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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-20170418.pdf>

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

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54 **1 Introduction**

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

61 **2 Terminology**

62 **2.1 Protocol Roles Terminology**

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

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

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

70 **2.2 Other Terms Used in This Document**

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

72 **2.3 Acronyms and Organizations**

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

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

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

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

77 **3 Rationale for IPP Get-User-Printer-Attributes Operation**

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

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

86 **3.1 Use Cases**

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

89 **3.1.1 Print Policy For User Limits Print Capabilities**

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

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

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

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

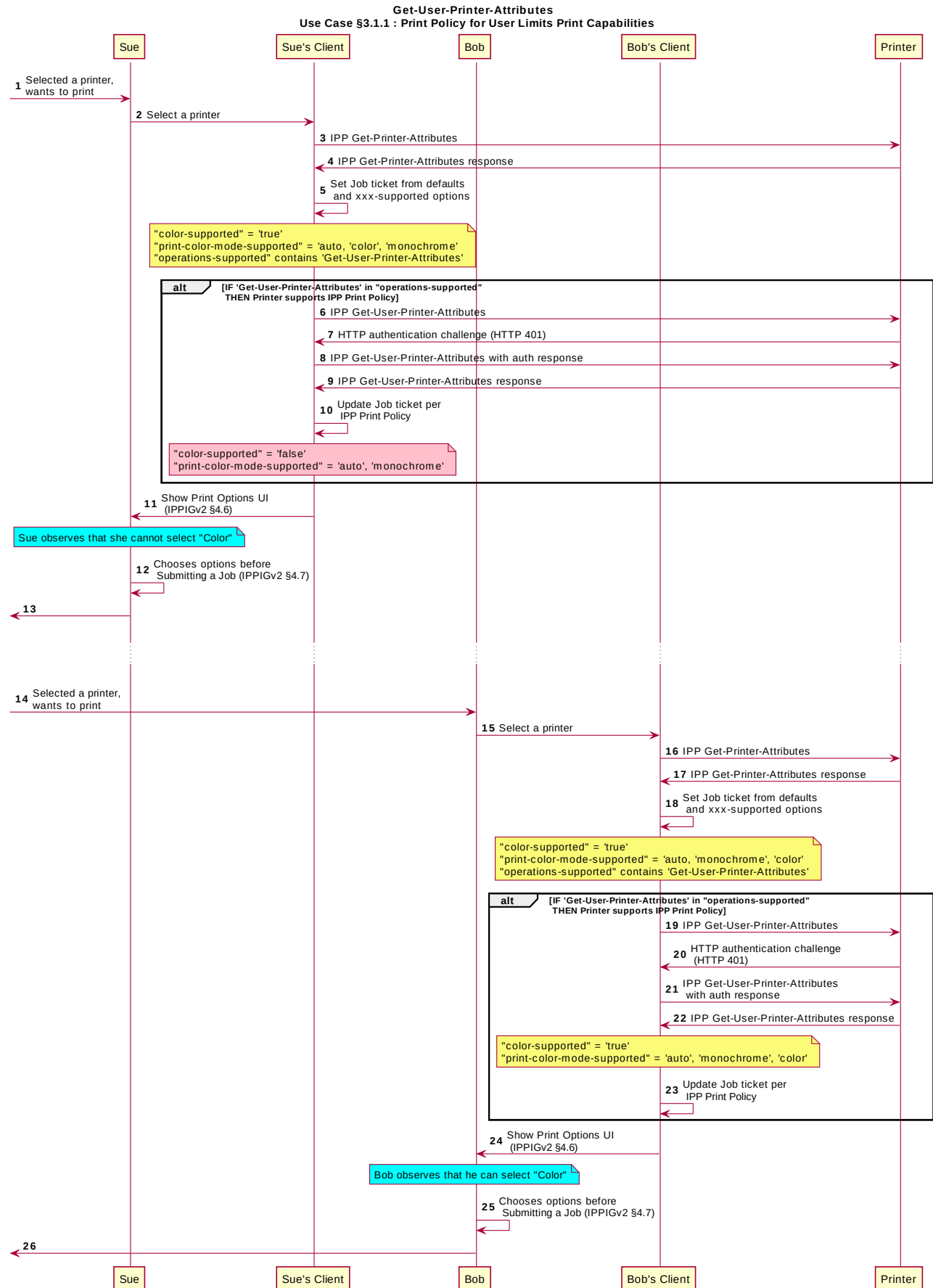


Figure 3.1 : Use Case 3.1.1 Sequence Diagram

107 **3.1.2 Print Policy For User Expands Print Capabilities**

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

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

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

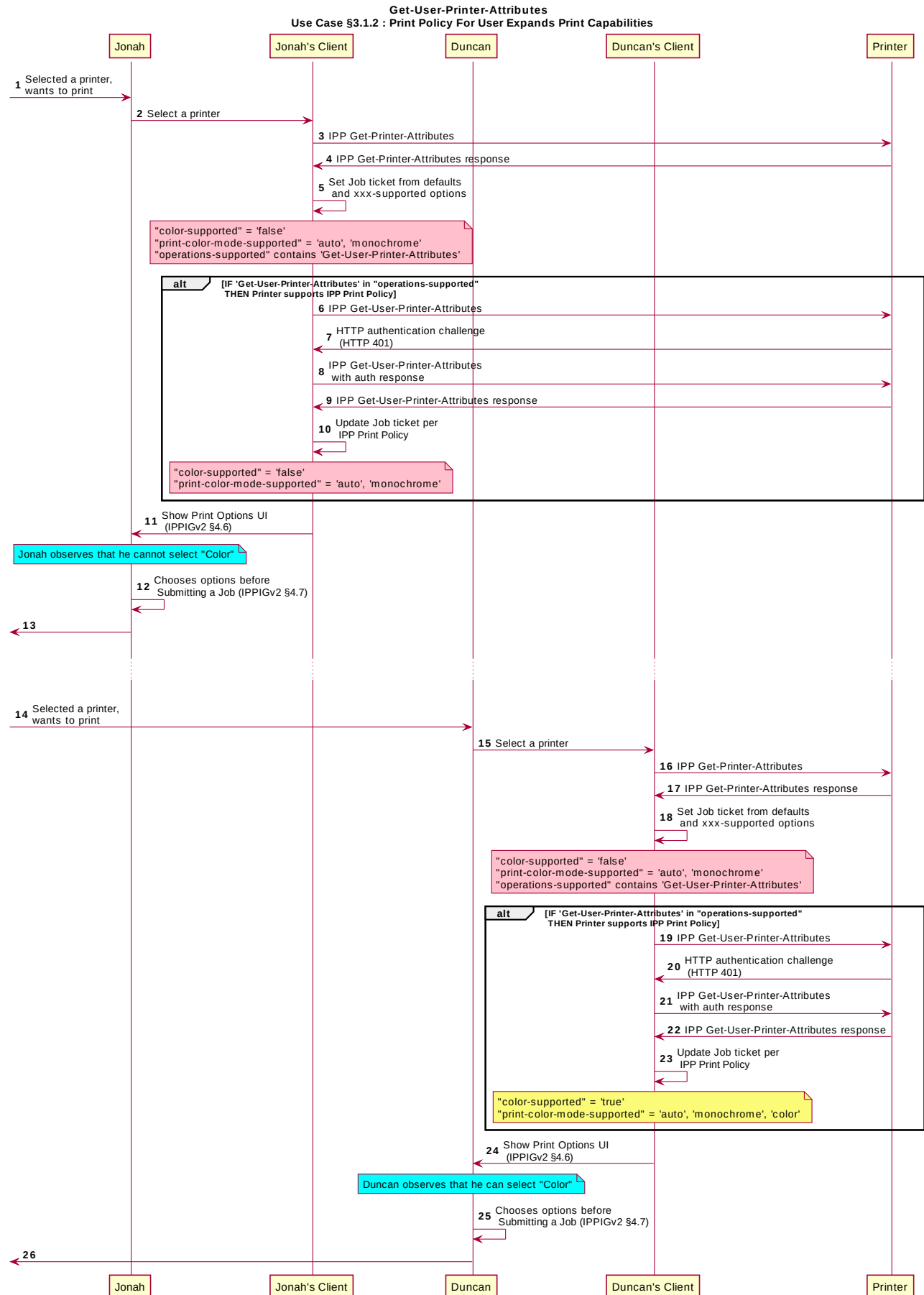



Figure 3.2 : Use Case 3.1.2 Sequence Diagram

126 **3.1.3 Print Policy Matching Job Accounting Attributes**

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

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

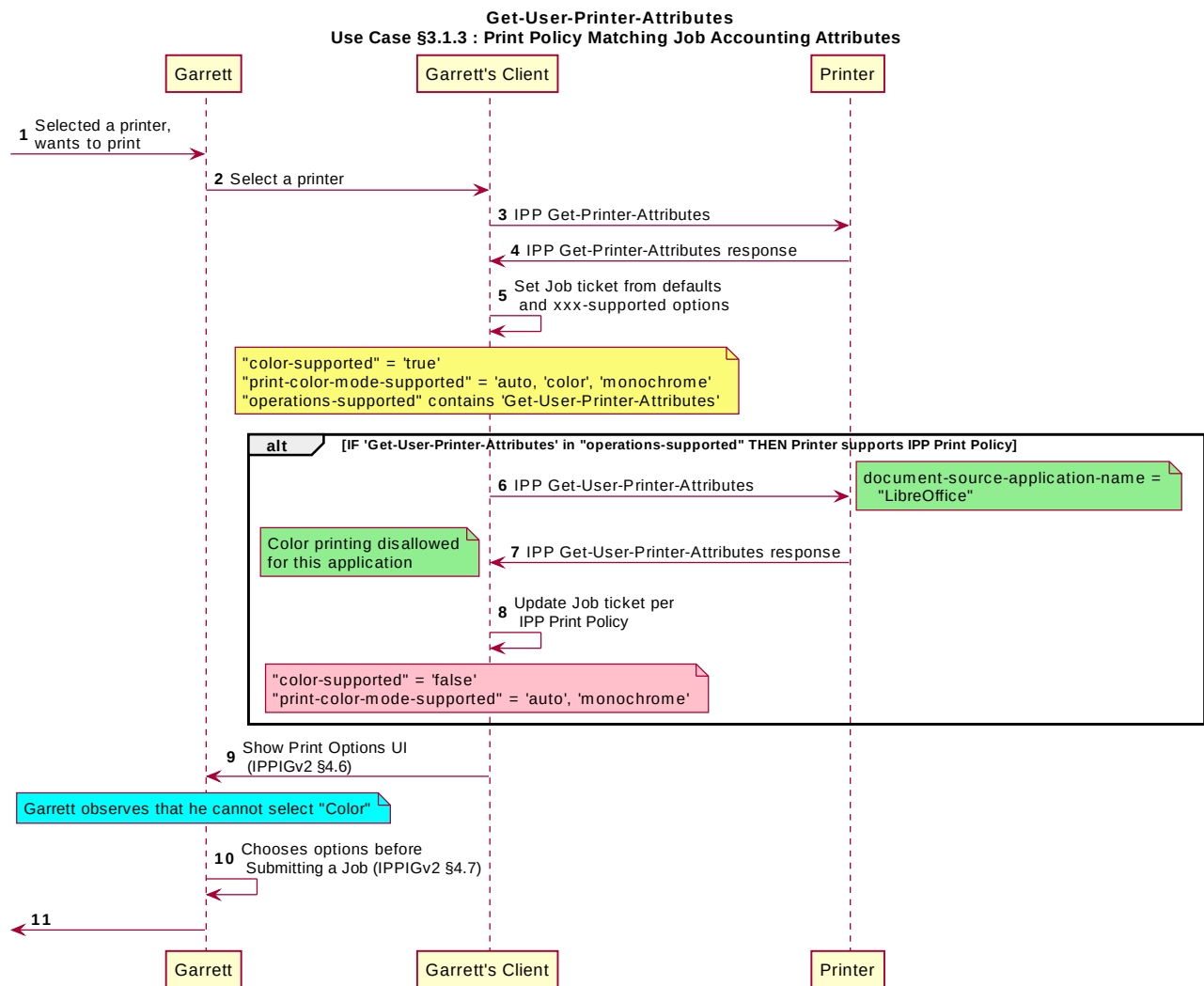


Figure 3.3 : Use Case 3.1.3 Sequence Diagram


134 3.1.4 User Print Policy from Separate Print Policy Service

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

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

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

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

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

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

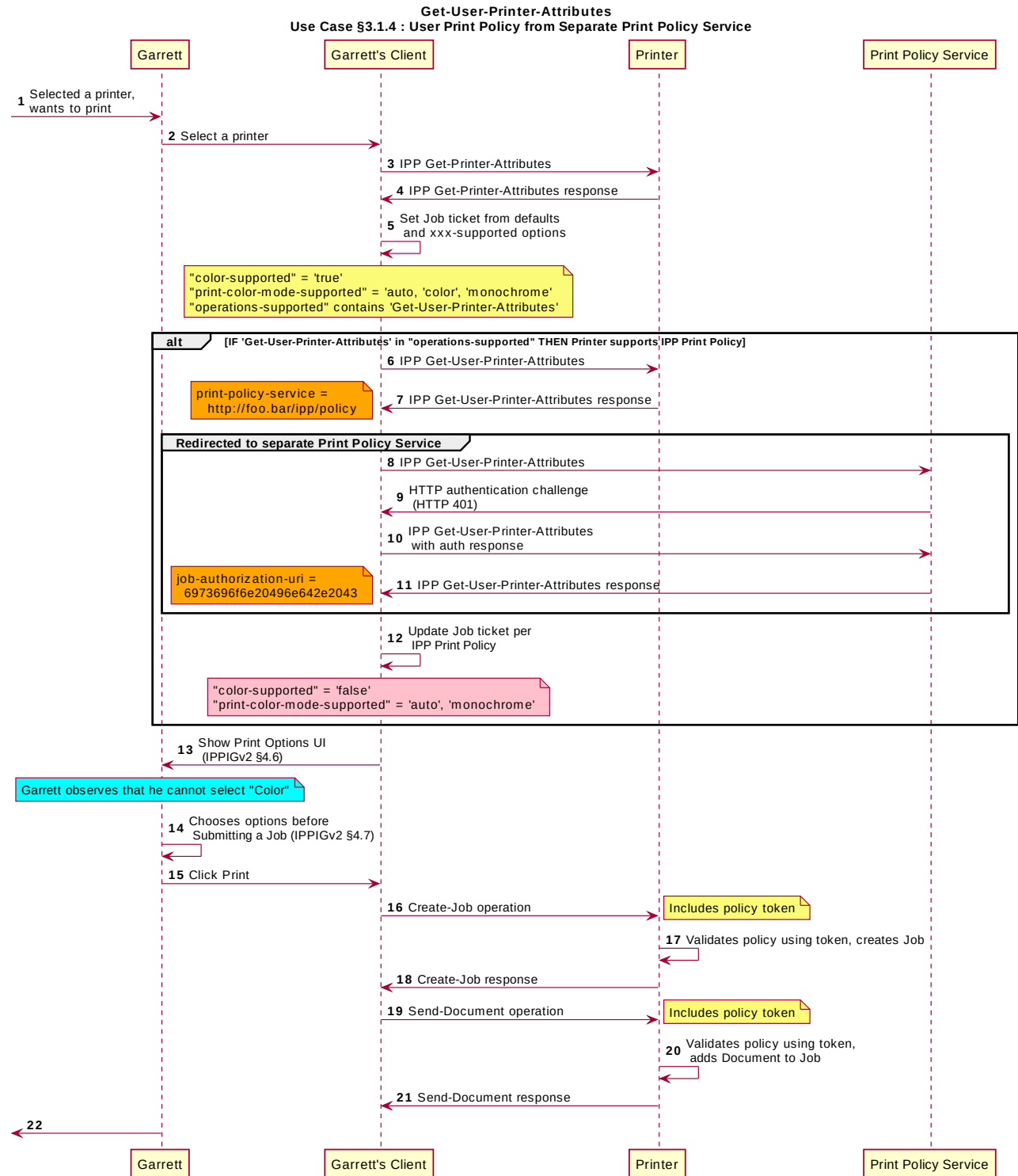


Figure 3.4 : Use Case 3.1.4 Sequence Diagram

155 3.1.5 User Not Listed In Print Policy or Legacy Client Allowed To Print

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

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

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

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

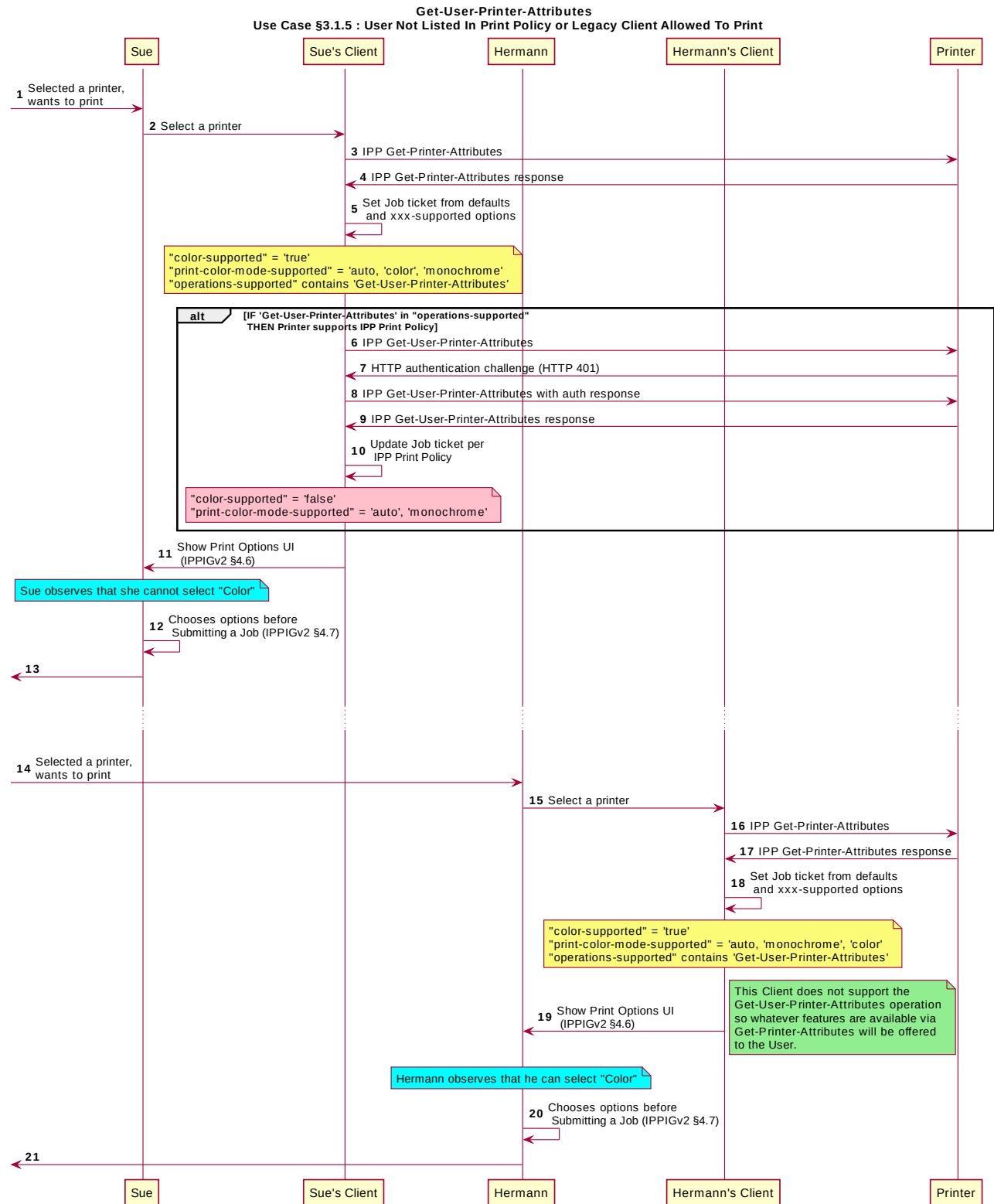


Figure 3.5 : Use Case 3.1.5 Sequence Diagram

173 3.1.6 User Not Listed in Print Policy Denied Ability to Print

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

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

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

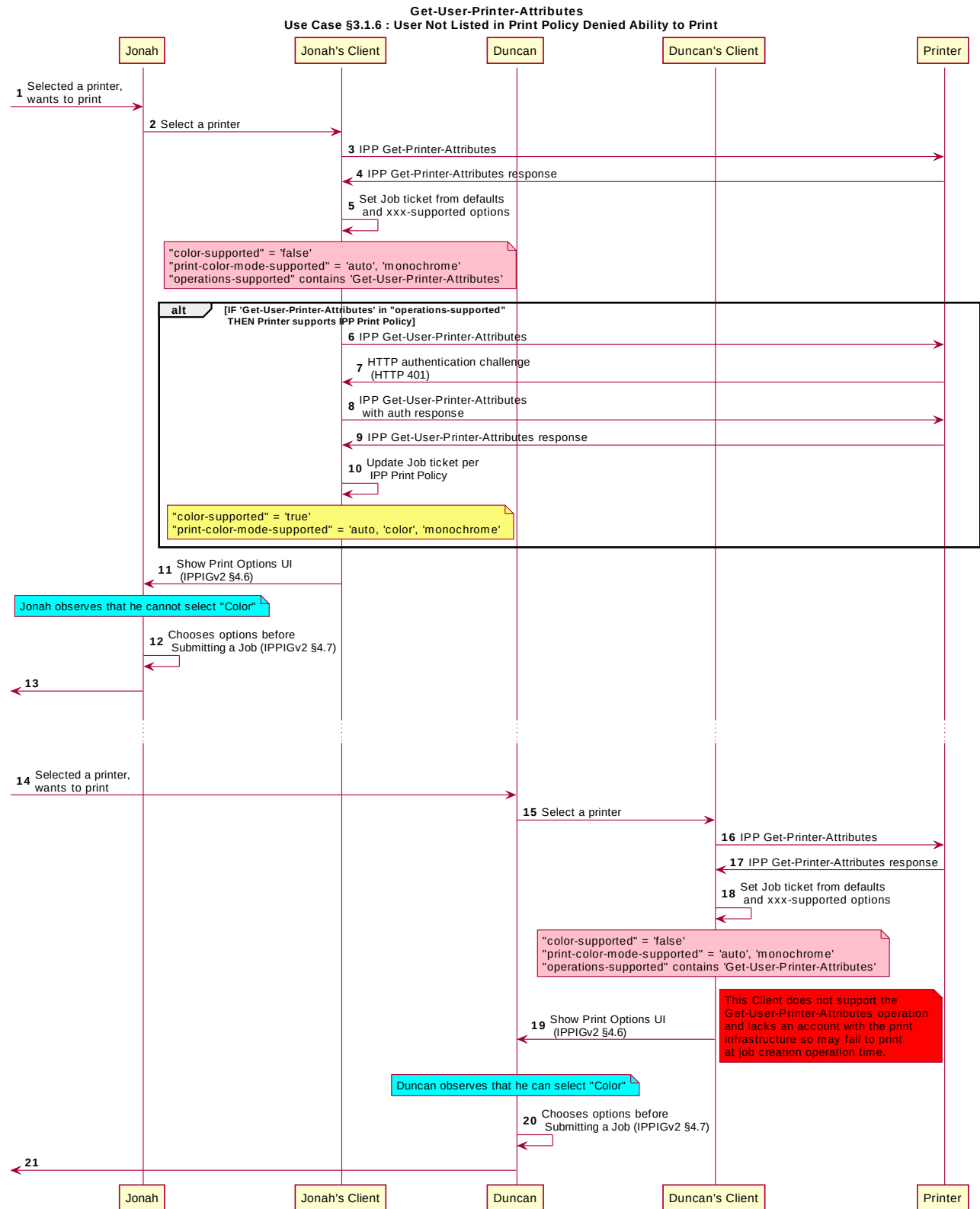


Figure 3.6 : Use Case 3.1.6 Sequence Diagram

184 **3.2 Exceptions**

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

186 **3.3 Out of Scope**

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

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

190 **3.4 Design Requirements**

191 The design requirements for this document are:

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

205 The design recommendations for this document are:

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

208 **4 Technical Solutions/Approaches**

209 The existing Get-Printer-Attributes operation itself has the correct semantics, but the
210 expectation of all legacy Clients is that the Printer will not respond to a Get-Printer-
211 Attributes operation with an HTTP challenge. Adding additional operation attributes to the
212 Get-Printer-Attributes operation to cause the Printer to respond with an authentication
213 challenge could be done but would require updating core IPP specifications, which is
214 procedurally not desirable. If the Printer were to filter its response or respond with an
215 authentication challenge if “requesting-user-name” were included in the operation request,
216 that would be a change to existing behavior precedent. A new operation with the
217 appropriate semantics was decided to be the most efficient way to add this facility to the
218 IPP ecosystem.

219 **5 IPP Operations**

220 **5.1 Get-User-Printer-Attributes Operation**

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

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

229 **6 IPP Attributes**

230 **6.1 user-options-token (integer)**

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

237 **7 Internationalization Considerations**

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

242 **8 Security Considerations**

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

245 **9 References**

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283 standard:

- 284 Turanga Leela - Planet Express
- 285 Zapp Brannigan - Democratic Order of Planets

286 **11 Change History**

287 **11.1 April 18, 2017**

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

291 **11.2 April 4, 2017**

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

294 **11.3 February 1, 2017**

- 295 • Editorial changes.

296 **11.4 January 30, 2017**

- 297 • Initial draft.