The Printer Working Group

1   **IPP Get-User-Printer-Attributes Operation**
2   (***USEROP***)

3   Status: Initial

4 Abstract: This document proposes a new Get-User-Printer-Attributes IPP operation that
5 allows an IPP Client to retrieve the Printer's settings that are available to the Client's
6 current User.

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

9 This document is available electronically at:

10   https://ftp.pwg.org/pub/pwg/ipp/whitepaper/tb-userop-20170801.odt
11   https://ftp.pwg.org/pub/pwg/ipp/whitepaper/tb-userop-20170801.pdf

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13   Title: *IPP Get-User-Printer-Attributes Operation (USEROP)*

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57 # 1   Introduction

58 This document proposes a new Get-User-Printer-Attributes IPP operation that allows an
59 IPP Client to retrieve the Printer's settings that are available to the Client's current User. It
60 is semantically identical to the existing Get-Printer-Attributes IPP operation [RFC8011],
61 with the key difference that the Printer will always respond with an authentication
62 challenge. Once the Client has authenticated using the User's credentials, the Printer will
63 respond with the settings for that user.

64 # 2   Terminology

65 ## 2.1   Protocol Roles Terminology

66 This document defines the following protocol roles in order to specify unambiguous
67 conformance requirements:

68 *Client*: Initiator of outgoing IPP session requests and sender of outgoing IPP operation
69 requests (Hypertext Transfer Protocol -- HTTP/1.1 [RFC7230] User Agent).

70 *Printer*: Listener for incoming IPP session requests and receiver of incoming IPP operation
71 requests (Hypertext Transfer Protocol -- HTTP/1.1 [RFC7230] Server) that represents one
72 or more Physical Devices or a Logical Device.

73 ## 2.2   Other Terms Used in This Document

74 *User*: A person or automata using a Client to communicate with a Printer.

75 ## 2.3   Acronyms and Organizations

76 *IANA*: Internet Assigned Numbers Authority, http://www.iana.org/

77 *IETF*: Internet Engineering Task Force, http://www.ietf.org/

78 *ISO*: International Organization for Standardization, http://www.iso.org/

79 *PWG*: Printer Working Group, http://www.pwg.org/

3　Rationale for IPP Get-User-Printer-Attributes Operation

While there are many solutions, both standard and non-standard, for creating print policies that provide a way to specify allowed or disallowed features according to individual users, systems, applications and so forth, there is no established method that is in-band of IPP. Having a print policy method using IPP would better support systems such as IPP Everywhere [PWG5100.14] in print infrastructures provided by public print providers, enterprises or educational environments such as university settings.

Technical justification for pursuing the creation of a new IPP operation rather than reusing or overloading existing operations such as Get-Printer-Attributes is discussed in section 4.

3.1　Use Cases

The need for solutions to these use cases emerged during the process of writing the IPP Implementor's Guide v2 [PWG5100.19].

3.1.1　Print Policy For Some Users Limits Print Capabilities

Sue wants to print her report on her department's workgroup printer. She wants to print it in color to make the color graphs look best. However, she has abused her printing privileges, so her department head has instructed the network administrator to restrict her user account's ability to print in color.

Sue opens the document on her laptop, chooses to print, and selects the department's workgroup printer. The Printer authenticates the laptop using Sue's credentials, and then provides the laptop with the print choices available for Sue's account, which does not include color printing. Sue decides whether to print it in black-and-white anyway or to print from one of the campus print centers, where she can pay to print in color.

Bob is an associate professor in the same department as Sue. His account has no limitations for color printing. He opens a document on his tablet, taps to print, and selects the department's workgroup printer. His tablet presents print options including the option of printing in color. Bob chooses to print in color, and prints his document, which prints in color as he expects.

Figure 3.1 illustrates this use case with a sequence diagram.

Get-User-Printer-Attributes
Use Case §3.1.1 : Print Policy for User Limits Print Capabilities

| Sue | Sue's Client | Bob | Bob's Client | Printer |

1 Selected a printer, wants to print

2 Select a printer

3 IPP Get-Printer-Attributes

4 IPP Get-Printer-Attributes response

5 Set Job ticket from defaults and xxx-supported options

"color-supported" = 'true'
"print-color-mode-supported" = 'auto', 'color', 'monochrome'
"operations-supported" contains 'Get-User-Printer-Attributes'

alt [IF 'Get-User-Printer-Attributes' in "operations-supported"
THEN Printer supports IPP Print Policy]

6 IPP Get-User-Printer-Attributes (with Expect: 100 Continue)

7 HTTP Response with auth challenge (401 for Basic/Digest, 302 for OAuth, others?)

Authentication token acquired (method details and additional participants outside scope of this diagram)

8 IPP Get-User-Printer-Attributes with auth credential

9 IPP Get-User-Printer-Attributes response

10 Update Job ticket per IPP Print Policy

"color-supported" = 'false'
"print-color-mode-supported" = 'auto', 'monochrome'

11 Show Print Options UI (IPPIGv2 §4.6)

Sue observes that she cannot select "Color"

12 Chooses options before Submitting a Job (IPPIGv2 §4.7)

13

14 Selected a printer, wants to print

15 Select a printer

16 IPP Get-Printer-Attributes

17 IPP Get-Printer-Attributes response

18 Set Job ticket from defaults and xxx-supported options

"color-supported" = 'true'
"print-color-mode-supported" = 'auto', 'monochrome', 'color'
"operations-supported" contains 'Get-User-Printer-Attributes'

alt [IF 'Get-User-Printer-Attributes' in "operations-supported"
THEN Printer supports IPP Print Policy]

19 IPP Get-User-Printer-Attributes

20 HTTP authentication challenge (HTTP 401)

21 IPP Get-User-Printer-Attributes with auth response

22 IPP Get-User-Printer-Attributes response

"color-supported" = 'true'
"print-color-mode-supported" = 'auto', 'monochrome', 'color'

23 Update Job ticket per IPP Print Policy

24 Show Print Options UI (IPPIGv2 §4.6)

Bob observes that he can select "Color"

25 Chooses options before Submitting a Job (IPPIGv2 §4.7)

26

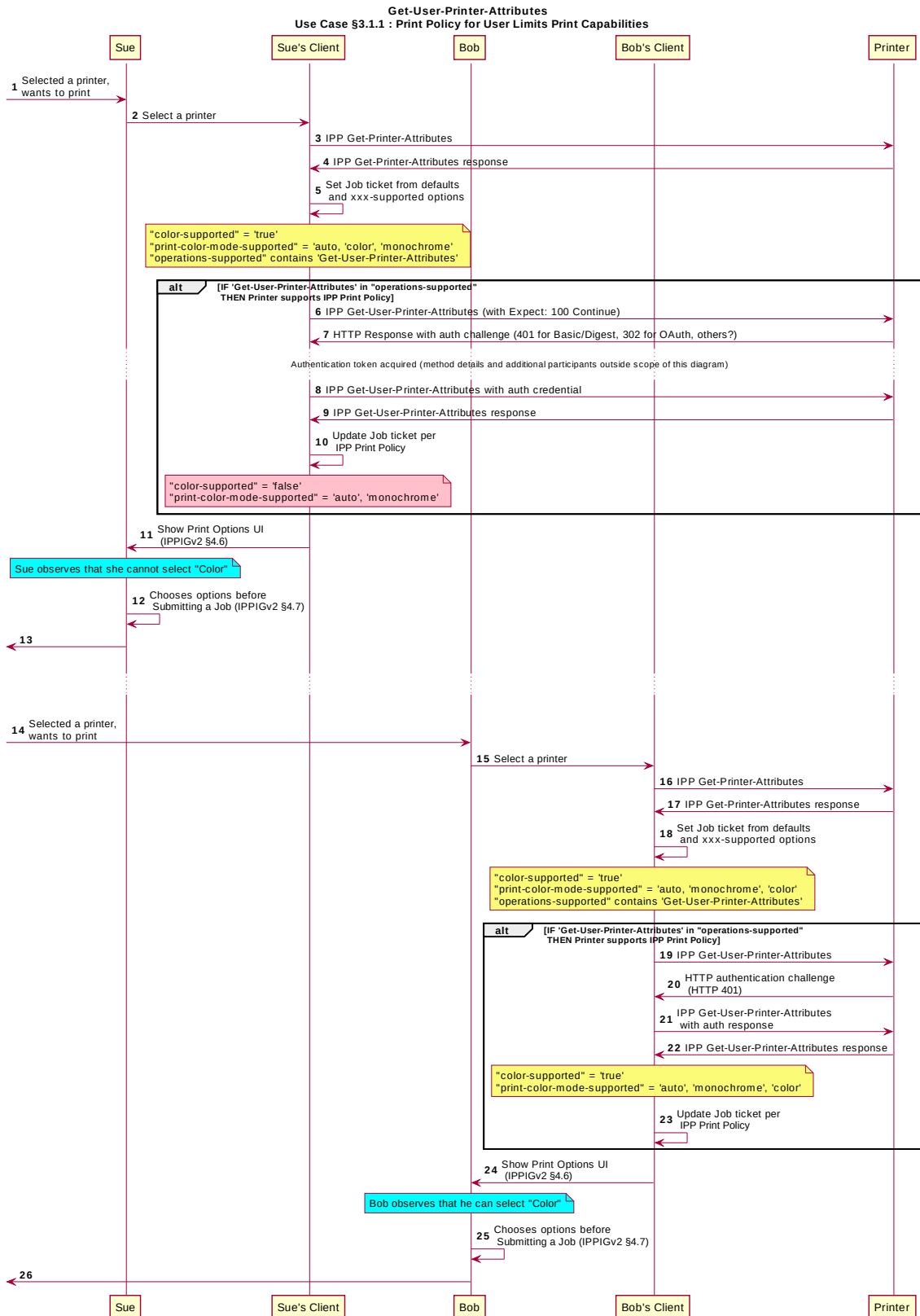| Sue | Sue's Client | Bob | Bob's Client | Printer |

Figure 3.1 : Use Case 3.1.1 Sequence Diagram

108   **3.1.2 User Not Listed in Print Policy Denied Ability to Print in Color**

109   In this use case, a user who is not named in the print policy system is denied the ability to
110   print using existing conventional IPP print protocol use. The Client may implement support
111   for IPP Print Policy but authentication may fail, or the Client may have not implemented
112   support for IPP Print Policy.

113   Duncan is at the office and needs to print a 5 page report that contains color diagrams
114   before his next meeting. His office user account has been granted permission by his office
115   network administrator to print in color. Duncan opens the document on his tablet, taps to
116   print, and selects the desired Printer. The tablet fetches the Printer's default capabilities,
117   and then authenticates using Duncan's user account to retrieve the print options available
118   to him as per his account's print policy, including the option to print in color or
119   monochrome. He prints the document using the color option, retrieves the hardcopy from
120   the printer, and then goes on to his meeting.

121   Ed is visiting Duncan's office and needs to print a 3 page document. Ed is not listed as a
122   user in the print policy. Ed opens the document on his laptop, clicks to print, and selects
123   the Printer recommended by Duncan. The laptop does not support print policies or does
124   but has no valid credentials. The Printer provides Ed's laptop with the default print
125   capabilities. When the Job is submitted to the Printer, the Printer rejects the Job or
126   identifies the setting that were adjusted, since unknown users don't have the right to print
127   in color on this printer.

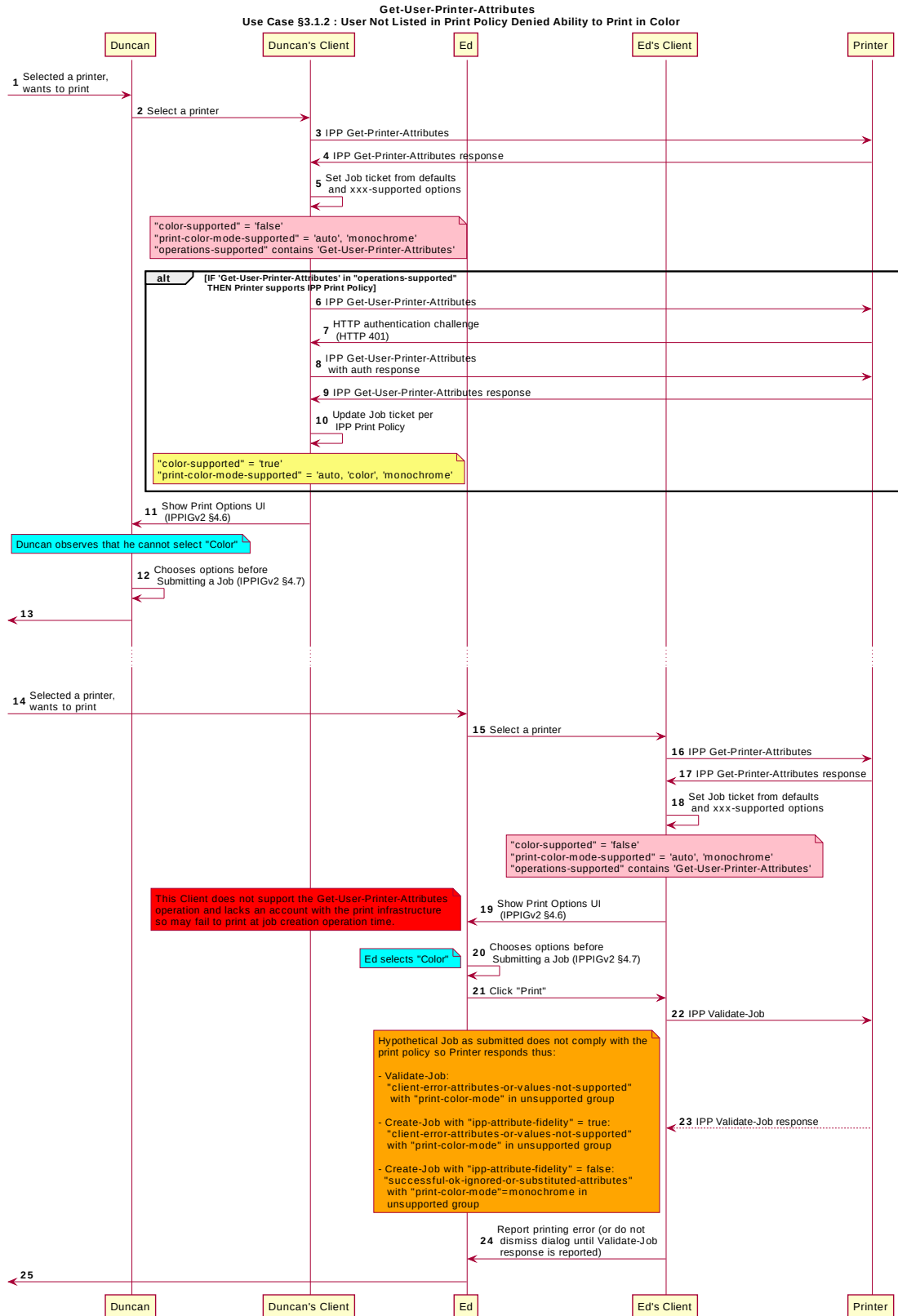128   Figure 3.2 illustrates this use case with a sequence diagram.

Get-User-Printer-Attributes
Use Case §3.1.2 : User Not Listed in Print Policy Denied Ability to Print in Color

Duncan	Duncan's Client	Ed	Ed's Client	Printer

1 Selected a printer, wants to print

2 Select a printer

3 IPP Get-Printer-Attributes

4 IPP Get-Printer-Attributes response

5 Set Job ticket from defaults and xxx-supported options

"color-supported" = 'false'
"print-color-mode-supported" = 'auto', 'monochrome'
"operations-supported" contains 'Get-User-Printer-Attributes'

alt [IF 'Get-User-Printer-Attributes' in "operations-supported" THEN Printer supports IPP Print Policy]

6 IPP Get-User-Printer-Attributes

7 HTTP authentication challenge (HTTP 401)

8 IPP Get-User-Printer-Attributes with auth response

9 IPP Get-User-Printer-Attributes response

10 Update Job ticket per IPP Print Policy

"color-supported" = 'true'
"print-color-mode-supported" = 'auto', 'color', 'monochrome'

11 Show Print Options UI (IPPIGv2 §4.6)

Duncan observes that he cannot select "Color"

12 Chooses options before Submitting a Job (IPPIGv2 §4.7)

13

14 Selected a printer, wants to print

15 Select a printer

16 IPP Get-Printer-Attributes

17 IPP Get-Printer-Attributes response

18 Set Job ticket from defaults and xxx-supported options

"color-supported" = 'false'
"print-color-mode-supported" = 'auto', 'monochrome'
"operations-supported" contains 'Get-User-Printer-Attributes'

This Client does not support the Get-User-Printer-Attributes operation and lacks an account with the print infrastructure so may fail to print at job creation operation time.

19 Show Print Options UI (IPPIGv2 §4.6)

20 Chooses options before Submitting a Job (IPPIGv2 §4.7)

Ed selects "Color"

21 Click "Print"

22 IPP Validate-Job

Hypothetical Job as submitted does not comply with the print policy so Printer responds thus:

- Validate-Job:
  "client-error-attributes-or-values-not-supported" with "print-color-mode" in unsupported group

- Create-Job with "ipp-attribute-fidelity" = true:
  "client-error-attributes-or-values-not-supported" with "print-color-mode" in unsupported group

- Create-Job with "ipp-attribute-fidelity" = false:
  "successful-ok-ignored-or-substituted-attributes" with "print-color-mode"=monochrome in unsupported group

23 IPP Validate-Job response

24 Report printing error (or do not dismiss dialog until Validate-Job response is reported)

25

Duncan	Duncan's Client	Ed	Ed's Client	Printer

Figure 3.2 : Use Case 3.1.2 Sequence Diagram

3.2 Exceptions

There are no exceptions to the use cases in section 3.1.

3.3 Out of Scope

The following are considered out of scope for this document:

1. Definition of actual print policies.
2. Definition of how print policy management systems structure and/or organize the sets of users and their policies.
3. Definition of non-IPP protocols that can provide similar functionality.

3.4 Design Requirements

The design requirements for this document are:

1. Identify an appropriate set of IPP operations that allows a supporting Client to acquire from the target Printer the set of print features available for a particular User.
2. Identify an appropriate Printer behavior and expected Client behavior for a non-supporting Client (i.e. one that is unaware of this new system) can still be a legitimate actor in the print policy system.
3. Identify an appropriate set of IPP operations and attributes that allows a Printer to refer a Client to a trusted IPP Print Policy Service, such that the Client can assert that the options it provides with a submitted job do comply with a policy originating from that trusted policy server.
4. Maintain backward compatibility with existing versions of IPP (IPP/1.1, IPP/2.x).
5. Register all attributes and operations with IANA.

The design recommendations for this document are:

1. Recommend suitable authentication methods and guidelines for the use of those methods that could inform the creation of a high quality Client user experience.

4   Technical Solutions/Approaches

Although the existing Get-Printer-Attributes operation [RFC8011] conveys the needed information and could be used for this task, few legacy Clients expect the Printer to respond to a Get-Printer-Attributes operation with an HTTP authentication challenge. To preserve backward compatibility with legacy Clients, a new operation is defined here, with semantics similar to Get-Printer-Attributes.

160   **5   IPP Operations**

161   **5.1   Get-User-Printer-Attributes Operation**

162   This REQUIRED operation allows a Client to request the values of the attributes of a
163   Printer. This operation is semantically similar to the Get-Printer- Attributes operation
164   [RFC8011] except that the returned attributes and values MAY be different depending on
165   the most authenticated user, and the Client MUST be prepared to respond to an HTTP
166   authentication challenge. The Client detects whether the Printer supports this operation by
167   examining the "operations-supported" attribute [RFC8011].

168   If the Client initiates the Get-User-Printer-Attributes operation over a non-TLS connection,
169   the Client MUST be prepared to receive an HTTP 426 response to upgrade the connection
170   to TLS [RFC2817]. The Printer MUST only send Get-User-Printer-Attributes responses
171   over TLS connections.

172   **5.1.1 Get-User-Printer-Attributes Request**

173   The following groups of attributes are supplied as part of the Get-User-Printer-Attributes
174   request:

175   Group 1: Operation Attributes

176   Natural Language and Character Set:

177   The "attributes-charset" and "attributes-natural-language" attributes as
178   described in [RFC8011] Section 4.1.4.1.

179   Target:

180   The "printer-uri" (uri) operation attribute, which is the target for this operation
181   as described in [RFC8011] Section 4.1.5.

182   Requesting User Name:

183   The "requesting-user-name" (name(MAX)) attribute SHOULD be supplied by
184   the Client as described in [RFC8011] Section 9.3. In addition, the
185   "requesting-user-uri" (uri) [PWG5100.13]and "requesting-user-vcard" (1setOf
186   text(MAX)) [PWG5100.SYSTEM] attribute SHOULD be supplied by the Client
187   as described in their respective PWG specifications. These attributes
188   SHOULD be sent even when HTTP authentication is used, since the "most
189   authenticated user" principle applies here as with all IPP operations, as per
190   [RFC8011] Section 9.3.

191   "requested-attributes" (1setOf keyword):

192   The "requested-attributes" (1setOf keyword) attribute SHOULD be supplied
193   by the Client as described in [RFC8011] Section 4.2.5.1.

194   "document-format" (mimeMediaType):

195   The "document-format" (mimeMediaType) attribute SHOULD be supplied by
196   the Client as described in [RFC8011] Section 4.2.5.1.

197   **5.1.2 Get-User-Printer-Attributes Response**

198   The Printer returns the following sets of attributes as part of the Get-User-Printer-Attributes
199   response:

200   Group 1: Operation Attributes

201   Natural Language and Character Set:

202   The "attributes-charset" and "attributes-natural-language" attributes as
203   described in [RFC8011] Section 4.1.4.1.

204   Status Message:

205   In addition to the REQUIRED status-code returned in every response, the
206   response MAY include a "status-message" (text(255)) and/or a "detailed-
207   status-message" (text(MAX)) operation attribute as described in [RFC8011]
208   Appendix B and Section 4.1.6.

209   Group 2: Unsupported Attributes

210   See [RFC8011] Section 4.1.7 for details on returning unsupported attributes.

211   Group 3: Printer Attributes

212   This is the set of requested attributes and their current values. See [RFC8011]
213   Section 4.2.5.2 for details.

6   Internationalization Considerations

215   For interoperability and basic support for multiple languages, conforming implementations
216   MUST support the Universal Character Set (UCS) Transformation Format -- 8 bit (UTF-8)
217   [RFC3629] encoding of Unicode [UNICODE] [ISO10646] and the Unicode Format for
218   Network Interchange [RFC5198].

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

221   • Unicode Bidirectional Algorithm [UAX9] – left-to-right, right-to-left, and vertical

222   •   Unicode Line Breaking Algorithm [UAX14] – character classes and wrapping

223   •   Unicode Normalization Forms [UAX15] – especially NFC for [RFC5198]

224   •   Unicode Text Segmentation [UAX29] – grapheme clusters, words, sentences

225   •   Unicode Identifier and Pattern Syntax [UAX31] – identifier use and normalization

226   •   Unicode Collation Algorithm [UTS10] – sorting

227   •   Unicode Locale Data Markup Language [UTS35] – locale databases

228 Implementations of this specification are advised to also review the following informational
229 documents on processing of human-readable Unicode text strings:

230   •   Unicode Character Encoding Model [UTR17] – multi-layer character model

231   •   Unicode in XML and other Markup Languages [UTR20] – XML usage

232   •   Unicode Character Property Model [UTR23] – character properties

233   •   Unicode Conformance Model [UTR33] – Unicode conformance basis

234   7   Security Considerations

235 The security considerations for the Get-User-Printer-Attributes operation build upon those
236 defined for IPP/1.1 [RFC8011] and IPP/2.0 [PWG5100.12] for the Validate-Job, Create-Job
237 and Print-Job operations. In addition to those security considerations, a Printer MUST
238 NOT send a Get-User-Printer-Attributes response over a non-TLS connection.

239   7.1   Human-readable Strings

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

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

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

245   •   Unicode Security FAQ [UNISECFAQ] – common Unicode security issues

8   References

8.1   Normative References

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The authors would also like to thank the following individuals for their contributions to this standard:

10   Change History

10.1 August 1, 2017

Updated as per feedback from July 20, 2017 IPP WG meeting minutes and feedback:

- Added sub-sections for the Get-User-Printer-Attributes request and response, leveraging text from RFC 8011 and 5100.SYSTEM

- Updated Internationalization section to use Unicode 10 and added a bunch of references.

- Updated references to add System, and full standard of IPP/2.0 (5100.12)

- Other editorial fixes

10.2 May 24, 2017

Updated as per feedback from May 2017 F2F review.

- Removed previous use cases 3.1.2-3.1.5; renamed 3.1.6 to be new 3.1.2, with updated sequence diagram that includes Validate-Job / Create-Job response.

- Removed section 6 – no new IPP attributes need to be defined as of this draft.

10.3 April 18, 2017

- Updated and clarified the description in section 4 "Technical Solutions/Approaches" to explain with more detail why it is not practical to use the venerable Get-Printer-Attributes operation for the task of conveying print policies.

10.4 April 4, 2017

- Updated with new and elaborated use cases and accompanying sequence diagrams to better articulate the breadth of the problem space.

10.5 February 1, 2017

- Editorial changes.

10.6 January 30, 2017

- Initial draft.