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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 support files can take on different shapes and forms depending on the specific client
26 platform, from simple configuration files to highly sophisticated printer drivers. This document refers to
27 these support files as "client print support files". Traditionally, the selection and installation of the correct
28 client print support files has been error prone. The selection and installation process can be simplified and
29 even automated if the workstation can learn some key information about the printer. This document
30 describes the IPP extensions that enable workstations to obtain the information needed to perform a proper
31 printer driver installation 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]

39

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 syntax with a maximum length limit of 64k: "long-text".

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

- 113 - A new REQUIRED Get-Printer-Attributes operational attribute: "client-print-support-files-
114 request".
- 115 - A new OPTIONAL printer operation: Get-Client-Print-Support-Files.

116 3.1 "client-print-support-files-supported" (1setOf long-text(MAX))

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

120 "field-name₁=val₁₁,...,val_{1o}< field-name₂=val₂₁,...,val_{2p}< ... < field-name_n=val_{n1},...,val_{nq}<"

121 The table below describes the fields that go into each string.

Field name	Field value
"uri"	One or more OPTIONAL uri's indicating where to obtain the support files for each OS platform, document format, and natural language the printer supports. Examples of uri types that may be found here are FTP, HTTP, and IPP. If this field is not present, 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. Predefined values: "ms-win-3x", "ms-win-95", "ms-win-98", "ms-win-nt", "ms-win-2k", [add Unix, Linux, etc.], "unknown".
"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.
"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.
"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".
"install-file-type"	One REQUIRED string identifying the type of the client print support files. Valid values are: "printer-driver", "ppd", "updf".
"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.

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 uir's).

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" (text(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 The table below describes the fields that may be included in this string.

Field name	Field value
"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.

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 uri's 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).

147 **3.2.2 Get-Printer-Attributes Response**

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

151 **3.3 Get-Client-Print-Support-Files**

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

153 **3.3.1 Get-Client-Print-Support-Files Request**

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

155 Group 1: Operation Attributes

156 Natural Language and Character Set:

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

159 Target:

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

162 Requesting User Name:

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

165 "client-print-support-files-request" (text(MAX)) :

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

171 3.3.2 Get-Client-Print-Support-Files Response

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

174 Group 1: Operation Attributes

175 Status Message:

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

179 Natural Language and Character Set:

180 The "attributes-charset" and "attributes-natural-language" attributes as described in [ipp-mod],
181 section 3.1.4.2.

182 Group 2: Unsupported Attributes

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

184 Group 3: Printer Object Attributes

185 "client-print-support-files-supported" (long-text(MAX)).

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

190 Group 4: Client Print Support Files

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

193 4 Encoding of the Operation Layer

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

195 5 Encoding of Transport Layer

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

197 New syntax tags:

198 0x4A longTextWithLanguage
199 0x4B longTextWithoutLanguage

200 New Error codes:

201 0x04XX clnt-err-client-print-support-file-not-found

202 New Operation code

203 0x00XX Get-Client-Print-Support-Files

204 **6 IANA Considerations**

205 There are no additional IANA consideration to those already addressed by IPP.

206 **7 Internationalization Considerations**

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

210 **8 Security Considerations**

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

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

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

220 **9 References**

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