

1 INTERNET-DRAFT There are 6 unresolved ISSUES
2 <draft-ietf-ipp-install-010.txt>

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10 Internet Printing Protocol (IPP):

11 **Printer Installation Extension**

12
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23 **Abstract**

24 Various client platforms require that some setting up take place at the workstation before the client can properly
25 submit jobs to a specific printer. This setup process is sometimes referred to as printer installation. Most clients
26 need some information about the printer being installed as well as support files to complete the printer installation.
27 The nature of the support files varies depending on the specific client platform, from simple configuration files to
28 highly sophisticated printer drivers. This document refers to these support files as “Client Print Support Files”.
29 Traditionally, the selection and installation of the correct Client Print Support Files has been error prone. The
30 selection and installation process can be simplified and even automated if the workstation can learn some key
31 information about the printer and which sets of Client Print Support Files are available. Such key information
32 includes: operating system type, CPU type, document-format (PDL), natural language, etc. This document
33 describes the IPP extensions that enable workstations to obtain the information needed to perform a proper printer
34 driver installation using IPP.

35

35 The full set of IPP documents includes:

36 Design Goals for an Internet Printing Protocol [RFC2567]

37 Rationale for the Structure and Model and Protocol for the Internet Printing Protocol [RFC2568]

38 Internet Printing Protocol/1.1: Model and Semantics [RFC2911]

39 Internet Printing Protocol/1.1: Encoding and Transport [RFC2910]

40 Internet Printing Protocol/1.1: Implementer's Guide [ipp-iiig]

41 Mapping between LPD and IPP Protocols [RFC2569]

42

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

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

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

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

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

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90 1 Introduction

91 A common configuration for printing from a workstation requires that some Client Print Support Files (e.g., PPD,
92 printer driver files) specific to the target printer be installed on that workstation. Selection and configuration of the
93 appropriate Client Print Support Files can be simplified and even automated if the workstation can obtain some key
94 information about the printer and which sets of Client Print Support Files are available. Such key information
95 includes: operating system type, CPU type, document-format (PDL), natural language, etc. With a few extensions,
96 IPP provides a simple and reliable vehicle for printers to convey this information to interested workstations. The
97 IPP extensions described in this document enable a flexible solution for installing Client Print Support Files on
98 workstations running different operating systems and for printers of all makes and models. It allows Client Print
99 Support Files to be downloaded from repositories of different sorts. A possible repository for the files is the
100 printer itself. The extensions necessary for getting Client Print Support Files from the printer are included in this
101 document.

102 2 Terminology

103 Client Print Support Files - a set of files, such as a printer driver, font metric file, printer configuration file (PPD,
104 GPD, etc.) that support a client printing to a particular Printer. A Printer can have multiple sets of Client Print
105 Support Files that work for different operating systems, document formats, natural languages, CPUs, etc.

106 This document uses terms such as “attributes”, “keywords”, and “support”. These terms have special meaning and
107 are defined in the model terminology [RFC2911] section 12.2.

108 Capitalized terms, such as MUST, MUST NOT, REQUIRED, SHOULD, SHOULD NOT, MAY, NEED NOT,
109 and OPTIONAL, have special meaning relating to conformance. These terms are defined in [RFC2911] section
110 12.1 on conformance terminology, most of which is taken from RFC 2119 [RFC2119].

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

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

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

116 3 Model Extensions

117 To assist workstations in the printer installation process, an IPP printer needs to provide the workstation with
118 information about the Client Print Support Files, such as the their name and location/s. This information needs to
119 match the workstation’s specific environment, such as its operating system, preferred natural language, and
120 preferred document format.

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

- 123 - A new REQUIRED ~~p~~Printer ~~d~~Description attribute: “client-print-support-files-supported” (1setOf
124 octetString(MAX)).
- 125 - A new REQUIRED Get-Printer-Attributes operation attribute: “client-print-support-files-~~filterrequest~~”
126 (octetString(MAX)).
- 127 - A new ~~OPTIONAL-RECOMMENDED~~ printer operation: Get-Client-Print-Support-Files.

128 3.1 client-print-support-files-supported (1setOf octetString(MAX))

129 An IPP Printer uses the REQUIRED ~~p~~Printer ~~d~~Description attribute “client-print-support-files-supported” to
130 represent relevant information about all of the Client Print Support Files it supports. Each value is a composite
131 UTF-8 string with well-defined fields (see Table 1). Each value string ~~must~~MUST be formatted as follows:

132 “uri=val₁< field-name₂=val₂₁,...,val_{2p}< ... < field-name_n=val_{n1},...,val_{nq}<”

133 The first field MUST be the “uri” field. The remaining fields MAY be in any order.

134 The string MUST NOT include any control characters (hex 00 to 1F), even the so-called white space control
135 characters (TAB, CR, and LF) anywhere. Only zero or more UTF-8 SPACE characters (hex 20) can be included
136 and they can be included only IMMEDIATELY AFTER the punctuation character: “<“, but NOT anywhere else,
137 including after “=” and “,”. However, if the UTF-8 SPACE character is needed in a file name value, then each
138 occurrence is included directly, without escaping (see example)escaped as: “\20” (SLP conventions—see
139 [RFC2608]. On the other hand, if the UTF-8 SPACE character is needed in ~~at~~the URL value, then each
140 occurrence is escaped as: “\x20” (URI conventions - see [RFC2396]). ~~ISSUE-01: Are these the correct white~~
141 ~~space rules?~~

142 Table 1 lists the REQUIRED fields that a Printer MUST support and the OPTIONAL fields that a Printer MAY
143 support in the “client-print-support-files-supported” (1setOf octetString(MAX)) Printer Description attribute. A
144 Printer implementation MAY support additional fields using the same syntax. Values are defined to be either
145 CASE-SENSITIVE or ALL-LOWER-CASE according to the definitions for the attribute syntaxes from
146 [RFC2911] (set off by single quotes in the table). The CASE-SENSITIVE values MAY have upper and lower
147 case letters as for the corresponding attribute syntaxes in [RFC2911]. The LOWER-CASE values MUST have
148 all lower case alphabetic letters. Additional characters, such as digits, hyphen-minus (-), period (.), and slash (/)
149 are according to the corresponding attribute syntaxes in [RFC2911].

150 Clients SHOULD ignore fields they don’t recognize in a given value. This allows for ~~feature~~future extensions to
151 the format of the string without breaking compatibility with earlier clients.

Table 1 - “client-print-support-files-supported” attribute fields

Field name	Field value
“uri”	One REQUIRED <u>CASE-SENSITIVE ‘uri’</u> 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 schemes that <u>may MAY</u> be found here are <u>FTPftp</u> , <u>HTTPhttp</u> , and <u>IPPipp</u> . <u>The FTP-ftp and HTTP-http schemes use their URIs</u> identify the archive file that contains all the necessary client support files. <u>The IPP-ipp scheme uses its URIs also</u> identify the <u>printer object from which the</u> archive file <u>which</u> may be obtained <u>from the Printer</u> using the Get-Client-Print-Support-Files operation (see section 3.3). <u>In order to distinguish between multiple Client Print Support Files, the ipp URL is used to distinguish between them in an implementation dependent manner, such as using a file URL parameter (‘file=xxx’). A Printer SHOULD support the ipp scheme.</u>
“os-type”	One or more REQUIRED comma-separated <u>LOWER-CASE</u> strings identifying the operating system types supported by this set of Client Print Support Files. Valid values include the operating system names defined in the IANA document [os-names]. <u>Although the IANA registry requires that the names be all upper-case, the values MUST be all lower case in this field (plus hyphen-minus (-), period (.), and slash (/)).</u> Examples: <u>linux, linux-2.2, os/2, sun-os-4.0, unix, unix-bsd, win32, windows-95, windows-98, windows-ce, windows-nt, windows-nt-4, windows-nt-5.</u>
“cpu-type”	One or more REQUIRED comma-separated <u>LOWER-CASE</u> strings identifying the CPU types supported by this set of Client Print Support Files. Values (or compatible): ‘unknown’, ‘x86-16’, ‘x86-32’, ‘x86-64’, ‘dec-vax’, ‘alpha’, ‘power-pc’, ‘ 68k-m-6800 ’, ‘sparc’, ‘itanium’, ‘mips’, ‘arm’.
“document-format”	One or more REQUIRED comma-separated <u>CASE-SENSITIVE ‘document-format’</u> 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 (see [RFC2911]). ‘unknown’ is a valid value.
“natural-language”	One or more REQUIRED comma-separated <u>LOWER-CASE ‘naturalLanguage’</u> strings identifying the natural language used by this set of Client Print Support Files. Valid values are the string representation of the IPP naturalLanguage syntax. ‘unknown’ is a valid value.
“compression”	One REQUIRED <u>LOWER-CASE ‘keyword’</u> 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’. The ‘none’ value is allowed but limits the uncompressed Client Print Support File to a single file.
“file-type”	One or more REQUIRED comma-separated <u>LOWER-CASE ‘keyword’</u> strings identifying the type of the Client Print Support Files. Valid values are: ‘printer-driver’, ‘ppd’, ‘updf’, ‘gpd’.
“file-name”	One REQUIRED <u>CASE-SENSITIVE</u> string identifying the name by which the Client Print

Field name	Field value
	Support Files will be installed on the workstation. For Client Print Support Files of type <u>“printer-driver”</u> , this is also the name that identifies this printer driver in an .inf file.
“policy”	One REQUIRED tag <u>LOWER-CASE ‘keyword’ string</u> indicating the policy for automatic loading. Values: ‘unknown’, ‘other’ , ‘manufacturer-recommended’, ‘administrator-recommended’, <u>‘manufacturer-experimental’</u> , and <u>‘latestadministrator-experimental’</u> . <u>The experimental values are for beta test. The ‘other’ value is used to indicate built-in files.</u>
“file-size”	One OPTIONAL file size in octets <u>represented as ASCII decimal digits</u> .
“file-version”	One OPTIONAL <u>LOWER-CASE</u> version number. Recommended to be of the form “Major.minor[.revision]” “Major” is the major version number, “minor” is the minor version number and “revision” is an optional revision number.
“file-date-time”	One OPTIONAL File <u>CASE-SENSITIVE</u> creation date and time <u>according to</u> ISO 8601 <u>where all fields are fixed length with leading zeroes (see [RFC2518] Appendix 2). Examples: 2000-01-01T23:09:05Z and 2000-01-01T02:59:59-04.00???</u>

153 Each value MUST refer to one and only one set of Client Print Support Files, even if the files are downloadable
 154 from various repositories (i.e., even if they are associated with multiple URIs).

155 The following illustrates what two valid values of the “client-print-support-files-supported” (1setOf
 156 octetString(MAX)) Printer Description attribute might look like:

```
157     “uri=ipp://mycompany.com/myprinter<
158     os-type=windows-95< cpu-type=x86-32<
159     document-format=application/postscript<
160     natural-language=en< compression=gzip< install-file-type=printer-driver<
161     install-file-name=CompanyX-ModelY-driver.gz<
162     policy=manufacturer-recommended<”
```

```
163     “uri=ftp://mycompany.com/root/drivers/win95/CompanyX/ModelY.gz<
164     os-type=windows-95< cpu-type=x86-32<
165     document-format=application/postscript,application/vnd.hp-PCL<
166     natural-language=en,fr< compression=gzip< install-file-type=printer-driver<
167     install-file-name=Company T X-ModelYModel Z -driver.gz<
168     policy=manufacturer-recommended<”
```

169 The above examples have been broken onto separate lines for readability in this document. However, there
 170 MUST NOT be any line breaks in the actual values.

171 The “client-print-support-files-supported” Printer Description attribute MAY be preset at manufacturing time or set
172 via the IPP Set-Printer-Attribute operation or through administrative means outside the scope of IPP.

173 **3.2 Get-Printer-Attributes Operation Extension**

174 ~~The “client-print-support-files-supported” Printer Description attribute defined in section 3.1 contains information,~~
175 ~~such as operating system, natural language, and document format, about all of the sets of Client Print Support~~
176 ~~Files. This section defines an extension to the Get-Printer-Attributes operation that allows a workstation to filter~~
177 ~~out all but the Client Print Support Files of interest. The following extensions allow a workstation to retrieve~~
178 ~~information on the client print support files that a printer supports using the existing Get-Printer-Attributes~~
179 ~~operation.~~

180 **3.2.1 Get-Printer-Attributes Request**

181 A Printer MAY contain information about multiple sets of eClient pPrint sSupport fFiles to match the different
182 operating systems, natural languages and document formats it supports. A workstation may query this information
183 by including the ‘client-print-support-files-supported’ keyword ~~in~~ as a value of the “requested-attributes” operation
184 attribute of the Get-Printer-Attributes operation.

185 **3.2.1.1 client-print-support-files-filter (octetString(MAX)) operation attribute**

186 The client can request a subset of the values of the “client-print-support-files-supported” Printer attribute by
187 supplying the “client-print-support-files-~~filterrequest~~” (octetString(MAX)) operation attribute in the request as a
188 filter. The filter value indicates in which Client Print Support Files the client is interested.

189 The client MAY supply this attribute. The Printer MUST support this attribute.

190 ~~The “client-print-support-files-request” (octetString(MAX)) operation attribute is used as a filter as follows.~~

191 ~~The IPP Printer is REQUIRED to support this operation attribute and all its member fields. An IPP Client MAY~~
192 ~~supply the attribute if it wishes to restrict the client print support files it receives from the Printer. Its text~~ The filter
193 value of the “client-print-support-files-filter” attribute is a composite string with the same format as that of “client-
194 print-support-files-supported” (see Table 1 - “client-print-support-files-supported” attribute fields in section 3.1):
195 The client can supply one or more values for each field separated by a comma with the following exceptions:

196 **Table 2 - “client-print-support-files-filter” attribute fields**

<u>Field Name</u>	<u>Field Value</u> in the “client-print-support-files-filter” attribute
<u>uri-scheme</u>	<u>One or more REQUIRED comma-separated LOWER-CASE ‘uriScheme’ string values identifying the uri scheme to be filtered on. Example URI schemes are: ftp, http, and ipp.</u>

	<u>The Printer SHOULD support the ipp scheme. If supplied by the client, this field NEED NOT be first. If this field is omitted by the client, the Printer returns all schemes.</u>
<u>xxx</u>	<u>All of the fields in “Table 1 - “client-print-support-files-supported” attribute fields, with the single exception of the “uri” field which a client MUST NOT supply and a Printer MUST NOT support.</u> <u>Any field can have more than one value separated by a COMMA (,), including the fields that Table 1 indicates MUST BE single valued.</u>

197

198 Clients MAY supply additional fields and/or additional values of defined fields.

199 The Printer returns only the values of the “client-print-support-files-supported” Printer Description attribute that
 200 match the filter in the “client-print-support-files-filter” operation attribute. A match occurs if at least one value of
 201 each field supplied in the filter matches a Client Print Support File value. A match for a CASE-INSENSITIVE
 202 field occurs independent of the case of the letters supplied by the client and those stored by the Printer, while a
 203 match for a LOWER-CASE field is a strict character for character match.

204 The following are two examples of a “client-print-support-files-filter” filter value:

205 os-type=windows-95< cpu-type=x86-32<
 206 document-format=application-postscript< natural-language=en,de<
 207
 208 uri-scheme=ipp< os-type=windows-95< cpu-type=x86-32<
 209 document-format=application-postscript< natural-language=en,de<
 210

211 See section 3.2.2 for example matching in the response.

212 The IPP Printer is REQUIRED to support this operation attribute and the following member fields in a “client-print-
 213 support-files-filter” operation attribute filter in the Get-Printer-Attributes request:

- 214 1. uri-scheme
- 215 2. os-type
- 216 3. cpu-type
- 217 4. document-format
- 218 5. natural-language

219 ~~—The Printer returns all files that have at least one value of each of the fields supplied. Table 2 describes the fields~~
220 ~~that may be included in this string. Printer Implementationsers~~ MAY support additional fields and additional values
221 of defined fields. Printers MUST ignore fields they do not support.

222 If the “client-print-support-files-~~filterrequest~~” operation attribute filter is not supplied by the client, the printer should
223 behave as if the attribute had been provided with all fields left empty (i.e., return an unfiltered list).

224 It is RECOMMENDED that workstations first use the Get-Printer-Attributes operation in combination with
225 “client-print-support-files-~~filterrequest~~” operation attribute filter to get a list of the potential Client Print Support
226 Files that meet the workstation’s requirements. The workstation can then choose from the returned list which
227 Client Print Support Files to use and where to get them. If one of the URIs returned is an IPP uri, the workstation
228 can ~~use that entire returned value to~~ retrieve the Client Print Support Files from an IPP printer via the Get-Client-
229 Print-Support-Files operation (see section 3.3).

Field name	Field value
“uri-scheme”	One or more OPTIONAL comma-separated 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 comma-separated 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.
“cpu-type”	One or more OPTIONAL comma-separated strings instructing the printer to only return information on client print support files that support the specified CPU types. If not present, the printer does not filter the information it returns based on cpu-type.
“document-format”	One or more OPTIONAL comma-separated 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 comma-separated 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 comma-separated 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.
	ISSUE 02: Why can’t the client filter on “file-type”? ISSUE 03: Should we collapse Table 2 into Table 1 by just adding a third column which names the field name or has N/A, if that field can’t be in a filter.
“file-version”	One or more OPTIONAL comma-separated strings instructing the Printer to only return information on client print support files that match the version number. Recommended to be of the form ‘major.minor[.revision]’ where ‘major’ is the major version number, ‘minor’ is the minor version number and ‘revision’ is an optional revision number. If not present, the printer does not filter the information it returns based on file-version.
“policy”	One or more OPTIONAL comma-separated strings indicating the policy for automatic down-loading. Values: ‘unknown’, ‘manufacturer-recommended’, ‘administrator-recommended’, ‘latest’. If not present, the printer does not filter the information it returns based on loading-policy.

231 **3.2.2 Get-Printer-Attributes Response**

232 A Printer MUST return the “client-print-support-files-supported” ([1setOf octetString\(MAX\)](#)) attribute in the
233 Printer Object Attributes group (group 3) when requested by a client. Each returned attribute value must satisfy
234 the criteria specified by the client in the request.

235 For example, if the request contains the following “client-print-support-files-[filterrequest](#)” filter:

```
236     os-type=windows-95< cpu-type=x86-32< document-format=application-postscript<  
237     natural-language=en,de<
```

238 A conforming response is [the following two octet String values](#):

```
239     uri=ipp://mycompany.com/myprinter<  
240     os-type=windows-95< cpu-type=x86-32<  
241     document-format=application/postscript<  
242     natural-language=en< compression=gzip< install-file-type=printer-driver<  
243     install-file-name=CompanyX-ModelY-driver.gz<  
244     policy=manufacturer-recommended<
```

```
245     uri=ftp://mycompany.com/root/drivers/win95/CompanyX/ModelY.gz<  
246     os-type=windows-95< cpu-type=x86-32<  
247     document-format=application/postscript,application/vnd.hp-PCL<  
248     natural-language=en,fr< compression=gzip< install-file-type=printer-driver<  
249     install-file-name=CompanyX-ModelY-driver.gz<  
250     policy=manufacturer-recommended<
```

251 [These examples have been broken onto separate lines for readability in this document. However, there MUST](#)
252 [NOT be any line breaks in the actual values.](#)

253 As an other example, if the above request had also contained the “uri-scheme” field in the following “client-print-
254 support-files-[filterrequest](#)” filter:

```
255     uri-scheme=ipp< os-type=windows-95< cpu-type=x86-32<  
256     document-format=application-postscript<  
257     natural-language=en,de<
```

258 Then only the first value would have been returned as [a single octetString value](#):

```
259     uri=ipp://mycompany.com/myprinter<  
260     os-type=windows-95< cpu-type=x86-32<  
261     document-format=application/postscript<  
262     natural-language=en< compression=gzip< install-file-type=printer-driver<  
263     install-file-name=CompanyX-ModelY-driver.gz<
```

264 policy=manufacturer-recommended<

265 3.3 Get-Client-Print-Support-Files

266 This ~~OPTIONAL~~ RECOMMENDED operation allows a client to download Client Print Support Files from an
267 IPP Printer.

268 3.3.1 Get-Client-Print-Support-Files Request

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

270 Group 1: Operation Attributes

271 Natural Language and Character Set:

272 The “attributes-charset” and “attributes-natural-language” attributes as described in [RFC2911],
273 section 3.1.4.1.

274 Target:

275 The “printer-uri” (uri) operation attribute which is the target for this operation as described in
276 [RFC2911], section 3.1.5.

277 Requesting User Name:

278 The “requesting-user-name” (name(MAX)) attribute SHOULD be supplied by the client as described
279 in [RFC2911], section 8.3.

280 “client-print-support-files-requesturi” (octetString(MAX)uri):

281 The client MUST supply this attribute specifying the ~~criteria~~ the uri returned for the desired Client Print
282 Support Files ~~should meet, i.e., the value of the “uri” field returned by the Get-Printer-Attributes in one~~
283 of the values of the “client-print-support-files-supported” (1setOf octetString(MAX)) Printer attribute.
284 The URI scheme must be ipp.

285 Note: This uri is neither the Printer’s target “printer-uri” nor the URI in the HTTP header. The format
286 and semantics of this attribute’s value are identical to those of the Get-Printer-Attributes operation
287 attribute of the same name described in section 3.2.1. If more than one set of client print support files
288 meet the specified criteria, the printer returns the first one it encounters. In order for the client to get a
289 specific set of client print support files, the client SHOULD supply all fields of one of the values
290 returned by the Get-Printer-Attributes, rather than passing in only a partially specified filter expression.
291 ISSUE-04: Can the value be “uri=xxx as returned by the Printer, rather than, or at least in addition to,
292 “uri-scheme=xxx, as in the filter request? Otherwise, the client has to edit the response to change
293 “uri=xxx://yyy” to “uri-scheme=xxx”.

294 3.3.2 Get-Client-Print-Support-Files Response

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

296 Group 1: Operation Attributes

297 Status Message:

298 In addition to the REQUIRED status code returned in every response, the response OPTIONALLY
299 includes a “status-message” (text(255)) operation attribute as described in [RFC2911], sections 13
300 and 3.1.6.

301 Natural Language and Character Set:

302 The “attributes-charset” and “attributes-natural-language” attributes as described in [RFC2911],
303 section 3.1.4.2.

304

305 Group 2: Unsupported Attributes

306 See [RFC2911], section 3.1.7 for details on returning Unsupported Attributes.

307

308 Group 3: Printer Object Attributes

309 “client-print-support-files-supported” (~~1~~setOf octetString(MAX)).

310 This attribute identifies the properties of the returned Client Print Support Files. The Printer object
311 MUST return this attribute if the response includes Group 4 (i.e., if a set of Client Print Support Files
312 identified by the supplied “client-support-files-uri” was found that meets the client’s criteria was found
313 and is included in the response). The Printer provided text string MUST use return the format shown
314 in section 3.1. ~~This attribute identifies the properties of the returned Client Print Support Files. The~~
315 ~~first value corresponds to the file returned in Group 4.~~

316

317

318 Group 4: Client Print Support Files

319 The printer MUST supply the Client Print Support Files that match the client’s criteria following the “end-
320 of-attributes” tag. All necessary files must be compressed into a single file.

321 4 Conformance

322 A Printer conforming to this specification:

- 323 1. MUST support the “client-print-support-files-supported” Printer Description attribute as defined in section
324 3.1, including all of the REQUIRED fields defined in Table 1 and MAY support the OPTIONAL fields
325 defined in Table 1.

- 326 2. MUST support the “client-print-support-files-filterrequest” operation attribute in the Get-Printer-Attributes
327 request as defined in section 3.2, including all of the fields defined in Table 2 and ignoring any fields not
328 recognized.
- 329 3. MUST support at least one of the following URI schemes that identify the support files: ftp, http, or ipp, of
330 which the ipp scheme is the RECOMMENDED one. ~~ISSUE-05: Interoperability concerns: Which~~
331 ~~schemes does a Printer have to support?~~
- 332 4. ~~MAY-SHOULD~~ support the Get-Client-Print-Support-Files operation as described in section 3.3. If this
333 operation is supported, then one of the supported schemes MUST be ipp.

334 A client conforming to this specification:

- 335 1. MUST ignore any fields returned by the Printer in the “client-print-support-files-supported” Printer
336 Description attribute that the client does not recognize or support.
- 337 2. ~~MUST-SHOULD~~ be able to retrieve Client Print Support Files by either ftp Get or http Get ~~oper~~reations.
- 338 3. MUST be able to retrieve Client Print Support Files using the Get-Client-Print-Support-Files operation,
339 i.e., support the ipp scheme. ~~ISSUE-06: Interoperability concerns: Which schemes does a client have to~~
340 ~~support?~~

341 5 Encoding of the Operation Layer

342 This extension uses the operation layer encoding described in [RFC2910].

343 6 Encoding of Transport Layer

344 This specification uses the transport layer encoding described in [RFC2910] with the following extensions.

345 New Error codes:

346 0x0417 client-error-client-print-support-file-not-found

347 New Operation code

348 0x0021 Get-Client-Print-Support-Files

349 7 IANA Considerations

350 The IANA-registered operating system names that IANA has registered [os-names] are required by this spec.

351 The “cpu-type” is not a current IANA registry. The current IANA machine registration [cpu-names] is really a
352 machine model number, not a CPU type. Also whether a CPU is 16-bit, 32-bit, or 64-bit needs to be indicated in

353 the CPU name which is not currently reflected in the IANA CPU registry. Therefore, the os-type will be a new
354 type of registration with initial values assigned in Table 1 under “os-type”, as with other elements in IPP [see
355 RFC2911 section 6 and 11].

356 All other IANA considerations are already addressed by IPP.

357 **8 Internationalization Considerations**

358 All text representations introduced by this specification adhere to the internationalization-friendly representation
359 supported by IPP. This work is also accommodates the use of Client Print Support Files of different languages.

360 **9 Security Considerations**

361 The IPP Model and Semantics document [RFC2911] discusses high-level security requirements (Client
362 Authentication, Server Authentication and Operation Privacy). Client Authentication is the mechanism by which the
363 client proves its identity to the server in a secure manner. Server Authentication is the mechanism by which the
364 server proves its identity to the client in a secure manner. Operation Privacy is defined as a mechanism for
365 protecting operations from eavesdropping.

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

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

370 **10 References**

371

372 [cpu-names]

373 IANA Registry of CPU Names at <ftp://ftp.isi.edu/in-notes/iana/assignments/XXX>.

374 [os-names]

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