Internet Printing Protocol
IPP/1.0

BOF on Internet Printing

IETF San Jose Meeting

December 12, 1996

Problem Statement

- Define a Protocol That Can be Used For Printing on the Internet
- Scope Requirements
  - draft-wright-ipp-req-00.txt
- Rapid availability and adoption
  - Goal: Deployable on top of existing products
  - Goal: No (minimize) client and server changes

Initial Proposals

- Lightweight Document Printing Application (LDPA)
  - Novell and Xerox
  - ftp://ftp.pwg.org/pub/pwg/ipp/historic/ldpa
- Hypertext Print Protocol (HTPP)
  - IBM
  - ftp://ftp.pwg.org/pub/pwg/ipp/historic/htpp
- Salutation
  - ftp://ftp.pwg.org/pub/pwg/ipp/historic/salutation

ISO/IEC 10175 DPA

- Document Printing Application (DPA)
  - MIT Palladium project (late 1980s)
  - Final standard text (1996)
- Products
  - DAZEL Output Server (DAZEL)
  - HP DPS (HP)
  - NDPS (Novell, HP, Xerox)
  - Printing Systems Manager (IBM)
  - Printxchange (Xerox, Digital, Sun)

Synergy

- New Project in the Printer Working Group (PWG)
  - ftp://ftp.pwg.org/pub/pwg/ipp/
  - http://www.pwg.org/
- Shared Goals for Producing Solutions
  - Quick consensus
  - Rapid prototyping
  - Rapid deployment
  - Focus on end-user requirements

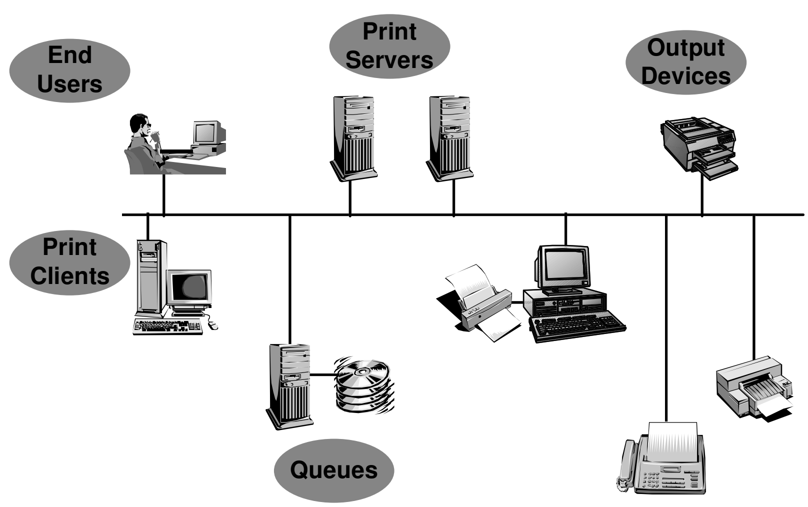
Broad Participation

- Adobe
- Canon
- Data Products
- DAZEL
- Digital
- DPI
- HP
- IBM
- Intel
- Kyocera
- Lexmark
- Northlake
- Novell
- QMS
- Sharp
- Sun
- Tektronix
- Underscore
- Unisys
- Xerox

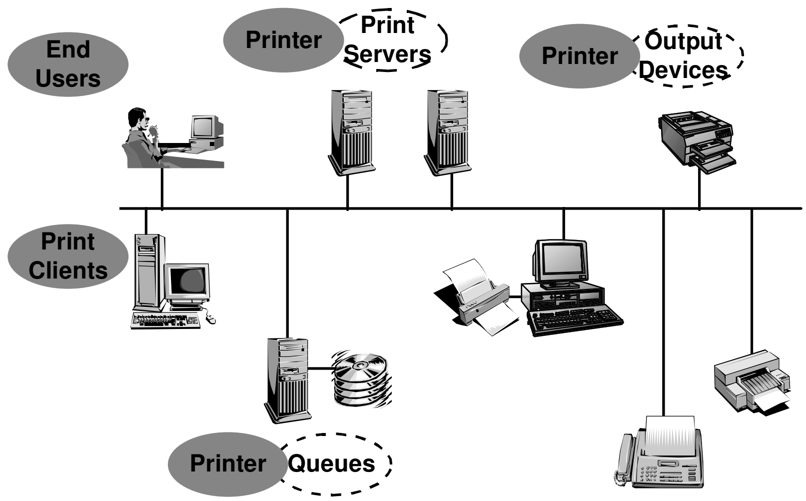
Solution = IPP

- "The Internet Printing Protocol (IPP) is an application level protocol that can be used for printing on the Internet"
  - draft-isaacson-ipp-info-00.txt
- Only End-user Functionality
- Heavily Influenced by DPA
  - Does not require DPA implementation
- Built on HTTP/1.0
  - Simple ASCII encodings for attributes and values

Common Print Systems Components



IPP Printing Model



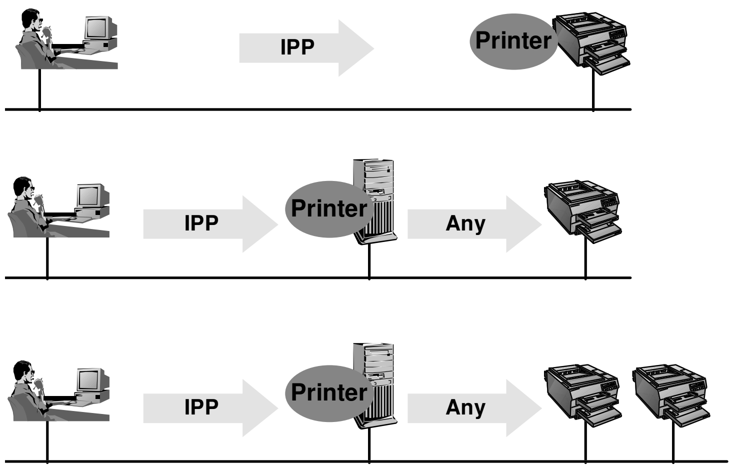
12/12/96 9

Printer Object

- A Printer is an Abstraction
  - Virtual or physical device
  - Implements IPP operations and interfaces
  - Example: printer, fax machine, imager, CD writer, etc.
- A Printer Optionally Supports
  - Multiple jobs
  - Queuing
  - Scheduling
  - Multiple Output Devices

12/12/96 10

Printer Configurations



Job Object

- Contains One or More Documents
  - Some attributes repeated for each document
    - » Content Description
    - » URL Reference
  - Some attributes are common and apply to all documents
    - » print-quality, finishing, media, etc.
  - No explicit document object
- Attribute Groupings
  - Job Status, Job Sheet, Notification, Job Scheduling
  - Job Production, Conversion of Text/HTML Files
  - Job Resources, Document Attributes

Job Template Object

- Models Job Defaults
- Can Have Several Templates per Output Device
- Each Template Represents a Possibly Different Set of Job Defaults

Naming

- HTTP URL Scheme for Printers and Jobs
  - Printers:
    - » http://some.domain.com/printer-1
    - » http://1.2.3.4:nnn/printer-2
      - IANA registered port number nnn for IPP
  - Jobs:
    - » http://some.domain.com/printer-1/0037
- Expose Printer and/or Job Templates
  - http://some.domain.com/two-sided-printer
  - http://some.domain.com/draft-printer
  - http://some.domain.com/hr-printer/resumes
  - http://some.domain.com/hr-printer/1040forms

Directory Services Support

- Directory Services Used for Naming & Browsing
- Each Printer Has an Entry in the Directory
  - Name, Description, Location , Resolution,
  - Color Supported, Maximum Speed, Make and Model,
  - Marker Type, Document Formats Supported,
  - Sides Supported, etc.
- Show a Mapping for LDAP
  - Schema
  - Query

IPP Operations

- Print
  - Submit Multiple Documents in one Request
    - » Submit content directly
    - » Submit content by referencing a URL
- Cancel Job
- Get Attributes
  - Used for Printer, Job, and Job Template objects
- Get Jobs
  - Directed at a Printer
  - Returns a list of Jobs at that Printer

IPP Messages over HTTP/1.0

- IPP messages contained within HTTP methods
  - Define Entity Headers
  - Use MIME Encodings
- POST method is used for:
  - Print, and
  - Cancel Job
- GET method is used for:
  - Get Attributes, and
  - Get Jobs

12/12/96 17

Object Attributes

- Attribute Names
  - Use DPA and Printer MIB where applicable
- Attribute Semantics
  - Use DPA and Printer MIB where applicable
- Attribute Syntaxes
  - Simple, ASCII encoding
  - Use RFC 822 notation

12/12/96 18

Security

- Rely on Existing Authentication Mechanisms
  - Take advantage of growth path
- Introduce a Simplified Authorization Mechanism
  - “end-user-acl” Attribute Control List
  - List contains “names” of authorized end-users
  - Names are opaque, support for any “name space”
- Support for Public Access Printing
  - No authentication or authorization

Work Items and Issues

- Can the proposed HTTP mapping for IPP be implemented on existing products (HTTP servers, browsers, CGI scripts, etc.)?
  - Are there other mappings?
    - » New raw protocol over TCP, HTML forms, etc?
  - Are other mappings required?
- Is the current HTTP mapping correct?
  - Use of HTTP Headers, Entity Headers, and MIME encodings

Work Items and Issues (cont.)

- Objective vs. Subjective Directory Attributes
- Job Templates
- Conformance Requirements
  - Optional vs. Mandatory Attributes
- Internationalization and Localization Issues
- Security Issues
- Coordination With Other Groups
  - IETF Fax, etc.

Open Invitation

- Get Involved
- Companies and Individuals Representing: Browsers, NOS, Client OS, ISP, Printers, etc.
- Join the IPP Mailing list
  - General Discussion: <ipp@pwg.org>
  - To Subscribe: <ipp-request@pwg.org>
  - Archive: ftp://ftp.pwg.org/pub/pwg/ipp/
  - Web Site: http://www.pwg.org/
- Attend PWG meetings on IPP
  - January 9, 1997, Albuquerque NM

IPP Scenario: Query Printer

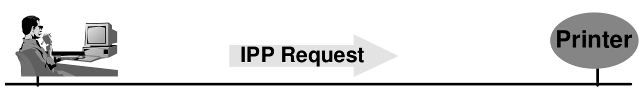
IPP Request

```
Post http://some.domain.com/printer-1 http/1.0
   Get-Attributes  IPP/1.0
      printer-state :
      sides-supported :
      media-supported :
      document-formats-supported :
```

IPP Response

```
http/1.0  201 "Created" (a response)
   IPP/1.0 xxx "attribute list returned"
      printer-state : idle
      sides-supported : 1-sided
      media-supported : iso-a4-white,iso-b4-white
      document-formats-supported : Postscript/2.0
```


IPP Scenario: Submit a Job




```
Post http://some.domain.com/printer-1 http/1.0
   Print IPP/1.0
      Print-Job-Object Header
         job-name : My Job
         medium : iso-a4-white
         notification-events : Job-completion
         notification-address : joe@pc.domain.com
         Document Header
            document-name : Letter to Mom
            Document-Content Header
               (Content type = Postscript/2.0)
               <Document in Postscript
                      Level 2 format>
```

IPP Response

```
http/1.0 201 "Created" (a response)
   IPP/1.0 xxx "print job accepted and queued"
      job-identifier : some.domain.com/printer-1/0037
      current-job-state : pending
      printer-state : needs-attention
```