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8 Internet Printing Protocol (IPP):  
9 **Printer Installation Extension**

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21 **Abstract**

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

32 The full set of IPP documents includes:

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

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

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

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

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

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

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## 82 **1 Introduction**

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

## 93 **2 Terminology**

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

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

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

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

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

## 104 **3 Model Extensions**

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

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

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

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

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

### 115 3.1 "client-print-support-files-supported" (1setOf octetString(MAX))

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

119 "uri=uri-val< field-name<sub>2</sub>=val<sub>21</sub>,...,val<sub>2p</sub>< ... < field-name<sub>n</sub>=val<sub>n1</sub>,...,val<sub>nq</sub><"

120 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 mimeType 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.

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

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

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

## 126 **3.2 Get-Printer-Attributes Extension**

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

### 129 **3.2.1 Get-Printer-Attributes Request**

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

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

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

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

142 It is recommended that workstations first use Get-Printer-Attributes in combination with "client-print-  
143 support-files-request" to get a list of the potential client print support files that meet the workstation's  
144 requirements. The workstation can then choose from the returned list which client print support files to use  
145 and where to get them. If one of the uris returned is an IPP uri, the workstation can retrieve the client print  
146 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.

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

148 **3.2.2 Get-Printer-Attributes Response**

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

152 **3.3 Get-Client-Print-Support-Files**

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

154 **3.3.1 Get-Client-Print-Support-Files Request**

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

156 Group 1: Operation Attributes

157 Natural Language and Character Set:

158 The "attributes-charset" and "attributes-natural-language" attributes as described in [ipp-mod],  
 159 section 3.1.4.1.

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

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

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

### 172 3.3.2 Get-Client-Print-Support-Files Response

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

#### 175 Group 1: Operation Attributes

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

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

#### 184 Group 2: Unsupported Attributes

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

#### 187 Group 3: Printer Object Attributes

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

#### 194 Group 4: Client Print Support Files

195 The printer MUST supply the client print support files that match the client's criteria following the  
196 "end-of-attributes" tag. All necessary files must be compressed into a single file.



## 197 **4 Encoding of the Operation Layer**

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

## 199 **5 Encoding of Transport Layer**

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

201 New syntax tags:

202           0x4A           longTextWithLanguage

203           0x4B           longTextWithoutLanguage

204 New Error codes:

205           0x04XX       clnt-err-client-print-support-file-not-found

206 New Operation code

207           0x00XX       Get-Client-Print-Support-Files

## 208 **6 IANA Considerations**

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

## 211 **7 Internationalization Considerations**

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

## 215 **8 Security Considerations**

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

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

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

## 225 9 References

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