The Printer Working Group

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

3   Status: Interim

4 Abstract: This document proposes a new Get-User-Printer-Attributes IPP operation that
5 allows an IPP Client to retrieve the Printer's attributes and capabilities that are available
6 specifically to the Client's most authenticated 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-20170817.odt
11   https://ftp.pwg.org/pub/pwg/ipp/whitepaper/tb-userop-20170817.pdf

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

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1   Introduction

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

2   Terminology

2.1   Protocol Roles Terminology

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

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

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

2.2   Other Terms Used in This Document

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

2.3   Acronyms and Organizations

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

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

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

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

3 Requirements for IPP Get-User-Printer-Attributes

3.1 Rationale for IPP Get-User-Printer-Attributes

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.

3.2 Use Cases

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

3.2.1 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

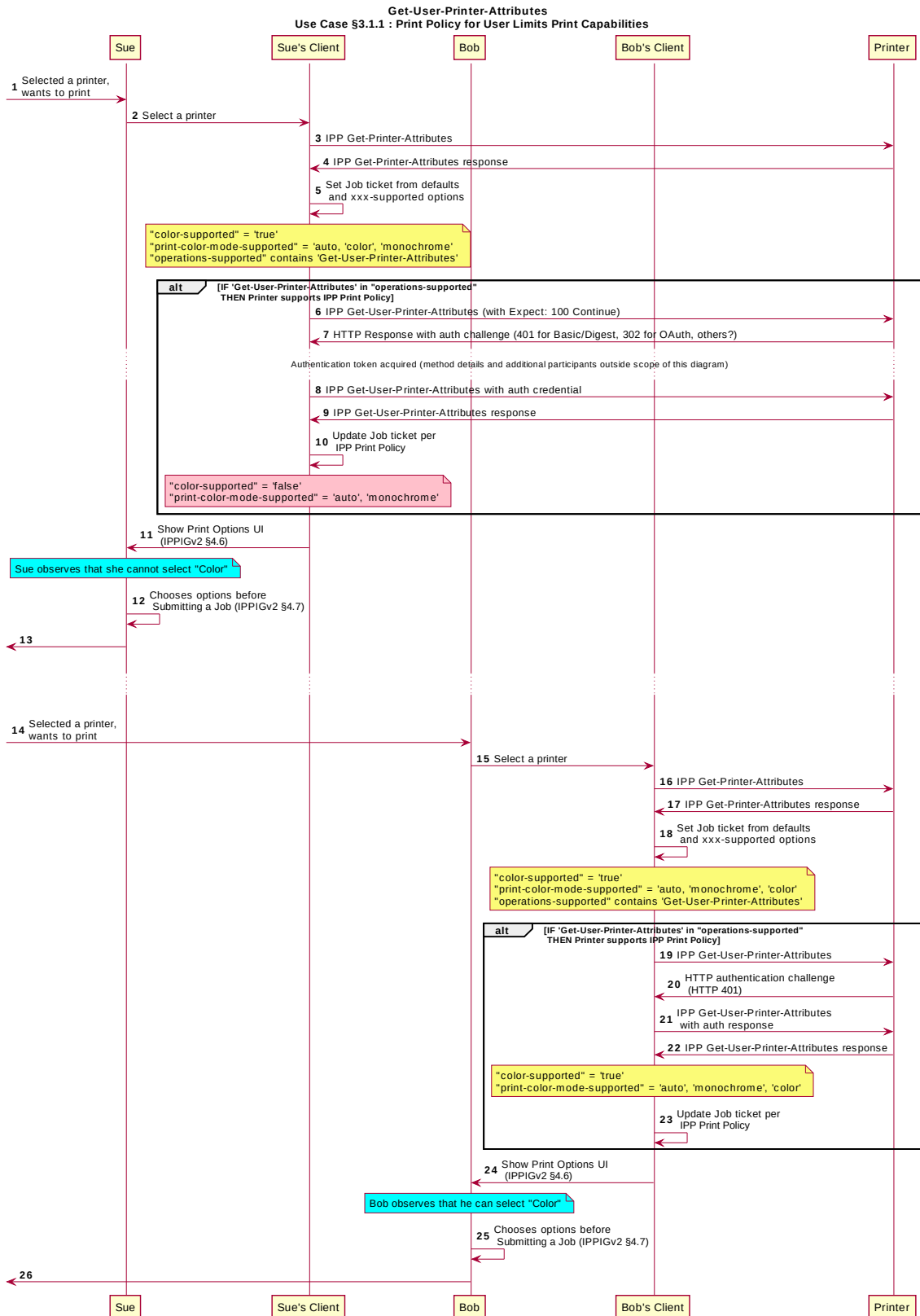| Sue	Sue's Client	Bob	Bob's Client	Printer

Figure 3.1 : Use Case 3.1.1 Sequence Diagram

109 3.2.2 User Not Listed in Print Policy Denied Ability to Print in Color

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

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

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

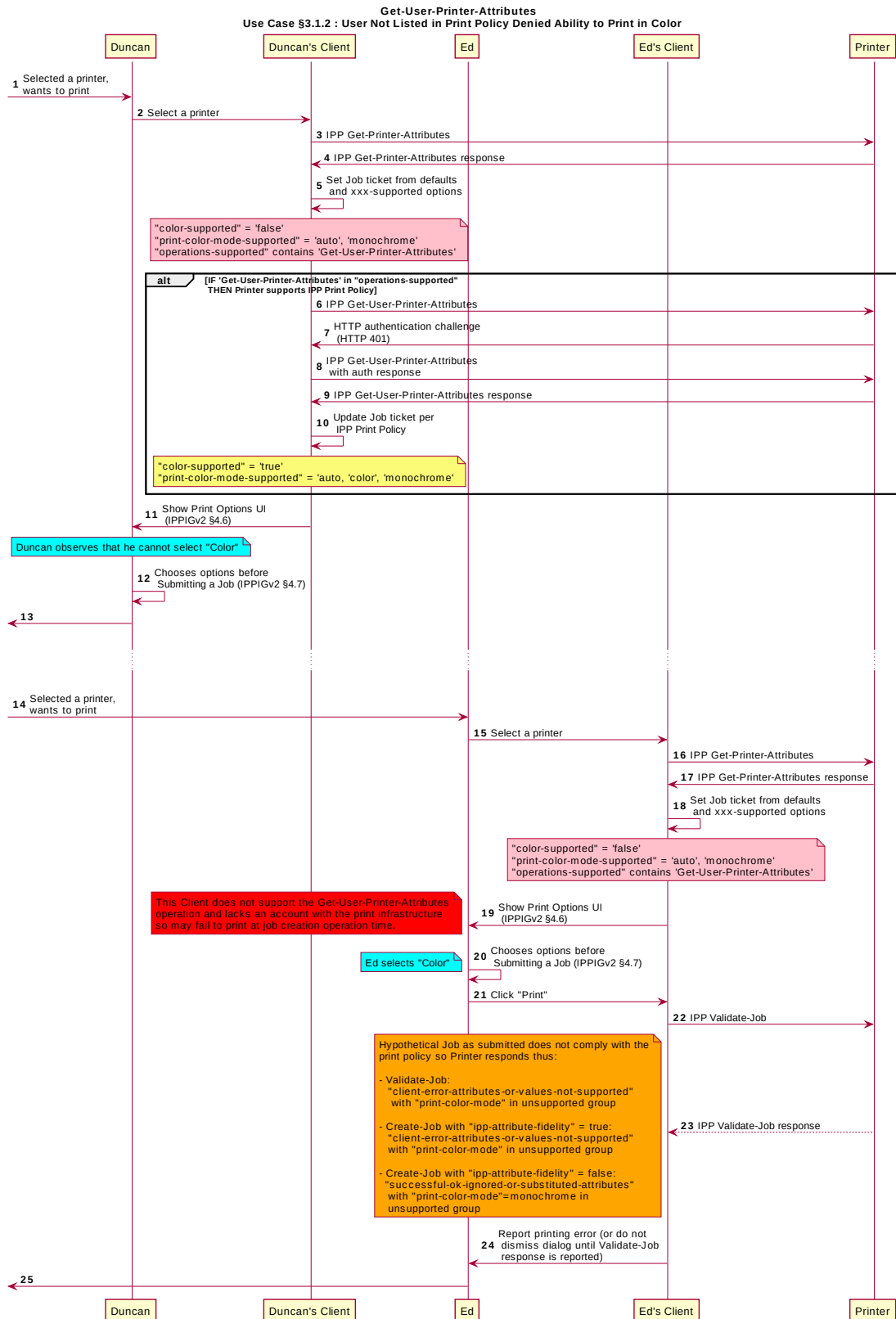129 Figure 3.2 illustrates this use case with a sequence diagram.

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)

Ed selects "Color"

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

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

3.3 Exceptions

There are no exceptions to the use cases in section 3.2.

3.4 Out of Scope

The following are considered out of scope for this document:

1. Definition of specific 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.

3.5 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   IPP Get-User-Printer-Attributes Definitions

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.

4.1 IPP Operations

4.1.1 Get-User-Printer-Attributes

This REQUIRED operation is semantically analogous to the Get-Printer-Attributes operation [RFC8011] except that the Printer MUST return the attributes and values allowed for the most authenticated user. The most authenticated user provides the identity the Printer will use to construct its IPP response, containing the attributes and values for that identity.

The Client MUST be prepared to respond to an HTTP authentication challenge. The Client detects whether the Printer supports this operation by examining the "operations-supported" attribute [RFC8011]. If the Client initiates the Get-User-Printer-Attributes operation over a non-TLS connection, the Client MUST be prepared to receive an HTTP 426 response to upgrade the connection to TLS [RFC2817]. The Printer MUST only send Get-User-Printer-Attributes responses over TLS connections [RFC8010] [RFC8011].

4.1.1.1   Get-User-Printer-Attributes Request

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

Group 1: Operation Attributes

  "attributes-charset" (charset) and
  "attributes-natural-language" (naturalLanguage) :

    As described in [RFC8011] Section 4.1.4.1. The Client MUST supply and the Printer MUST support both of these attributes.

  "printer-uri" (uri) :

    The Client MUST supply and the Printer MUST support this attribute, which is the target for this operation as described in [RFC8011] Section 4.1.5.

  "requesting-user-name" (name(MAX)) :

    The Client MUST supply and the Printer MUST support this attribute, as described in [RFC8011] Section 9.3.

  "requesting-user-uri" (uri) :

    The Client MUST supply and the Printer MUST support this attribute, as described in [PWG5100.13] section

  "requesting-user-name" (name(MAX)) and
  "requesting-user-uri" (uri) and
  "requesting-user-vcard" (1setOf text(MAX)) :

194 The Client SHOULD supply and the Printer MUST support all three of these
195 attributes.

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

197 The "requested-attributes" (1setOf keyword) attribute MAY be supplied by the
198 Client and MUST be supported by the Printer as described in [RFC8011]
199 Section 4.2.5.1.

200 "document-format" (mimeMediaType):

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

203 **4.1.1.2   Get-User-Printer-Attributes Response**

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

206 Group 1: Operation Attributes

207 "attributes-charset" (charset) and
208 "attributes-natural-language" (naturalLanguage) :

209 As described in [RFC8011] Section 4.1.4.1. The Client MUST supply and the
210 Printer MUST support both of these attributes.

211 Status Message:

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

216 Group 2: Unsupported Attributes

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

218 Group 3: Printer Attributes

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

221 # 5 Internationalization Considerations

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

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

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

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

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

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

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

233　　• Unicode Collation Algorithm [UTS10] – sorting

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

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

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

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

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

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

241 # 6 Security Considerations

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

246 ## 6.1 Human-readable Strings

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

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

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

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

253   7   References

254   7.1   Normative References

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290 [UAX14]   Unicode Consortium, "Unicode Line Breaking Algorithm", UAX#14,
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325   Mike Sweet – Apple Inc.
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9   Change History

9.1   August 17, 2017

Updated as per feedback from August 2017 IPP WG vF2F meeting minutes:

- Removed section 4

- Rewrote portions of now section 4 "Get-User-Printer-Attributes" definition and restructured presentation of list of attributes in request and response sub-sections for Get-User-Printer-Attributes definition

- Relabeled document to be "IPP Registration" instead of "White Paper"

9.2   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

9.3   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.

9.4   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.

9.5   April 4, 2017

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

9.6   February 1, 2017

- Editorial changes.

9.7   January 30, 2017

- Initial draft.