INTERNET-DRAFT
<draft-parra-install-00.txt>

Hugo Parra
Novell, Inc.
Ted Tronson
Novell, Inc.
June 26, 2000

Internet Printing Protocol (IPP):

Printer Installation Extension

Status of this Memo

Abstract

Various client platforms require that some setting up take place at the workstation before the client can properly submit jobs to a specific printer. This setup process is sometimes referred to as printer installation. Most clients need some information about the printer being installed as well as support files to complete the printer installation. The nature of the support files varies depending on the specific client platform, from simple configuration files to highly sophisticated printer drivers. This document refers to these support files as "client print support files". Traditionally, the selection and installation of the correct client print support files has been error prone. The selection and installation process can be simplified and even automated if the workstation can learn some key information about the printer. This document describes the IPP extensions that enable workstations to obtain the information needed to perform a proper printer driver installation using IPP.

The full set of IPP documents includes:

Design Goals for an Internet Printing Protocol [RFC2567]
Rationale for the Structure and Model and Protocol for the Internet Printing Protocol [RFC2568]
Internet Printing Protocol/1.1: Model and Semantics [ipp-mod]
Internet Printing Protocol/1.1: Encoding and Transport [ipp-pro]
Internet Printing Protocol/1.1: Implementer's Guide [ipp-iig]
Mapping between LPD and IPP Protocols [RFC2569]

The "Design Goals for an Internet Printing Protocol" document takes a broad look at distributed printing functionality, and it enumerates real-life scenarios that help to clarify the features that need to be included in a printing protocol for the Internet. It identifies requirements for three types of users: end users, operators, and administrators. It calls out a subset of end user requirements that are satisfied in IPP/1.0. A few OPTIONAL operator operations have been added to IPP/1.1.

The "Rationale for the Structure and Model and Protocol for the Internet Printing Protocol" document describes IPP from a high level view, defines a roadmap for the various documents that form the suite of IPP specification documents, and gives background and rationale for the IETF working group's major decisions.

The "Internet Printing Protocol/1.1: Encoding and Transport" document is a formal mapping of the abstract operations and attributes defined in the model document onto HTTP/1.1 [RFC2616]. It defines the encoding rules for a new Internet MIME media type called "application/ipp". This document also defines the rules for transporting a message body over HTTP whose Content-Type is "application/ipp". This document defines a new scheme named 'ipp' for identifying IPP printers and jobs.

The "Internet Printing Protocol/1.1: Implementer's Guide" document gives insight and advice to implementers of IPP clients and IPP objects. It is intended to help them understand IPP/1.1 and some of the considerations that may assist them in the design of their client and/or IPP object implementations. For example, a typical order of processing requests is given, including error checking. Motivation for some of the specification decisions is also included.

The "Mapping between LPD and IPP Protocols" document gives some advice to implementers of gateways between IPP and LPD (Line Printer Daemon) implementations.

Table of Contents

1 Introduction

A common configuration for printing from a workstation requires that some client print support files (e.g., PPD, printer driver files) specific to the target printer be installed on that workstation. Selection and configuration of the appropriate client print support files can be simplified and even automated if the workstation can obtain some key information about the printer. With a few extensions, IPP provides a simple and reliable vehicle for printers to convey this information to interested workstations. The IPP extensions described in this document enable a flexible solution for installing client print support files on workstations running different operating systems and for printers of all makes and models. It allows client print support files to be downloaded from repositories of different sorts. A possible repository for the files is the printer itself. The extensions necessary for getting client print support files from the printer are included in this document.

2 Terminology

This document uses terms such as "attributes", "keywords", and "support". These terms have special meaning and are defined in the model terminology [ipp-mod] section 12.2.

Capitalized terms, such as MUST, MUST NOT, REQUIRED, SHOULD, SHOULD NOT, MAY, NEED NOT, and OPTIONAL, have special meaning relating to conformance. These terms are defined in [ipp-mod] section 12.1 on conformance terminology, most of which is taken from RFC 2119 [RFC2119].

This section defines the following additional terms that are used throughout this document:

REQUIRED: if an implementation supports the extensions described in this document, it MUST support a REQUIRED feature.

OPTIONAL: if an implementation supports the extensions described in this document, it MAY support an OPTIONAL feature.

3 Model Extensions

To assist workstations in the printer installation process, an IPP printer needs to provide the workstation with information about the client print support files, such as the their name and location/s. This information needs to match the workstation's specific environment, such as its operating system, preferred natural language, and preferred document format.

The following extensions to the IPP model enable assisted or automated printer installation. This section describes each extension in detail.

- A new REQUIRED printer-description attribute: "client-print-support-files-supported".

- A new REQUIRED Get-Printer-Attributes operational attribute: "client-print-support-files-request".

- A new OPTIONAL printer operation: Get-Client-Print-Support-Files.

3.1 "client-print-support-files-supported" (1setOf octetString(MAX))

An IPP Printer uses the REQUIRED printer-description attribute "client-print-support-files-supported" to represent relevant information about the client print support files it supports. Each value is a composite string with well-defined fields. Each value string must be formatted as follows:

"uri=uri-val< field-name$_2$=val$_{21}$,…,val$_{2p}$< … < field-name$_n$=val$_{n1}$,…,val$_{nq}$<"

Table 1 describes the fields that go into each string.

Field name	Field value
"uri"	One REQUIRED string identifying the uri where to obtain the support files for each OS platform, document format, and natural language the printer supports. This MUST be the first field in each value. Examples of uri types that may be found here are FTP, HTTP, and IPP. If the field's value is the string "unknown", the workstation will have to prompt the user for the location of a client print support file repository.
"os-type"	One or more REQUIRED strings identifying the operating system types supported by this set of client print support files. Legal values include the operating system names defined in the IANA document [os-names]. The value "unknown" is a legal value.
"document-format"	One or more REQUIRED strings identifying the document formats supported by this set of client print support files. Valid values are the string representation of the IPP mimeMediaType syntax. The value "unknown" is a legal value.
"natural-language"	One REQUIRED string identifying the natural language used by this set of client print support files. Valid values are the string representation of the IPP naturalLanguage syntax. The value "unknown" is a legal value.
"compression"	One REQUIRED string identifying the mechanism used to compress this set of client print support files. All files needed for the installation of a printer driver MUST be compressed into a single file. Valid values are: "deflate", "gzip", "compress". "none" is allowed but limits the uncompressed client print support file to a single file.
"install-file-type"	One REQUIRED string identifying the type of the client print support files. Valid values are: "printer-driver", "ppd", "updf", "gpd".
"install-file-name"	One REQUIRED string identifying the name by which the client print support files will be installed on the workstation. For client print support files of type "printer-driver", this is also the name that identifies this printer driver in an .inf file.

Table 1. client-print-support-files-supported fields

Each value MUST refer to one and only one set of client print support files, even if the files are downloadable from various repositories (i.e., are associated with multiple uir's).

The "client-print-support-files-supported" printer description attribute may be preset at manufacturing time or set via the IPP set-printer-attribute operation or through administrative means outside the scope of IPP.

3.2 Get-Printer-Attributes Extension

The following extensions allow a workstation to retrieve information on the client print support files a printer supports using the existing Get-Printer-Attributes operation.

3.2.1 Get-Printer-Attributes Request

A printer may contain information on multiple client print support files to match the different operating systems, natural languages and document formats it supports. A workstation may query this information by including "client-print-support-files-supported " in the "requested-attributes" operational attribute of the Get-Printer-Attributes operation. The workstation can control what information a printer returns by including the "client-print-support-files-request" operational attribute.

"client-print-support-files-request" (octetString(MAX)) is used as follows.

The IPP Printer is REQUIRED to support this operational attribute. An IPP Client MAY supply the attribute if it wishes to restrict the printer driver information it receives from the printer. Its text value is a composite string with the same format as that of "client-print-support-files-supported" (see section 3.1). Table 2 describes the fields that may be included in this string.

If "client-print-support-files-request" is not specified by the client, the printer should behave as if the attribute had been provided with all fields left empty (i.e., return an unfiltered list).

It is recommended that workstations first use Get-Printer-Attributes in combination with "client-print-support-files-request" to get a list of the potential client print support files that meet the workstation's requirements. The workstation can then choose from the returned list which client print support files to use and where to get them. If one of the uri's returned is an IPP uri, the workstation can retrieve the client print support files from an IPP printer via the Get-Client-Print-Support-Files operation (see section 3.3).

Field name	Field value
"uri-scheme"	One or more OPTIONAL strings instructing the printer to only return information on client print support files that can be located at uri's of the specified uri schemes. If not present, the printer does not filter the information it returns based on uri-scheme.
"os-type"	One or more OPTIONAL strings instructing the printer to only return information on client print support files that support the specified operating systems. If not present, the printer does not filter the information it returns based on os-type.
"document-format"	One or more OPTIONAL strings instructing the printer to only return information on client print support files that support the specified document formats. If not present, the printer does not filter the information it returns based on document format.
"natural-language"	One or more OPTIONAL strings instructing the printer to only return information on client print support files that support the specified natural languages. If not present, the printer does not filter the information it returns based on natural language.
"compression"	One or more OPTIONAL strings instructing the printer to only return information on client print support files that use the specified compressions. If not present, the printer does not filter the information it returns based on compression.

Table 2. client-print-support-files-request fields

3.2.2 Get-Printer-Attributes Response

A printer MUST return the "client-print-support-files-supported" attribute in the "printer-object" attribute group when a requested by a client. Each returned attribute value must satisfy the criteria specified by the client in the request.

3.3 Get-Client-Print-Support-Files

This OPTIONAL operation allows a client to download client print support files from an IPP Printer.

3.3.1 Get-Client-Print-Support-Files Request

The following sets of attributes are part of the Get-Client-Print-Support-Files request:

Group 1: Operation Attributes

Natural Language and Character Set:
The "attributes-charset" and "attributes-natural-language" attributes as described in [ipp-mod], section 3.1.4.1.

Target:
The "printer-uri" (uri) operation attribute which is the target for this operation as described in [ipp-mod], section 3.1.5.

Requesting User Name:
The "requesting-user-name" (name(MAX)) attribute SHOULD be supplied by the client as described in [ipp-mod], section 8.3.

"client-print-support-files-request" (octetString(MAX)) :
The client MUST supply this attribute specifying the criteria the returned client print support files should meet. If more than one set of client print support files meet the specified criteria, the printer returns the first one it encounters. The format and semantics of this attribute's value are identical to those of the Get-Printer-Attributes operational attribute of the same name described in section 3.2.1.

3.3.2 Get-Client-Print-Support-Files Response

The Printer object returns the following sets of attributes as part of the Get-Client-Print-Support-Files Response:

Group 1: Operation Attributes

Status Message:
In addition to the REQUIRED status code returned in every response, the response OPTIONALLY includes a "status-message" (text(255)) operation attribute as described in [ipp-mod], sections 13 and 3.1.6.

Natural Language and Character Set:
The "attributes-charset" and "attributes-natural-language" attributes as described in [ipp-mod], section 3.1.4.2.

Group 2: Unsupported Attributes
See [ipp-mod], section 3.1.7 for details on returning Unsupported Attributes.

Group 3: Printer Object Attributes
"client-print-support-files-supported" (octetString(MAX)).
The Printer object MUST return this attribute if the response includes Group 4 (i.e., if a set of client print support files that meets the client's criteria was found and is included in the response). The provided text string MUST use the format shown in section 3.1. This attribute identifies the properties of the returned client print support files.

Group 4: Client Print Support Files
The printer MUST supply the client print support files that match the client's criteria following the "end-of-attributes" tag. All necessary files must be compressed into a single file.

4 Encoding of the Operation Layer

This extension uses the operation layer encoding described in [ipp-pro].

5 Encoding of Transport Layer

This specification uses the transport layer encoding described in [ipp-pro] with the following extensions.

New syntax tags:

0x4A	longTextWithLanguage
0x4B	longTextWithoutLanguage

New Error codes:

0x04XX	clnt-err-client-print-support-file-not-found

New Operation code

0x00XX	Get-Client-Print-Support-Files

6 IANA Considerations

IANA-registered operating system names are required by this spec. All other IANA considerations are already addressed by IPP.

7 Internationalization Considerations

All text representations introduced by this specification adhere to the internationalization-friendly representation supported by IPP. This work is also accommodates the use of client print support files of different languages.

8 Security Considerations

The IPP Model and Semantics document [ipp-mod] discusses high-level security requirements (Client Authentication, Server Authentication and Operation Privacy). Client Authentication is the mechanism by which the client proves its identity to the server in a secure manner. Server Authentication is the mechanism by which the server proves its identity to the client in a secure manner. Operation Privacy is defined as a mechanism for protecting operations from eavesdropping.

Only operators of a printer should be allowed to set the "printer-driver-supported" attribute and only users of the printer should be allowed to query that information.

Printers that support the Get-Client-Print-Support-Files operation are REQUIRED to implement TLS to enable users to reliably authenticate the source of the client print support files.

9 References

[ipp-mod]
R. deBry, T. Hastings, R. Herriot, S. Isaacson, P. Powell, "Internet Printing Protocol/1.0: Model and Semantics", <draft-ietf-ipp-model-v11-06.txt>, March 1, 2000.

[ipp-pro]
Herriot, R., Butler, S., Moore, P., Tuner, R., "Internet Printing Protocol/1.1: Encoding and Transport", draft-ietf-ipp-protocol-v11-05.txt, March 1, 2000.

[os-names]
IANA, "Operating System Names", www.isi.edu/in-notes/iana/assignments/operating-system-names, February 3, 2000.

[rfc2026]
S. Bradner, "The Internet Standards Process -- Revision 3", RFC 2026, October 1996.

[rfc2616]
R. Fielding, J. Gettys, J. Mogul, H. Frystyk, L. Masinter, P. Leach, T. Berners-Lee, "Hypertext Transfer Protocol - HTTP/1.1", RFC 2616, June 1999.

10 Author's Addresses

Hugo Parra
Novell, Inc.
1800 South Novell Place
Provo, UT 84606
Phone: 801-861-3307
Fax: 801-861-4025
e-mail: hparra@novell.com

Ted Tronson
Novell, Inc.
1800 South Novell Place
Provo, UT 84606
Phone: 801-861-3338
Fax: 801-861-4025
e-mail: ttronson@novell.com

11 Full Copyright Statement