The Printer Working Group

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White Paper

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

Status: Initial

Abstract: 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.

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:

https://ftp.pwg.org/pub/pwg/ipp/whitepaper/tb-userop-20170524~~18~~.odt
https://ftp.pwg.org/pub/pwg/ipp/whitepaper/tb-userop-20170524~~18~~.pdf

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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 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 ~~is a university graduate student, and~~ wants to print her report on her department's workgroup printer. She wants to print it in color to mak~~because~~e the co~~report contains co~~lor graphs look best. However, she has abused her printing privileges, so her department head has instructed the network administrator to restric~~limi~~t her user account's a~~a~~bility to print in color~~. Her account is added to a "print feature black list" that will restrict access to some printing features for her account~~.

Sue opens the document on her laptop, chooses to print, and selects the de~~sired Printer, which is in the de~~partment's workgroup printer~~ office common room~~. 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~~are more limited than what others are allowed~~. 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 ~~is not included in the "feature black list", so he~~ has no ~~printing~~ 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 pp~~r~~inting in color. Bob chooses to print in color, and prints his document, which prints in color as he expects.

Figure 3.6 illustrates this use case with a sequence diagram.

3.1.2 ~~Print Policy For User Expands Print Capabilities~~

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

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

~~Figure Error: Reference source not found illustrates this use case with a sequence diagram.~~

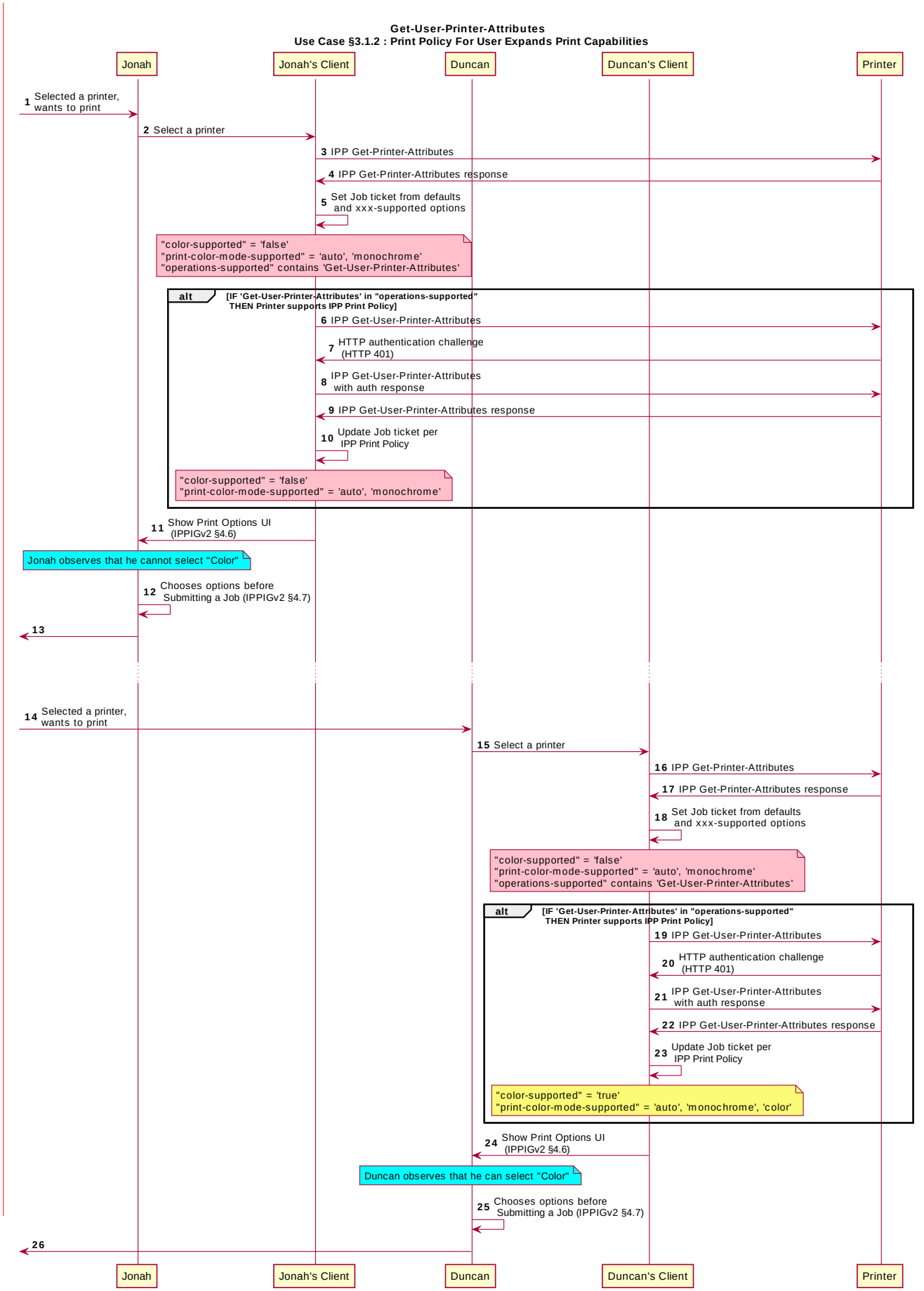

Figure 3.1 : Use Case 3.1.2 Sequence Diagram

3.1.3 ~~Print Policy Matching Job Accounting Attributes~~

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

~~Figure Error: Reference source not found illustrates this use case with a sequence diagram.~~

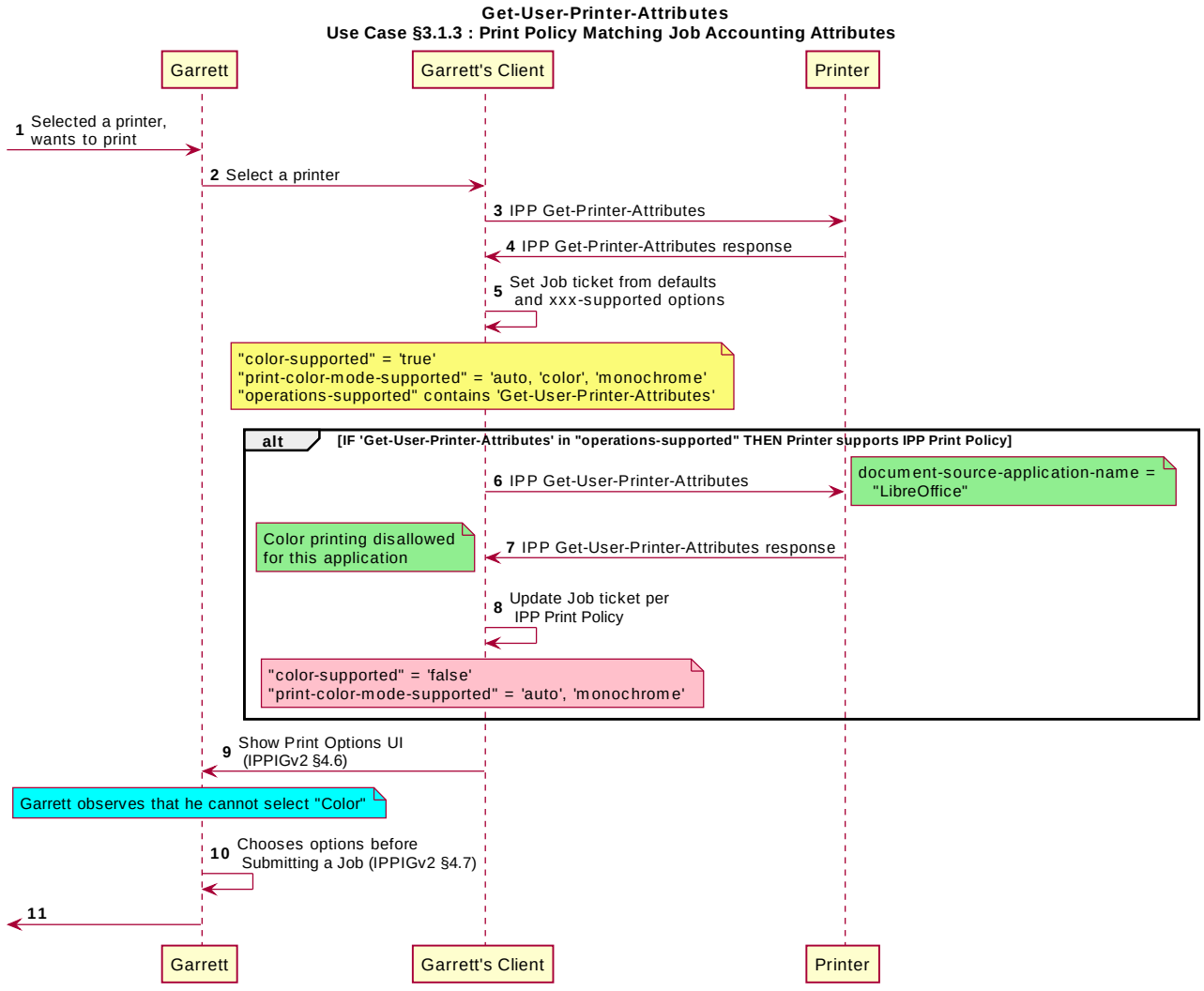

Figure 3.2 : Use Case 3.1.3 Sequence Diagram

3.1.4 ~~User Print Policy from Separate Print Policy Service~~

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

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

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

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

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

~~Figure Error: Reference source not found illustrates this use case with a sequence diagram.~~

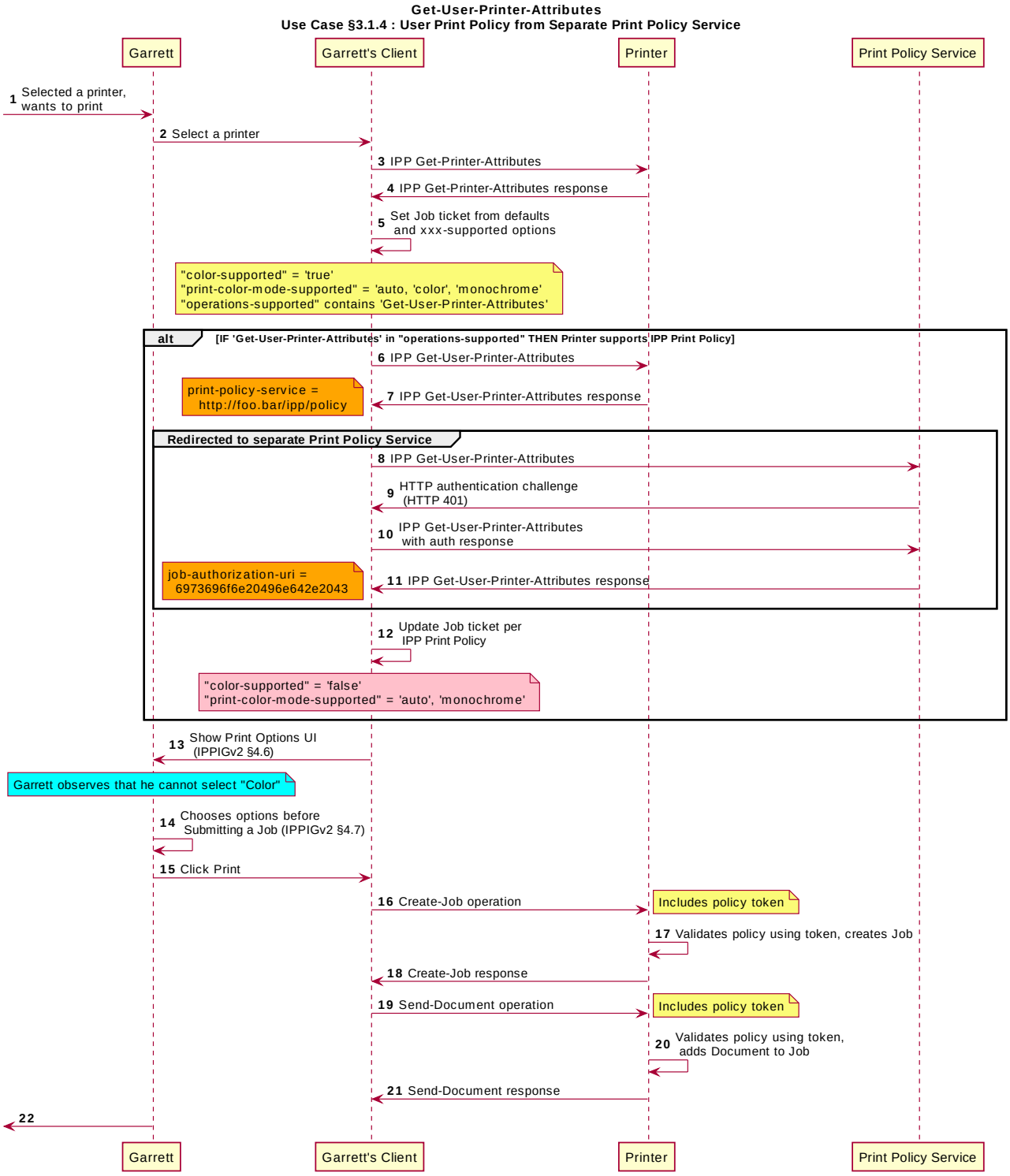

Figure 3.3 : Use Case 3.1.4 Sequence Diagram

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

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

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

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

~~Figure Error: Reference source not found illustrates this use case with a sequence diagram.~~

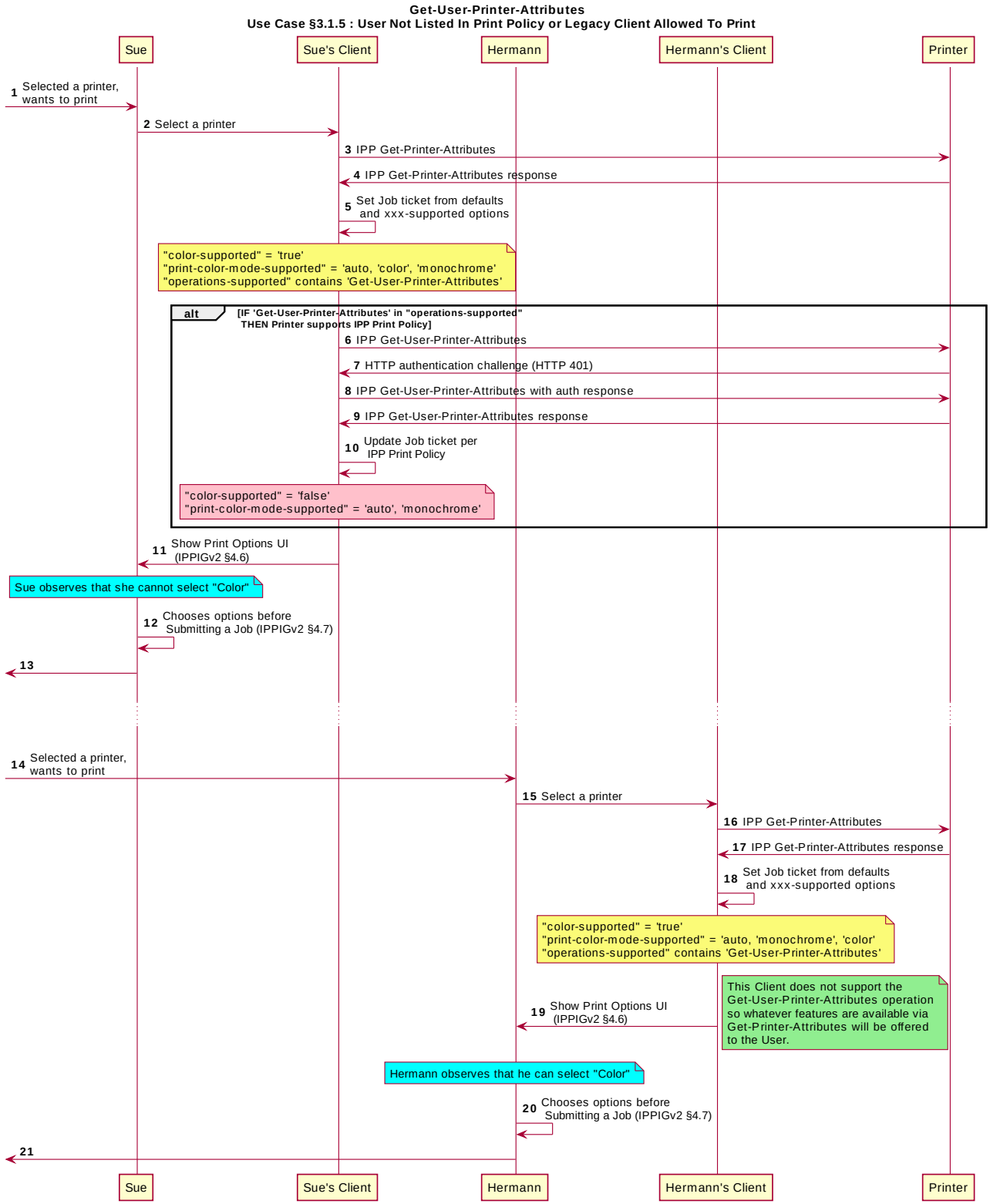

Figure 3.4 : Use Case 3.1.5 Sequence Diagram

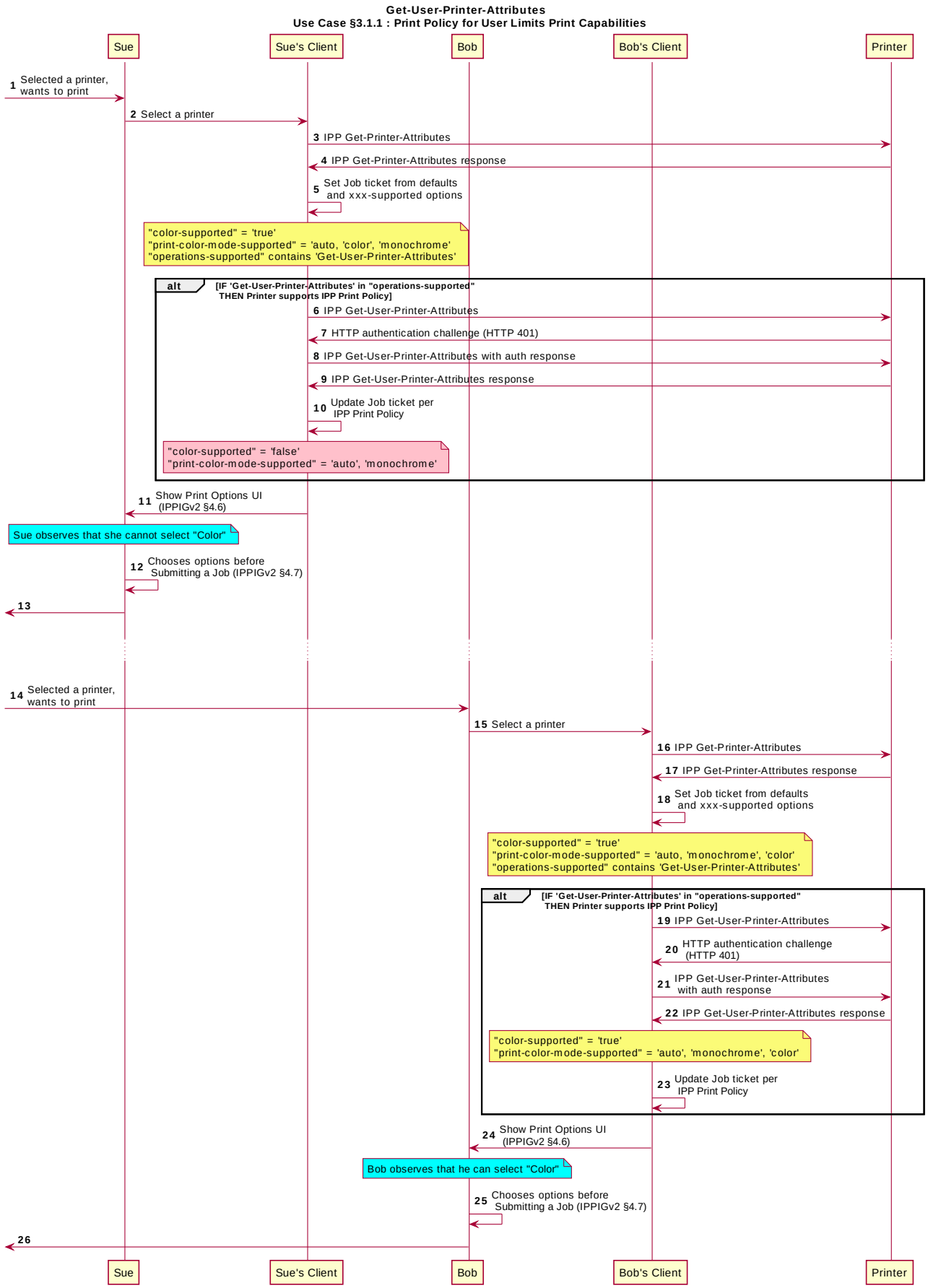

Figure 3.5 : Use Case 3.1.1 Sequence Diagram

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

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

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

Ed is visiting Duncan's office and needs to print a 3 page document. Ed is not listed as a user in the print policy. Ed opens the document on his laptop, clicks to print, and selects the Printer recommended by Duncan. The laptop does not support print policies or does ~~is challenged to authenticate~~ but has no valid credentials. The Printer provides Ed's laptop with the default print capabilities. When the Job is submitted to the Printer, the Printer rejects the Job or identifies the setting that were adjusted, since unknown users don't have the r~~indicates to Ed via his laptop that he has no r~~ights~~s~~ to print in color on~~from~~ this p~~P~~rinter.

Figure 3.7 illustrates this use case with a sequence diagram.

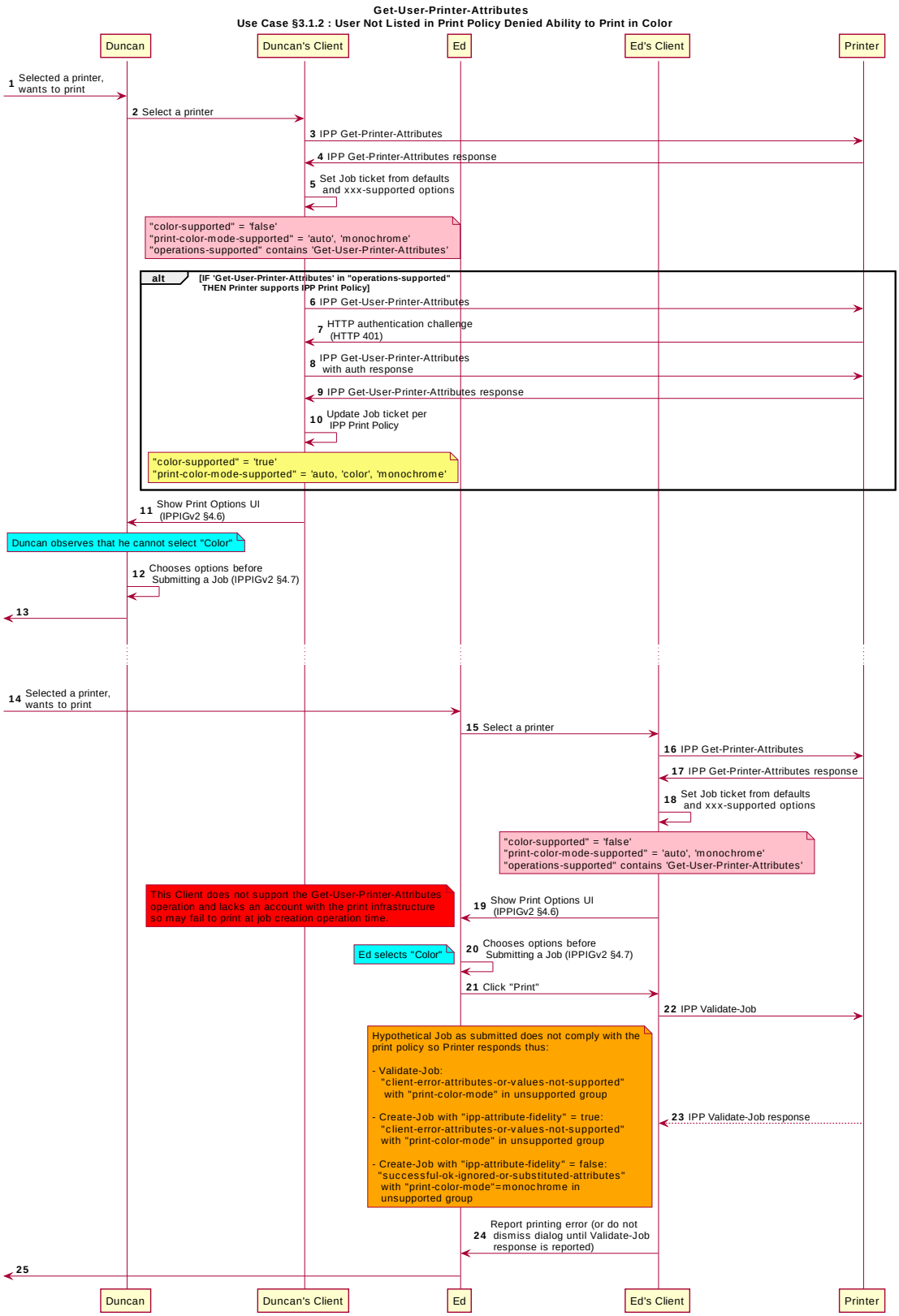

Figure 3.7 : Use Case 3.1.2 Sequence Diagram

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 ~~from a particular Printer~~ 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.
    a. ~~Scope of differences~~
        i. ~~Average Client has more capabilities than a specific Client~~
        ii. ~~Average Client has fewer capabilities than a specific Client~~
    b. ~~Client that is unaware of this new system can still be a legitimate actor in the print policy system.~~
    c. 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.
3. Maintain backward compatibility with existing versions of IPP (IPP/1.1, IPP/2.x).
4. 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 ~~help the~~ Client ~~to provide a high quality u~~ser experience.

4 Technical Solutions/Approaches

Although th~~Th~~e existing Get-Printer-Attributes operation [RFC8011] conveyitself has the needed information and could be used for this task, no l~~correct semantics, but the expectation of all l~~egacy Clients expect~~is that~~ the Printer to~~will not~~ respond to a Get-

Printer-Attributes operation with an HTTP authentication cchallenge. A new operation with the appropriate semantics was decided to be the most efficient way to add this facility to the IPP ecosystem. Addindding additional operation attributes to the Get-Printer-Attributes operation to cause the Printer to respond with an authentication challenge could be done, but would require updating the core IPP specifications, which is procedurally not desirable. If the Printer were to filter its response or respond with an authentication challenge if "requesting-user-name" were included in the operation request, that would be a change to existing behavior precedent. ~~A new operation with the appropriate semantics was decided to be the most efficient way to add this facility to the IPP ecosystem.~~

5 IPP Operations

5.1 Get-User-Printer-Attributes Operation

This REQUIRED operation allows a Client to request the values of the attributes of a Printer. The semantics of this operation are identical to the semantics for the Get-Printer-Attributes operation, with the difference that 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.

~~6 IPP Attributes~~

~~6.1 user-options-token (integer)~~

~~7 The "user-options-token" attribute is used in two contexts. In the first context, a Printer includes this attribute in a Get-User-Printer-Attributes operation response, to identify a session where a Client has requested print options for a particular user. In the second context, a Client includes it in a Validate-Job operation request and/or in a Job Creation operation request, to prove that these options were authorized by an earlier Get-User-Printer-Attributes operation.~~

8 Internationalization Considerations

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

9 Security Considerations

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

10 References

[ISO10646] "Information technology -- Universal Coded Character Set (UCS)", ISO/IEC 10646:2011

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[RFC2817] R. Khare, S. Lawrence, “Upgrading to TLS Within HTTP/1.1”, RFC 2817, May 2000, https://www.ietf.org/rfc/rfc2817.txt

[RFC3629] F. Yergeau, “UTF-8, a transformation format of ISO 10646”, RFC 3629, November 2003, https://www.ietf.org/rfc/rfc3629.txt

[RFC5198] J. Klensin, M. Padlipsky, “Unicode Format for Network Interchange”, RFC 5198, March 2008, https://www.ietf.org/rfc/rfc5198.txt

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[RFC8010] M. Sweet, I. McDonald, “Internet Printing Protocol/1.1: Encoding and Transport”, RFC 8010, January 2017, https://www.ietf.org/rfc/rfc8010.txt

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~~Zapp Brannigan - Democratic Order of Planets~~
Change History

11.1 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.

11.2 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.

11.3 April 4, 2017

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

11.4 February 1, 2017

- Editorial changes.

11.5 January 30, 2017

- Initial draft.

