



The Printer Working Group

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White Paper

IPP Print Quality Customization Extensions (CUSTOMPQI)

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Abstract: This document is a white paper that defines extensions to IPP enabling Printers to offer support for a broader range of print quality and rendering color mode choices than were previously available via standard attributes, enabling Printer vendors and system integrators with ways to provide a normalized structure for print quality hint customization settings.

This document is a White Paper. For a definition of a "White Paper", see:
<http://ftp.pwg.org/pub/pwg/general/pwg-process30.pdf>

This document is available electronically at:

<http://ftp.pwg.org/pub/pwg/ipp/white/white-hp-ipp-custompq-20190423.docx>
<http://ftp.pwg.org/pub/pwg/ipp/white/white-hp-ipp-custompq-20190423.pdf>

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2 Title: IPP Print Quality Customization Extensions (CUSTOMPQI)

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61 **1. Introduction**

62 Vendor-controlled print quality customizations are very important to demanding end users
63 because they give the user finer control over the color rendering the printer provides.
64 These customizations are also important to printer vendors and print service providers
65 because they enable product and service differentiation and customized solutions to meet
66 individual customer's needs. Historically these customizations were handled using model-
67 specific drivers and vendor-unique mechanisms. As print ecosystems continue their move
68 away from model-unique vendor-provided drivers and towards universal print solutions that
69 rely upon printer self-description via IPP, some additions to standard IPP are needed to
70 provide a framework that can satisfy printer vendors', print service providers' and
71 demanding users' needs for vendor-controlled print quality controls while avoiding vendor-
72 unique IPP attributes. This white paper defines several extensions to IPP that provide this
73 framework to satisfy these needs.

74 **2. Terminology**

75 **2.1 Conformance Terminology**

76 Capitalized terms, such as MUST, MUST NOT, RECOMMENDED, REQUIRED, SHOULD,
77 SHOULD NOT, MAY, and OPTIONAL, have special meaning relating to conformance as
78 defined in Key words for use in RFCs to Indicate Requirement Levels [RFC2119]. The
79 term CONDITIONALLY REQUIRED is additionally defined for a conformance requirement
80 that applies when a specified condition is true.

81 **2.2 Printing Terminology**

82 Normative definitions and semantics of printing terms are imported from IETF Printer MIB
83 v2 [RFC3805], IETF Finisher MIB [RFC3806], and IETF Internet Printing Protocol/1.1:
84 Model and Semantics [STD92].

85 *Administrator:* An End User who is also authorized to manage all aspects of an Output
86 Device or Printer, including creating the printer instances and controlling the authorization
87 of other End Users and Operators [RFC2567].

88 *Document:* An object created and managed by an Imaging Service that contains the
89 description, processing, and status information. A Document object may have attached
90 data and is bound to a single Job object [RFC8011].

91 *End User:* A person or software process that is authorized to perform basic printing
92 functions, including finding/locating a printer, creating a local instance of a printer, viewing
93 printer status, viewing printer capabilities, submitting a print job, viewing print job status,
94 and altering the attributes of a print job [RFC2567].

95 *Job*: An object created and managed by an Imaging Service that contains the description,
96 processing, and status information. A Job object also contains zero or more Document
97 objects [RFC8011].

98 *Logical Device*: a print server, software service, or gateway that processes jobs and either
99 forwards or stores the processed job or uses one or more Physical Devices to render
100 output [RFC8011].

101 *Operator*: An End User that also has special rights on the Output Device or Printer. The
102 Operator typically monitors the status of the Printer and manages and controls the Jobs at
103 the Output Device [RFC2567]. The Operator is allowed to query and control the Printer,
104 Jobs, and Documents based on site policy.

105 *Output Device*: a single Logical or Physical Device [PWG5100.18].

106 *Owner*: The End User or Administrator who owns and manages (and typically created) a
107 Job, Printer, Resource, Subscription, or System [PWG5108.06].

108 *Physical Device*: a hardware implementation of an endpoint device, e.g., a marking engine,
109 a fax modem, etc.

110 **2.3 Protocol Role Terminology**

111 This document also defines the following protocol roles in order to specify unambiguous
112 conformance requirements:

113 *Client*: Initiator of outgoing connections and sender of outgoing operation requests
114 (Hypertext Transfer Protocol -- HTTP/1.1 [RFC7230] User Agent).

115 *Printer*: Listener for incoming connections and receiver of incoming operation requests
116 (Hypertext Transfer Protocol -- HTTP/1.1 [RFC7230] Server) that represents one or more
117 Physical Devices or a Logical Device.

118 **2.4 Other Terminology**

119 *Document Creation Operations*: The operations that create documents: Print-Job, Print-
120 URI, Send-Document and Sent-URI.

121 *Job Creation operation*: One of the operations that creates a Job object: Print-Job, Print-
122 URI and Create-Job. The Restart-Job operation [STD92] is not considered a Job Creation
123 operation, since the Printer re-uses the existing Job object. The Validate-Job operation is
124 not considered a Job Creation operation because no Job object is created. Therefore,
125 when a statement also applies to either the Restart-Job and/or the Validate-Job operation,
126 they are mentioned explicitly.

127 **2.5 Acronyms and Organizations**

128 *IANA*: Internet Assigned Numbers Authority, <http://www.iana.org/>

129 *IETF*: Internet Engineering Task Force, <http://www.ietf.org/>

130 *ISO*: International Organization for Standardization, <http://www.iso.org/>

131 *PWG*: Printer Working Group, <http://www.pwg.org/>

132

133 3. Rationale for IPP Print Quality Customization Extensions

134 Existing specifications define the following:

- 135 1. IPP/1.1 Model and Semantics [STD92] defines the "print-quality" Job Template
136 attribute that enables a Client to specify a requested output quality level.
- 137 2. IPP: Job and Printer Extensions – Set 3 (JPS3) [PWG5100.13] defines:
 - 138 a. the "print-color-mode" Job Template attribute that enables a Client to request
139 a particular color mode be used when rendering the document to output;
 - 140 b. the "printer-icc-profiles" Printer Description attribute that enables the Printer
141 to specify the ICC profiles it supports for color management;
 - 142 c. the Message Catalog content type ("text/strings") that defines mappings
143 between attribute name and/or value keys and localized string value
144 equivalents, made available at a URL specified by the "printer-strings-uri"
145 Printer Description attribute.

146 End users and print system deployment administrators are increasingly demanding that
147 clients and printers support customized print quality and fidelity capabilities even within
148 universal print system ecosystems such as IPP Everywhere™ [PWG5100.14]. To enable
149 Printers to support these demands, this specification should:

- 150 1. Extend the range of enum values for "print-quality" to support additional values that
151 may have printer-specific meanings, and define the associated semantics when
152 these are present;
- 153 2. Extend the range of possible keyword values for the "print-color-mode" attribute, or
154 articulate the semantics of vendor-unique keywords, to enable Printers to specify
155 vendor or deployment-specific color modes, and define the associated semantics
156 when these are present;
- 157 3. Define attributes to support "soft proofing" ICC profiles to support Client
158 presentation of a preview of the effect of the selected color mode;
- 159 4. Extend the Message Catalog syntax to support "tool tips" and "online help" for any
160 attribute or attribute value provided;
- 161 5. Define attributes to allow a Printer to identify a number of vendor-specific attributes
162 as "print quality hints" so that a Client can present them in a limited fashion without
163 having to be aware of their semantic meaning.

164 **3.1 Use Cases**

165 The following use cases articulate the value that the extensions proposed later can provide
166 to the IPP ecosphere.

167 **3.1.1 Manufacturer-Deployed Print Quality Mode**

168 X Printers, a printer manufacturer, has developed a new technology that provides
169 significant customer benefit above and beyond that of the existing print quality modes
170 available. It is exposed to the user as a new "X Magic" print quality mode. The "X Magic"
171 print quality mode depends on the printer having a print engine mechanism that
172 implements the requisite imaging technology.

173 The new print quality mode does not fit well in the context of the existing print quality
174 modes, and the vendor does not want to cause customer confusion by remapping the use
175 of existing print quality modes on devices that support the technology, and not on those
176 that do not. Doing so would also prevent product differentiation.

177 In this case, the existing basic print quality modes (Draft, Normal, High) are preserved and
178 the new print quality mode is added as a custom mode. A tooltip explains to the user the
179 value provided by the "X Magic" print quality mode. The client drivers are unaware of the
180 mode's meaning. Since the custom PQ mode is defined on the device, the mode will only
181 be shown when connected to a device supporting that mode.

182 **3.1.2 Administrator-Deployed Print Quality Mode**

183 A customer has agreed with its print service provider to pay for an additional print quality
184 mode called "Eco-Draft", that is enabled through the service contract. This additional print
185 quality mode will only be made available on select printers, facilitated by the print service
186 provider's IT administration and deployment system.

187 This "Eco-Draft" print mode differs from the standard "Draft", "Normal" and "High" modes in
188 that, when selected and indicated to the Printer, the Printer employs a unique combination
189 of rendering selections to produce output generally comparable to "Draft" but with a
190 significantly reduced ink or toner usage, and a corresponding reduction in per-page cost.
191 In order to preserve the conventional definition and user perception of "Draft", the "Eco-
192 Draft" is offered as a new print quality setting unique to this deployment. A unique name
193 and quality value are important for two reasons: making it clear to end users they are using
194 a different print quality, so they can make an informed choice; and for job accounting
195 reasons so that the billing system can bill pages using this quality level differently than the
196 other familiar quality levels.

197 The IT administrators have a print policy defined so that users from different departments
198 or role families are given different print capabilities. Those in the Finance department will
199 only be offered the "Eco-Draft" print quality option, while executives and those in the
200 Marketing department will be offered "Eco-Draft" in addition to the standard "Draft",

201 “Normal” and “High” options. The different quality levels factor into the billing cost the IT
202 administrators and their print service providers have negotiated.

203 **3.1.3 Manufacturer-Deployed Color Transformation Preferences**

204 X Printers, a printer manufacturer, has produced printers for many years. Its customers
205 have asked X Printers to provide a “color output mode” control with a “legacy color
206 compatibility mode” choice. X Printers implements this feature in its newer printers that
207 have more accurate color output, to cause them to produce output that appears as though
208 it was printed on an older printer whose output exhibited a different particular set of color
209 output characteristics. The customers want to be able to select this “color output
210 preference” on a per-job and/or per-Client basis, because some users have a need for this,
211 but only in certain applications, while others do not.

212 The customers have also asked for a "print preview" to show them what the color would
213 look like before printing. The printers that implement this new "legacy color compatibility
214 mode" also provide a special "soft proofing" ICC profile so that the client can present this
215 accurately to the user.

216 **3.1.4 Administrator-Deployed Color Transformation Preference**

217 Fred is a print administrator at an architecture firm. He has been tasked with finding a way
218 to provide a “blueprint output mode” to the architects in the office, that can be selected as
219 an option in the print dialog. When this option is selected, the submitted job will be output
220 as though it was printed from a blueprinting machine. To produce this, the document color
221 depth is flattened to a 1-bit monochrome, and then transformed so that the white
222 background is rendered in Prussian blue (Web color #003153 or sRGB 0,49,83), and the
223 "black" lines are rendered in white. Fred provisions the printer with settings and resources
224 to describe the desired color transformation to its users' systems using an administrative
225 interface to add this feature.

226 Lisa works in the office, and her laptop discovers this “Blueprint” color transformation
227 option when it interrogates the printer for its capabilities. Her client device presents the
228 “Blueprint” color transformation option in the print dialog. Lisa positions her mouse pointer
229 over the option and sees a “tool tip” (snippet of descriptive text) over the “Blueprint” option,
230 that describes what that will do. Lisa likes what the tool tip describes for the “Blueprint”
231 option and selects it. The print preview in the print dialog shows her what the output will
232 look like. She likes it more, so she clicks “Print”, and the job is printed as per the preview.
233 Lisa is happy, and thanks Fred.

234 **3.1.5 Print Quality Hints to Influence Printer Color Processing**

235 Juan is a graphic artist, and his team has a high-performance color printer. It has produced
236 high quality output for all of the applications from which he and his team are printing. But
237 then Juan encounters a problem. He is viewing a document in a particular application,
238 prints the document, and realizes that the output is not meeting his needs. He is unable to
239 find settings in the application that will allow it to produce satisfactory printed output

240 without either changing the document in unacceptable ways or affecting other users of the
241 printer. He looks in the print dialog and finds a set of "print quality hints", and through a
242 process of trial-and-error, is able to produce output that meets his needs.

243 Knowing he will need these settings in the future, and also knowing that his computer
244 supports IPP Presets, he saves these settings as a Preset for future quick access.

245 **3.2 Exceptions**

246 There are no exception conditions for the use cases specified in section 3.1.

247 **3.3 Out of Scope**

248 The following are considered out of scope for this document:

- 249 1. Definition of specific color transformations
- 250 2. Specifying the user interface for controls that present the IPP options

251 **3.4 Design Requirements**

252 The design requirements for this document are:

- 253 1. Define attributes that allow a Client to specify a color transformation be
254 performed by the Printer for a particular Job;
- 255 2. Define additional enum values for "print-quality" that allow site- or vendor-
256 customizable print quality modes, that may or may not fit into the linear
257 sequence provided by the existing "print-quality" attribute enum values;
- 258 3. Define additions to the IPP localization system that allow the Printer to provide
259 additional descriptions for options in the strings catalog;
- 260 4. Register all attributes and operations with IANA

261 The design recommendations for this document are:

- 262 1. Consider the user experiences the IPP attributes might support

263 **4. Custom Color Mode Feature**

264 In addition to choosing "color" or "monochrome", there are cases where customers want to
265 be able to influence the character of how colors are rendered. This "transformation
266 preference" or "color mode preference" happens before color management and color
267 separation occurs.

268 The "print-color-mode" IPP Job Template attribute conveys a color mode selection to the
269 Printer. Standard color mode keywords included "color", "monochrome", "process-
270 monochrome", and others. While vendor-unique or printer-unique modes were syntactically

271 possible, their semantic implications were not previously considered. Some additional
 272 supporting elements are needed to support non-standard color modes properly. A
 273 sophisticated Client ought to have a way to present a "preview" illustrating the effects the
 274 color mode will have on their document. In addition to a localized name, tooltips and other
 275 help content can also help to educate the User on the unique color mode.

276 5. Printer Description Attributes

277 5.1 print-quality-hints-supported (1setOf keyword)

278 The "print-quality-hints-supported" Printer Description attribute specifies the set of Job
 279 Template attributes supported by the Printer that provide "hints" that can influence fine
 280 points relating to print quality. A Client supporting print quality hints implementing universal
 281 print solution such as IPP Everywhere™ to present a package of "advanced print settings"
 282 to the user. The named attributes can be vendor-specific or standard ones registered with
 283 IANA and the PWG. A Client could present these member attributes using the following UI
 284 control types:

285 **Table 1: Attribute syntax and controls for "print-quality-hints-supported"**

Syntax	Control
boolean	Checkbox
integer	Text box
type2 keyword	Pop-up menu or list
name	Pop-up menu or list

286 The attribute syntax for all Job Template attributes named in "print-quality-hints-supported"
 287 MUST use only the following attribute syntaxes:

- 288 • boolean
- 289 • integer
- 290 • type2 keyword
- 291 • name

292 The Printer MUST support "xxx-supported" and "xxx-default" Printer Description attributes
 293 for every attribute whose name is specified in "print-quality-hints-supported".

294 To illustrate how this attribute would be used, if a printer vendor named NotPWG defined
 295 vendor-unique print quality hint attributes "pwg-clever-x" and "pwg-magic-y", and wanted to
 296 flag those as print quality hint attributes to the Client, it could do it like so:

297 ATTR boolean notpwg-clever-x-supported true
298 ATTR boolean notpwg-clever-x-default false
299 ATTR keyword notpwg-magic-y-supported 'none','aguamenti','duro','episkey'
300 ATTR keyword notpwg-magic-y-default 'episkey'
301 ATTR keyword print-quality-hints-supported 'notpwg-clever-x','notpwg-magic-y'

302 A Client could present a checkbox for "notpwg-clever-x" and a pop-up menu or list for
303 "notpwg-magic-y".

304 **5.2 soft-proof-icc-profiles (1setOf collection)**

305 The "soft-proof-icc-profiles" Printer Description attribute specifies the set of ICC profiles the
306 Printer provides for soft proofing the color transformation the Printer will perform for a
307 given particular print color mode. Similar to the "printer-icc-profiles" attribute
308 [PWG5100.13], each collection value consists of "profile-name (name(MAX))" and "profile-
309 uri (uri)" member attributes plus any Job Template attributes (as member attributes) that
310 contribute to the selection of the profile.

311 These profiles MUST be used ONLY for soft proofing and MUST NOT be used for color
312 management.

313 **5.2.1 profile-name (name(MAX))**

314 The REQUIRED "profile-name" member attribute provides a unique name for a given ICC
315 profile. A given "profile-name" value MAY appear in multiple collection values but MUST
316 always be paired with the same "profile-uri" value. That is, a "profile-name" of "Glossy
317 Paper, High Quality" might be listed multiple times but will always refer to the same
318 "profile-uri", for example "http://example.com/glossy-high.icc".

319 The "profile-name" value SHOULD be localized by the Printer based on the value of the
320 "attributes-natural-language" operation attribute.

321 **5.2.2 profile-uri (uri)**

322 The REQUIRED "profile-uri" member attribute references an ICC color profile as a "http:"
323 or "https:" URI. Standard vendor-supplied profiles SHOULD be Printer-resident so that
324 Client printing does not require access to external networks. Printer-resident profiles
325 SHOULD be made available on the same TCP port number used for IPP (default 631) to
326 ensure resource availability.

327 **6. Additional Values and Semantics for Existing Attributes**

328 **6.1 print-color-mode (type2 keyword)**

329 The "print-color-mode " Printer Description attribute [PWG5100.13] specifies the color
330 modes the Printer supports to transform the document content when producing output.

331 Vendor-defined keywords SHOULD have the distinguishing prefix 'smiNNN-' [STD92]
 332 where NNN is an SMI Private Enterprise Number (PEN) [IANA-PEN]. Vendor-defined
 333 keywords SHOULD have either the '-monochrome' or '-color' suffixes to assist clients. For
 334 example, if the company Example Corp. had obtained the SMI PEN 32473, has a vendor-
 335 unique color mode "magic" that pertains to color, the Printer could specify the 'smi32473-
 336 magic-color'.

337 The Printer SHOULD provide localized user-presentable label strings in its message
 338 catalogs for all keywords that can be specified for the value of "print-color-mode ". The
 339 Printer makes its message catalog available at the URL specified by the "printer-strings-
 340 uri" Printer Description attribute [PWG5100.13]. The Printer SHOULD also provide
 341 "tooltips" strings [PWG5100.TOOLTIP] to provide lightweight contextual help content for its
 342 supported keywords.

343 If this attribute is supported, the Printer SHOULD also support the "soft-proof-icc-profiles"
 344 attribute (section 5.2) and SHOULD provide an ICC profile for all supported keywords, to
 345 allow a Client to present a soft proof preview for each supported print color mode.

346 As an example, a Printer that implements the 'smi32473-magic-color' and 'smi32473-
 347 blueprint' custom color modes ought to implement the following attributes and values
 348 (using "ipptoolfile" syntax):

```

349     ATTR keyword print-color-mode-supported auto,color,monochrome, smi32473-
350         magic-color, smi32473-blueprint
351     ATTR uri printer-strings-uri https://myprinter.local.:631/strings/ipp-
352         en.strings
353     ATTR uri soft-proof-icc-profiles {
354         MEMBER name smi32473-magic-color
355         MEMBER uri https://myprinter.local.:631/proofing/magic-color.icc
356     }, {
357         MEMBER name smi32473-blueprint
358         MEMBER uri https://myprinter.local.:631/proofing/blueprint.icc
359     }
  
```

360 Its message catalog at /strings/ipp-en.strings would include the following (for en-us):

```

361     "print-color-mode" = "Print Color Mode";
362     "print-color-mode.auto" = "Automatic";
363     "print-color-mode.auto-monochrome" = "Auto Monochrome";
364     "print-color-mode.bi-level" = "Text";
365     "print-color-mode.color" = "Color";
366     "print-color-mode.highlight" = "Highlight";
367     "print-color-mode.monochrome" = "Monochrome";
368     "print-color-mode.process-bi-level" = "Process Text";
369     "print-color-mode.process-monochrome" = "Process Monochrome";
370     "print-color-mode.smi32473-magic-color" = "Magic Color";
371     "print-color-mode.smi32473-magic-color._tooltip" = "Makes the colors look
372         magical";
373     "print-color-mode.smi32473-blueprint" = "Blueprint";
374     "print-color-mode.smi32473-blueprint._tooltip" = "Blue background with white
375         foreground lines";
  
```

376

377 **6.2 print-quality (type2 enum)**

378 The following new enum values for the “print-quality” attribute allow a Printer to specify
 379 support for additional printer-specific print quality options that the Client can specify the
 380 Printer use for a Job. A Printer that supports any of the enum labels defined here **MUST**
 381 provide localized labels for each using the Localization Message Catalog available at the
 382 URL specified by “printer-strings-uri” [PWG5100.13]. The Message Catalog localized
 383 strings provide the localization and the meaning of that enum for its own implementation. A
 384 Printer **SHOULD** also provide a localized “tool tip” using the “_tooltip” label extensions to
 385 the Localization Message Catalog defined in [PWG5100.TOOLTIP] to provide some
 386 contextual help for its customized label.

Enum Value	Enum Label	Description
3	draft	RFC 8011
4	normal	RFC 8011
5	high	RFC 8011
10	custom-10	Lowest custom print quality level
11	custom-11	Custom print quality level lower than 'custom-2'
12	custom-12	Custom print quality level lower than 'draft'
16	custom-16	Custom print quality level higher than 'high'
17	custom-17	Custom print quality level higher than 'custom-16'
18	custom-18	Highest custom print quality level
20	custom-20	Non-linear custom print quality
21	custom-21	Non-linear custom print quality
22	custom-22	Non-linear custom print quality

387 The string catalog entries for each of these might look like this:

```
388 "print-quality.10" = "EcoWickedDrafty";
389 "print-quality.12" = "EcoDrafty";
390 "print-quality.3" = "Draft";
391 "print-quality.4" = "Normal";
392 "print-quality.5" = "High";
393 "print-quality.16" = "Max";
394 "print-quality.18" = "MegaMax";
```

```
395 "print-quality.20" = "Non-linear Ennui";
396 "print-quality.21" = "Non-linear Trepidation";
397 "print-quality.22" = "Non-linear Happiness";
398
399 "print-quality.10._tooltip" = "Usable only for rough layout";
400 "print-quality.12._tooltip" = "Lower quality with greatly reduced toner use";
401 "print-quality.3._tooltip" = "Low quality with less toner use";
402 "print-quality.4._tooltip" = "Average quality - best for everyday use";
403 "print-quality.5._tooltip" = "Higher quality";
404 "print-quality.16._tooltip" = "Maximum quality";
405 "print-quality.18._tooltip" = "Super Maximum quality";
406 "print-quality.20._tooltip" = "Produces output that makes you bored";
407 "print-quality.21._tooltip" = "Produces output that makes you nervous ";
408 "print-quality.22._tooltip" = "Produces output that makes you kinder";
```

410 7. Internationalization Considerations

411 For interoperability and basic support for multiple languages, conforming implementations
412 MUST support:

- 413 1. The Universal Character Set (UCS) Transformation Format -- 8 bit (UTF-8) [STD63]
414 encoding of Unicode [UNICODE] [ISO10646]; and
- 415 2. The Unicode Format for Network Interchange [RFC5198] which requires
416 transmission of well-formed UTF-8 strings and recommends transmission of
417 normalized UTF-8 strings in Normalization Form C (NFC) [UAX15].

418 Unicode NFC is defined as the result of performing Canonical Decomposition (into base
419 characters and combining marks) followed by Canonical Composition (into canonical
420 composed characters wherever Unicode has assigned them).

421 WARNING – Performing normalization on UTF-8 strings received from Clients and
422 subsequently storing the results (e.g., in Job objects) could cause false negatives in Client
423 searches and failed access (e.g., to Printers with percent-encoded UTF-8 URIs now
424 'hidden').

425 Implementations of this specification SHOULD conform to the following standards on
426 processing of human-readable Unicode text strings, see:

- 427 Unicode Bidirectional Algorithm [UAX9] – left-to-right, right-to-left, and vertical
- 428 Unicode Line Breaking Algorithm [UAX14] – character classes and wrapping
- 429 Unicode Normalization Forms [UAX15] – especially NFC for [RFC5198]
- 430 Unicode Text Segmentation [UAX29] – grapheme clusters, words, sentences
- 431 Unicode Identifier and Pattern Syntax [UAX31] – identifier use and normalization

- 432 Unicode Collation Algorithm [UTS10] – sorting
- 433 Unicode Locale Data Markup Language [UTS35] – locale databases
- 434 Implementations of this specification are advised to also review the following informational
- 435 documents on processing of human-readable Unicode text strings:
- 436 Unicode Character Encoding Model [UTR17] – multi-layer character model
- 437 Unicode Character Property Model [UTR23] – character properties
- 438 Unicode Conformance Model [UTR33] – Unicode conformance basis

439 **8. Security Considerations**

440 The IPP extensions defined in this document require the same security considerations as
441 defined in the Internet Printing Protocol/1.1 [STD92]

442 Implementations of this specification SHOULD conform to the following standard on
443 processing of human-readable Unicode text strings, see:

444 Unicode Security Mechanisms [UTS39] – detecting and avoiding security attacks

445 Implementations of this specification are advised to also review the following informational
446 document on processing of human-readable Unicode text strings:

447 Unicode Security FAQ [UNISECFAQ] – common Unicode security issues

448 **9. IANA Considerations**

449 **9.1 IPP Attribute and Keyword Value Registrations**

450 This section contains the exact registration information for IANA to update according to the
451 procedures defined in [STD92].

452 The registry entries will contain the following information:

453	Job Template attributes:	Reference
454	-----	-----
455	print-quality-hints-supported (1setOf keyword)	[CUSTOMPQI]
456	soft-proof-icc-profiles (collection)	[CUSTOMPQI]
457	profile-name (name(MAX))	[CUSTOMPQI]
458	profile-uri (uri)	[CUSTOMPQI]
459		

460 9.2 Type2 enum Attribute Value Registrations

461 The enumerations defined in this document will be published by IANA according to the
462 procedures in IPP/1.1 Model and Semantics [STD92] section 7.1 in the following file:

463 <http://www.iana.org/assignments/ipp-registrations>

464 The registry entries will contain the following information:

465	Attribute (attribute syntax)		
466	Enum Value	Enum Symbolic Name	Reference
467	-----		-----
468	print-quality		[RFC8011]
469	3	draft	[RFC8011]
470	4	normal	[RFC8011]
471	5	high	[RFC8011]
472	10	custom-10	[CUSTOMPQI]
473	11	custom-11	[CUSTOMPQI]
474	12	custom-12	[CUSTOMPQI]
475	16	custom-16	[CUSTOMPQI]
476	17	custom-17	[CUSTOMPQI]
477	18	custom-18	[CUSTOMPQI]
478	20	custom-20	[CUSTOMPQI]
479	21	custom-21	[CUSTOMPQI]
480	22	custom-22	[CUSTOMPQI]

481

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598 **12. Change History**

599 **12.1 April 23, 2019**

600 Various changes as per feedback from the mailing list upon the initial draft's first posting:

- 601 • Moved the Message Catalog extensions to their own Best Practices document
- 602 • Removed mention of "print-color-mode-default" and "print-color-mode-supported"
- 603 since those attributes don't change
- 604 • Updated the new set of enum values for "print-quality" so that the enum values 1
- 605 and 2 are no longer defined in conflict with the earlier convention of never defining
- 606 any meaning to values 1 and 2.

607 **12.2 April 12, 2019**

608 Initial revision.