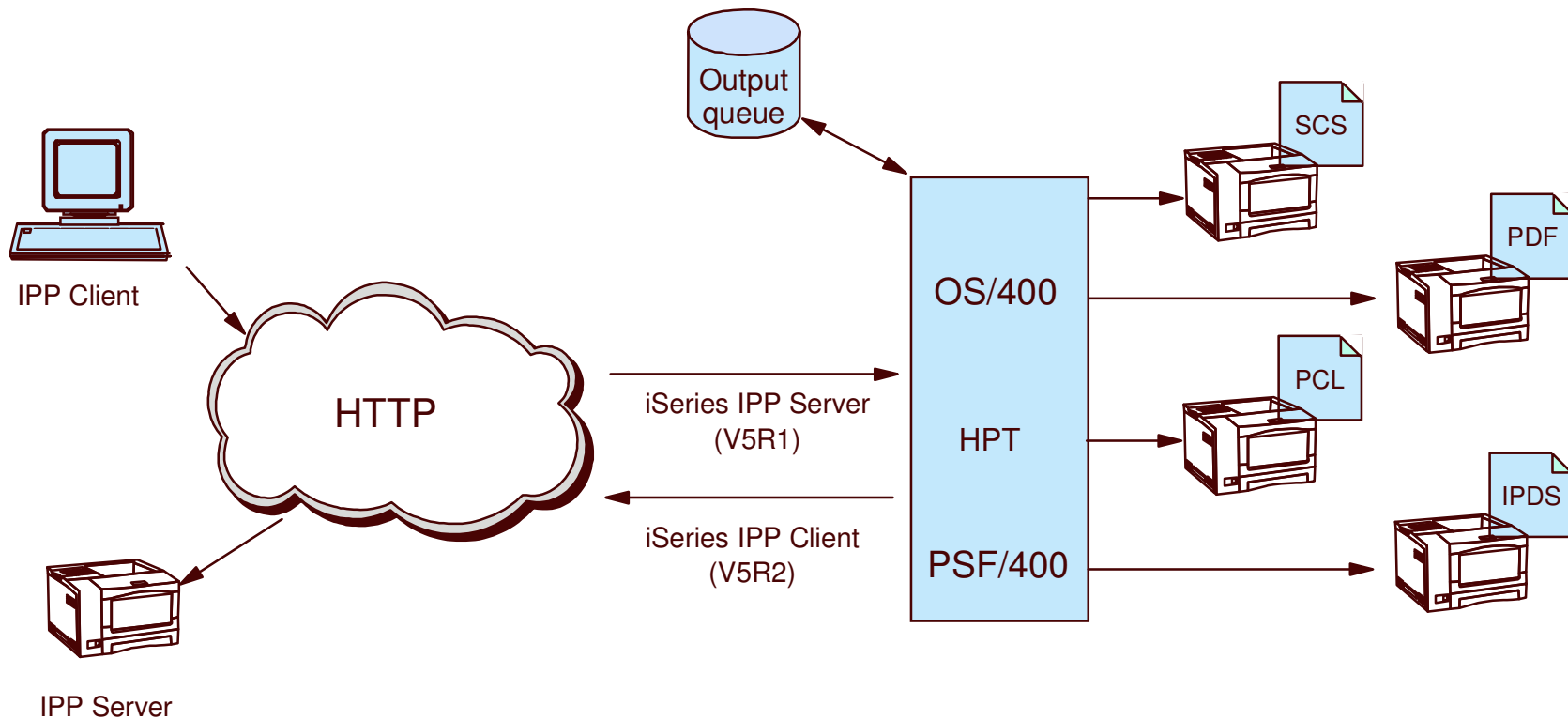
In Summary

- iSeries provides choices for:
  - Creating your output
  - Creating your resources
  - Handling new data streams
  - Delivering output to a printer
  - Delivering output to the Web
  - Delivering output via e-mail
- Choose the path that meets your business needs

Additional Information

- IBM Printing Systems - www.printers.ibm.com/iseries
- AS/400 - www.iSeries.ibm.com
- AS/400 Service and Knowledge Base- www.as400service.ibm.com
- Online books - www.as400bks.rochester.ibm.com
- Redbooks - www.redbooks.ibm.com
-
- AS/400 Guide to AFP and PSF (S544-5319)
- 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 AS/400 Printing VI (SG24-6250)
- AS/400 System API Reference (SC41-5801)
- AS/400 Printer Device Programming (SC41-5713)
- AS/400 Workstation Customization Programming (SC41-3605)
- Infoprint Server Planning (G544-5774), User's Guide (G544-5775)
- Infoprint Designer Getting Started (G544-5773)

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
- Form Def - Form definition - OS/400 object used to position and format data, text and images on an output page
- 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

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)**
- **Page Def - Page Definition - OS/400 object used to describe the printed page - Created using PPFA or other tools**
- **PPFA - Page Printer Formatting Aid - A language to define output**