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White Paper

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-20170418.odt>

11 <https://ftp.pwg.org/pub/pwg/ipp/whitepaper/tb-userop-20170404.odt>

12 <https://ftp.pwg.org/pub/pwg/ipp/whitepaper/tb-userop-20170418.pdf>

13 <https://ftp.pwg.org/pub/pwg/ipp/whitepaper/tb-userop-20170404.pdf>

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

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| | | |
|----|--|--------------------------|
| 25 | | |
| 26 | | Table of Contents |
| 27 | 1 Introduction..... | 4 |
| 28 | 2 Terminology..... | 4 |
| 29 | 2.1 Protocol Roles Terminology..... | 4 |
| 30 | 2.2 Other Terms Used in This Document..... | 4 |
| 31 | 2.3 Acronyms and Organizations..... | 4 |
| 32 | 3 Rationale for IPP Get-User-Printer-Attributes Operation..... | 5 |
| 33 | 3.1 Use Cases..... | 5 |
| 34 | 3.1.1 Print Policy For User Limits Print Capabilities..... | 5 |
| 35 | 3.1.2 Print Policy For User Expands Print Capabilities..... | 7 |
| 36 | 3.1.3 Print Policy Matching Job Accounting Attributes..... | 9 |
| 37 | 3.1.4 User Print Policy from Separate Print Policy Service..... | 10 |
| 38 | 3.1.5 User Not Listed In Print Policy or Legacy Client Allowed To Print..... | 12 |
| 39 | 3.1.6 User Not Listed in Print Policy Denied Ability to Print..... | 14 |
| 40 | 3.2 Exceptions..... | 16 |
| 41 | 3.3 Out of Scope..... | 16 |
| 42 | 3.4 Design Requirements..... | 16 |
| 43 | 4 Technical Solutions/Approaches..... | 16 |
| 44 | 5 IPP Operations..... | 17 |
| 45 | 5.1 Get-User-Printer-Attributes Operation..... | 17 |
| 46 | 6 IPP Attributes..... | 17 |
| 47 | 6.1 user-options-token (integer)..... | 17 |
| 48 | 7 Internationalization Considerations..... | 17 |
| 49 | 8 Security Considerations..... | 17 |
| 50 | 9 References..... | 17 |
| 51 | 10 Authors' Addresses..... | 18 |
| 52 | 11 Change History..... | 20 |
| 53 | 11.1 February 1, 2017..... | 20 |
| | 11.2 January 30, 2017..... | 20 |

| | | |
|----|---|------------------------|
| 54 | | List of Figures |
| | Figure 3.1 : Use Case 3.1.1 Sequence Diagram..... | 6 |
| | Figure 3.2 : Use Case 3.1.2 Sequence Diagram..... | 8 |
| | Figure 3.3 : Use Case 3.1.3 Sequence Diagram..... | 9 |
| | Figure 3.4 : Use Case 3.1.4 Sequence Diagram..... | 11 |
| | Figure 3.5 : Use Case 3.1.5 Sequence Diagram..... | 13 |
| | Figure 3.6 : Use Case 3.1.6 Sequence Diagram..... | 15 |

| | | |
|----|--|-----------------------|
| 55 | | List of Tables |
|----|--|-----------------------|

56 **1 Introduction**

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

63 **2 Terminology**

64 **2.1 Protocol Roles Terminology**

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

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

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

72 **2.2 Other Terms Used in This Document**

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

74 **2.3 Acronyms and Organizations**

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

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

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

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

79 **3 Rationale for IPP Get-User-Printer-Attributes Operation**

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

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

88 **3.1 Use Cases**

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

91 **3.1.1 Print Policy For User Limits Print Capabilities**

92 Sue is a university graduate student, and wants to print her report on her department's
93 workgroup printer. She wants to print in color because the report contains color graphs.
94 However, she has abused her printing privileges, so her department head has instructed
95 the network administrator to limit her ability to print in color. Her account is added to a
96 "print feature black list" that will restrict access to some printing features for her account.

97 Sue opens the document on her laptop, chooses to print, and selects the desired Printer,
98 which is in the department office common room. The Printer authenticates the laptop using
99 Sue's credentials, and then provides the laptop with the print choices available for Sue's
100 account, which are more limited than what others are allowed. Sue decides whether to
101 print it in black-and-white anyway or to print from one of the campus print centers, where
102 she can pay to print in color.

103 Bob is an associate professor in the same department as Sue. His account is not included
104 in the "feature black list", so he has no printing limitations. He opens a document on his
105 tablet, taps to print, and selects the department's workgroup printer. His tablet presents
106 print options including printing in color. Bob chooses color and prints his document, which
107 prints in color as he expects.

108 Figure 3.1 illustrates this use case with a sequence diagram.

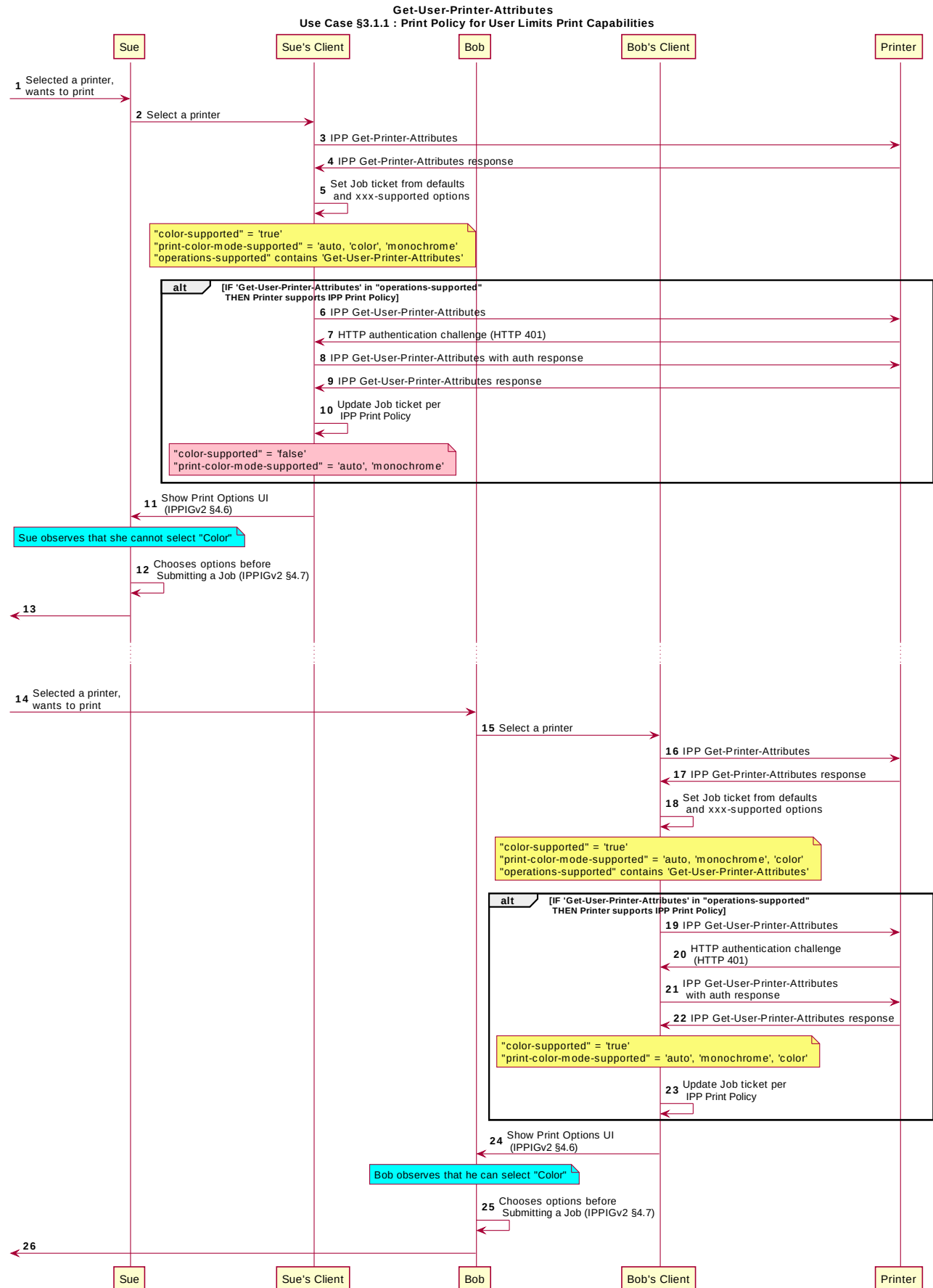


Figure 3.1 : Use Case 3.1.1 Sequence Diagram

109 **3.1.2 Print Policy For User Expands Print Capabilities**

110 Jonah is at his office and wants to print a 32 page draft specification document to review it
111 in hardcopy form. His office user account has not been granted permission to print in color
112 by his office network administrator, who has also set the default configuration for the ability
113 to print in color to “off” (“false”). Jonah opens the document on his laptop, selects the
114 printer he wishes to use, and the laptop presents the printer features available to him as
115 per his user account's print policy, which doesn't include an option to print in color. He
116 submits the print job to the Printer, which prints it in monochrome. Jonah picks up his
117 hardcopy and goes to the cafeteria with a pen and highlighter to read it over a cup of tea.

118 Duncan is also at the office and needs to print a 5 page report that contains color diagrams
119 before his next meeting. His office user account has been granted permission by his office
120 network administrator to print in color. Duncan opens the document on his tablet, taps to
121 print, and selects the desired Printer, which is the same printer that Jonah used. The tablet
122 fetches the Printer's default capabilities, which are restricted, and then authenticates using
123 Duncan's user account, which has a print policy that provides a broader set of print options
124 than the defaults, including the option to print in color or monochrome. He prints the
125 document using the color option, retrieves the hardcopy from the printer, and then goes on
126 to his meeting.

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

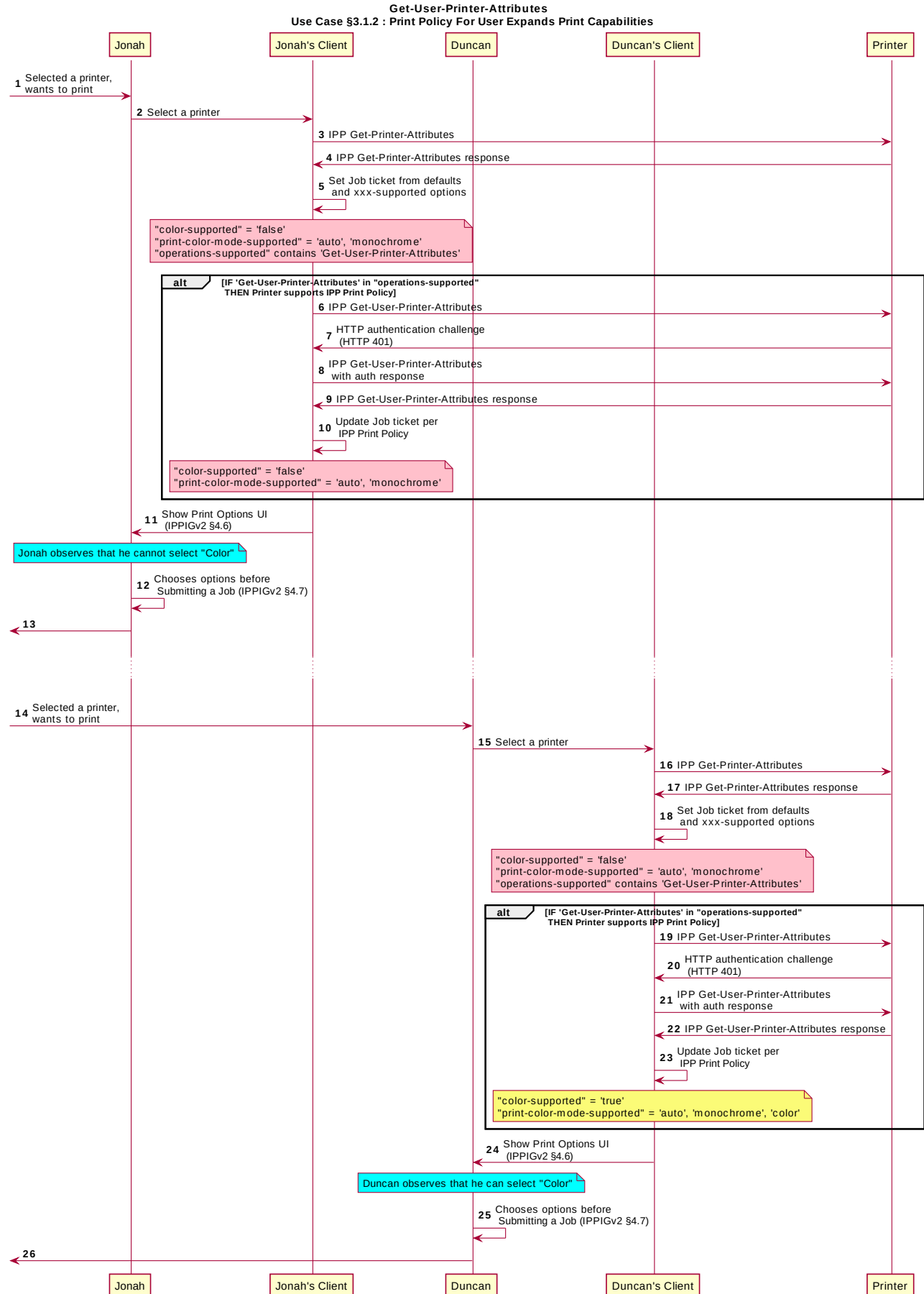



Figure 3.2 : Use Case 3.1.2 Sequence Diagram

128 **3.1.3 Print Policy Matching Job Accounting Attributes**

129 Duncan receives some pictures via MMS text message from his wife, with the message
 130 that she would like him to print them on the office printer. He opens the pictures in his
 131 photo app, taps to print, and selects the same printer he was using earlier. The network
 132 administrator has restricted the Printer from processing print jobs that were created using
 133 the photo app. Duncan is presented only with the option to print in monochrome. He
 134 abandons printing the photos.

135 Figure 3.3 illustrates this use case with a sequence diagram. 

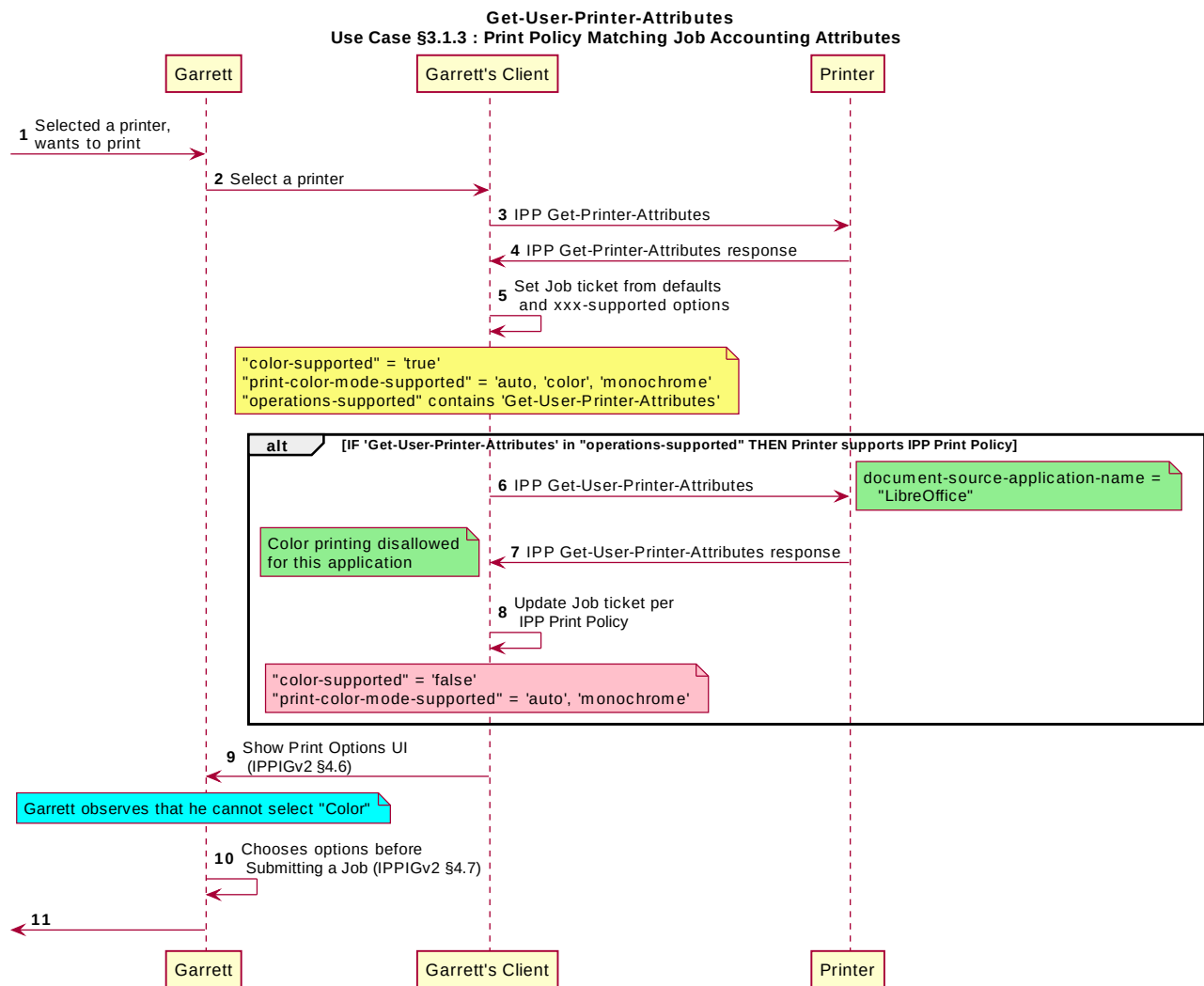


Figure 3.3 : Use Case 3.1.3 Sequence Diagram


136 3.1.4 User Print Policy from Separate Print Policy Service

137 Helen is a network administrator who is implementing IPP Print Policy. In her environment,
138 users print to many isolated printers directly, rather than printing through queues hosted on
139 a central print server. She wishes to centralize the print policy management in a separate
140 policy server rather than needing to push the configurations out to each of the printers or
141 requiring that the printers check with the policy server behind the scenes when a Client
142 requests the IPP Print Policy.

143 Helen configures the printers to refer the Client to a separate IPP Print Policy service
144 hosted on a separate system. Clients requesting the policy from a Printer will be redirected
145 to that policy service, which will also provide tokens to prove to the Printer that they have
146 acquired a legitimate print policy.

147 Garrett is at his office, and wishes to print a 10 page report. Garrett opens the document
148 on his laptop, chooses to print, and selects the desired Printer.

149 When the laptop attempts to retrieve the print policy from the Printer, the Printer redirects
150 the laptop to a separate "Print Policy Service". The laptop authenticates with the Print
151 Policy Service using Garrett's credentials, and then provides the laptop with the print policy
152 for Garrett's account, which includes the option to print in color or monochrome.

153 Garrett makes his selections, and then submits the Job to the Printer. The Job information
154 from the laptop includes a unique print policy token that the Printer uses to validate that the
155 choices conform to a legitimate print policy. 

156 Figure 3.4 illustrates this use case with a sequence diagram.

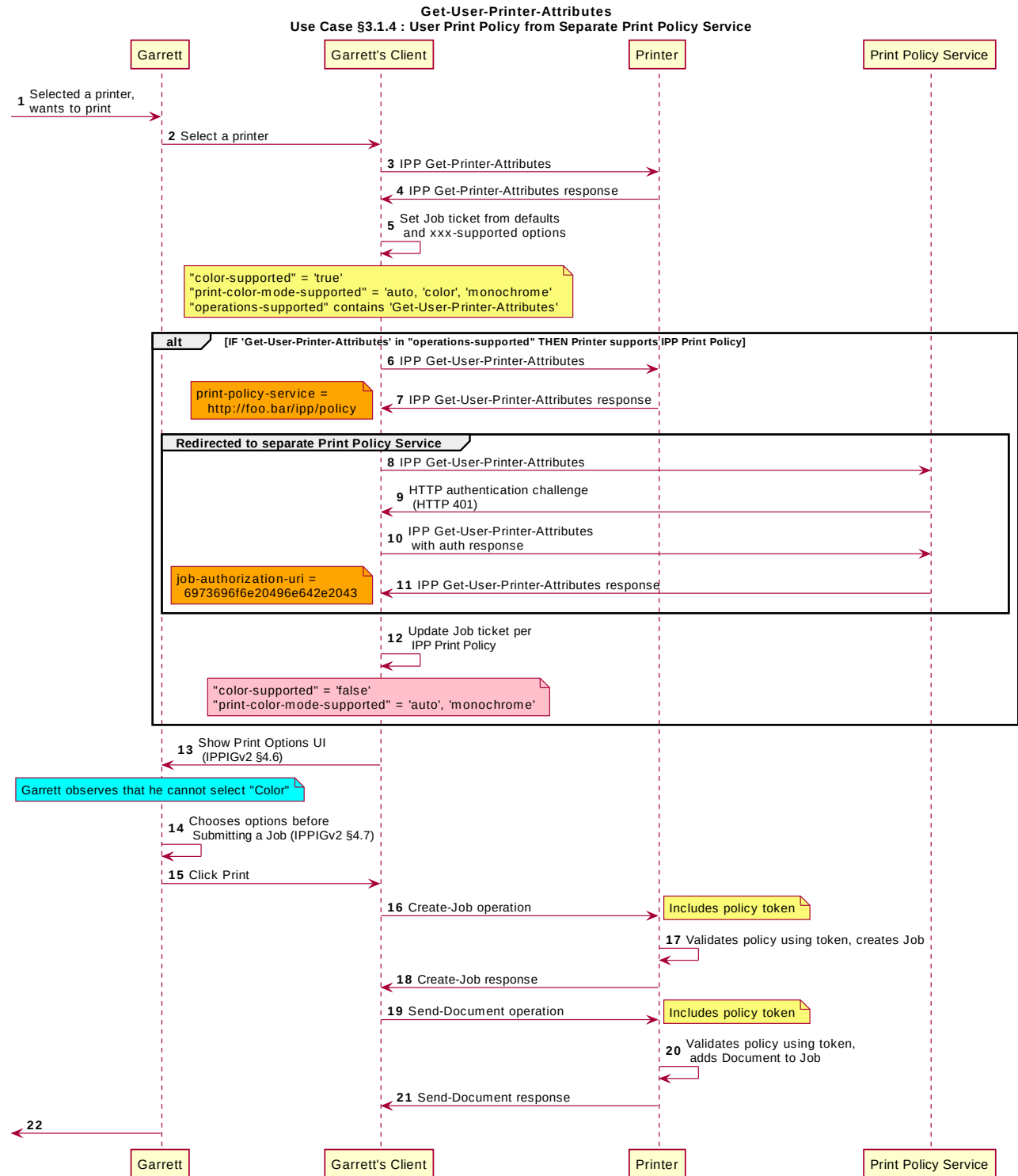


Figure 3.4 : Use Case 3.1.4 Sequence Diagram

157 3.1.5 User Not Listed In Print Policy or Legacy Client Allowed To Print

158 In this use case, a user who is not named in the print policy system is still able to print
159 using existing conventional IPP print protocol use. The Client may implement support for
160 IPP Print Policy but authentication may fail, or the Client may have not implemented
161 support for IPP Print Policy.

162 Sue is a university graduate student, and wants to print her report on her department's
163 workgroup printer. She wants to print in color because the report contains color graphs.
164 However, she has abused her printing privileges, so her department head has instructed
165 the network administrator to limit her ability to print in color. Her account is added to a
166 "print feature black list" that will restrict access to some printing features for her account.

167 Hermann is a visiting professor in Sue's university department. He wishes to print a slide
168 set in color. Since he doesn't have a local account, he has no credentials with which to
169 authenticate with the print policy system. Hermann opens the slide set document on his
170 laptop, chooses to print, and selects the desired Printer. His laptop does not authenticate
171 his user account with the Printer. Hermann's laptop gets a listing of all the possible print
172 capabilities provided by that Printer. Hermann chooses his print options, and sends the job
173 to the Printer. The job prints successfully according to Hermann's intent.

174 Figure 3.5 illustrates this use case with a sequence diagram.

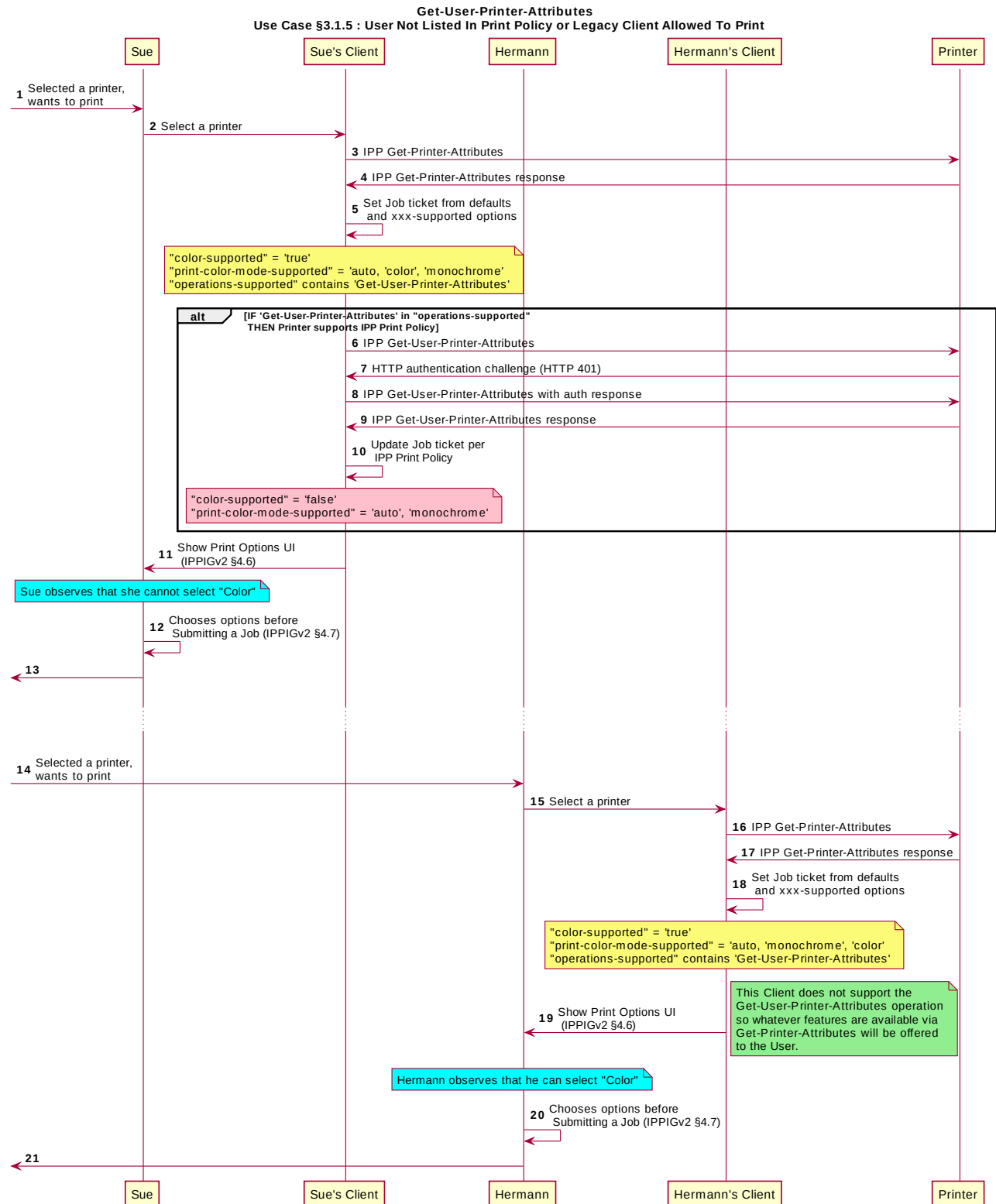


Figure 3.5 : Use Case 3.1.5 Sequence Diagram

175 3.1.6 User Not Listed in Print Policy Denied Ability to Print

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

180 Ed is visiting Duncan's office and needs to print a 3 page document. Ed is not listed as a
181 user in the print policy. Ed opens the document on his laptop, clicks to print, and selects
182 the Printer recommended by Duncan. The laptop is challenged to authenticate but has no
183 valid credentials. The Printer indicates to Ed via his laptop that he has no rights to print
184 from this Printer.

185 Figure 3.6 illustrates this use case with a sequence diagram.

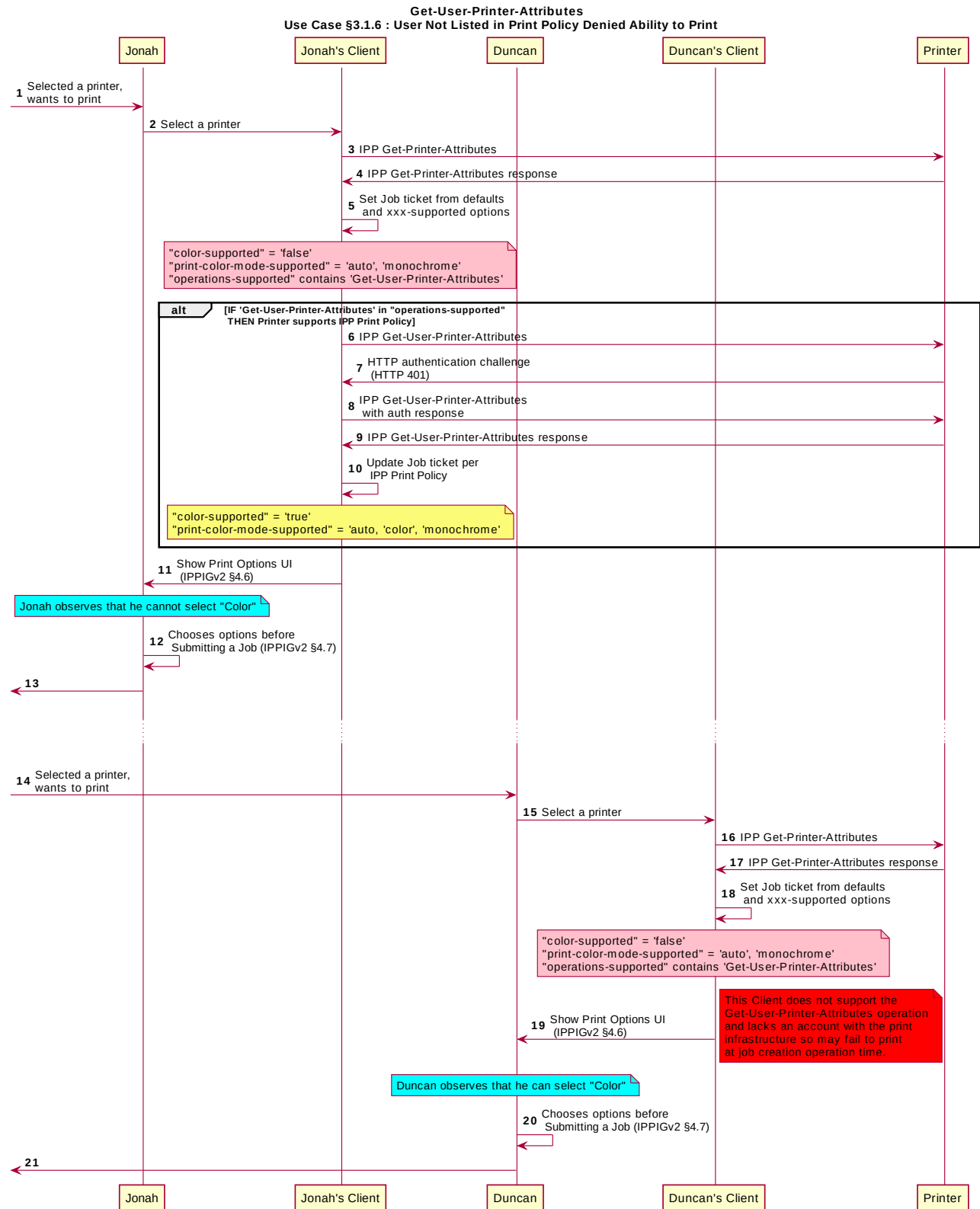


Figure 3.6 : Use Case 3.1.6 Sequence Diagram

186 3.2 Exceptions

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

188 3.3 Out of Scope

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

- 190 1. Definition of print policies.
- 191 2. Definition of non-IPP protocols that can provide similar functionality.

192 3.4 Design Requirements

193 The design requirements for this document are:

- 194 1. Identify an appropriate set of IPP operations that ~~allow~~^s a Client to acquire the
195 set of print features available from a particular Printer for a particular User.
 - 196 a. Scope of differences
 - 197 i. Average Client has more capabilities than a specific Client
 - 198 ii. Average Client has fewer capabilities than a specific Client
 - 199 b. Client that is unaware of this new system can still be a legitimate actor in
200 the print policy system.
- 201 2. Identify an appropriate set of IPP operations and attributes that allows a Printer
202 to refer a Client to a trusted IPP Print Policy Service, such that the Client can
203 assert that the options it provides with a submitted job do comply with a policy
204 originating from that trusted policy server.
- 205 3. Maintain backward compatibility with existing versions of IPP (IPP/1.1, IPP/2.x).
- 206 4. ~~Identify an appropriate set of IPP operations and attributes that allow a Printer to~~
207 ~~refer a Client to a trusted IPP Print Policy Service, such that the Client can~~
208 ~~assert that the options it provides with a submitted job do comply with a policy~~
209 ~~originating from that trusted policy server.~~
- 210 5. Register all attributes and operations with IANA.

211 The design recommendations for this document are:

- 212 1. Recommend suitable authentication methods and guidelines that could help the
213 Client to provide a high quality user experience.

214 4 Technical Solutions/Approaches

215 The existing Get-Printer-Attributes operation itself has the correct semantics, but the
216 expectation of all legacy Clients is that the Printer will not respond to a Get-Printer-
217 Attributes operation with an HTTP challenge. Adding additional operation attributes to the
218 Get-Printer-Attributes operation to cause allow the Printer to respond with an authenticat
219 operation challenge could~~to~~ be done but would require updating core IPP specifications,
220 which used for this procedurally not desirable. If the Printer were to filter its response or

221 ~~respond with an authentication challenge if “requesting-user-name” were included, purpose~~
222 ~~was similarly deemed in the operation request, that would be a change to existing behavior~~
223 ~~precedent. A n~~appropriate. ~~As such, a new operation with the appropriate semantics was~~
224 ~~decided to be the most efficient way to add this facility to the IPP ecosystem as deemed~~
225 ~~necessary.~~

226 **5 IPP Operations**

227 **5.1 Get-User-Printer-Attributes Operation**

228 This REQUIRED operation allows a Client to request the values of the attributes of a
229 Printer. The semantics of this operation are identical to the semantics for the Get-Printer-
230 Attributes operation, with the difference that the Client MUST be prepared to respond to an
231 HTTP authentication challenge. The Client detects whether the Printer supports this
232 operation by examining the “operations-supported” attribute [RFC8011].

233 If the Client initiates the Get-User-Printer-Attributes operation over a non-TLS connection,
234 the Client MUST be prepared to receive an HTTP 426 response to upgrade the connection
235 to TLS [RFC2817].

236 **6 IPP Attributes**

237 **6.1 user-options-token (integer)**

238 The “user-options-token” attribute is used in two contexts. In the first context, a Printer
239 includes this attribute in a Get-User-Printer-Attributes operation response, to identify a
240 session where a Client has requested print options for a particular user. In the second
241 context, a Client includes it in a Validate-Job operation request and/or in a Job Creation
242 operation request, to prove that these options were authorized by an earlier Get-User-
243 Printer-Attributes operation.

244 **7 Internationalization Considerations**

245 For interoperability and basic support for multiple languages, implementations use the
246 “Universal Character Set (UCS) Transformation Format -- 8 bit (UTF-8)” [RFC3629]
247 encoding of Unicode [UNICODE] [ISO10646] and the Unicode Format for Network
248 Interchange [RFC5198].

249 **8 Security Considerations**

250 The security considerations for the Get-User-Printer-Attributes operation are identical to
251 those listed for IPP/1.1 [RFC8011] and IPP/2.0 [PWG5100.12].

252 9 References

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290 standard:

291 Turanga Leela - Planet Express
292 Zapp Brannigan - Democratic Order of Planets

293 **11 Change History**

294 | **11.1 April 18, 2017**

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

298 | **11.2 April 4, 2017**

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

301 **11.3 February 1, 2017**

- 302 | • Editorial changes.

303 **11.4 January 30, 2017**

- 304 | • Initial draft.