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White Paper

The Printer Working Group

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-20170~~4~~2041~~1~~.odt
https://ftp.pwg.org/pub/pwg/ipp/whitepaper/tb-userop-20170~~4~~2041~~1~~.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/

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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.

~~Provide a rationale for the document.~~

Use Cases

The need for solutions to th~~e~~is~~e~~ use case~~s~~ emerged during the process of writing the IPP Implementor's Guide v2 [PWG5100.19].

3.1.1 ~~User~~ Print Policy F~~f~~or User Limits Print Capabiliti~~es~~

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.

Sue opens the document on her laptop, chooses to print, and selects the desired Printer, which is in the department 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 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. He opens a document on his tablet, taps to print, and selects the department's workgroup printer. His tablet presents print options including printing in color. Bob chooses color and prints his document, which prints in color as he expects.

Figure 3.1 illustrates this use case with a sequence diagram.

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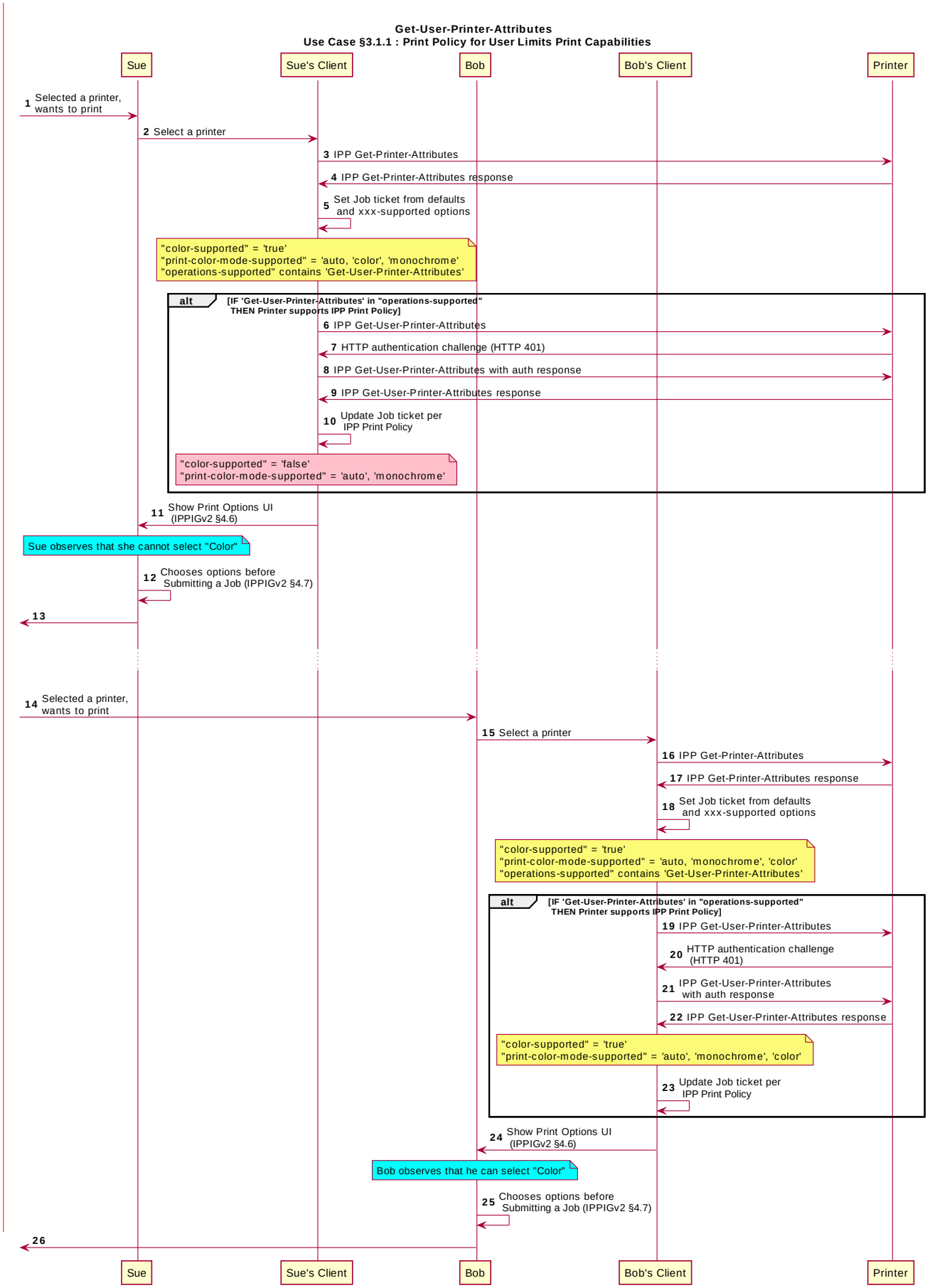

Figure 3.1 : Use Case 3.1.1 Sequence Diagram

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 rdocumeporn~~t~~ that contains color diagrams before his next meeting. His office user account has been granted permission ~~to print in color from his office applications~~ 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 ~~a~~t ~~t~~he samen~~d~~ prin~~of t~~her that Jon~~llw~~ah usedy~~.~~ The tablet fetches the Printer's default capabilities, which are resntricated,~~s~~ and then ~~t~~authb~~l~~enticates using Duncan's us~~cr~~er accou~~d~~ent, which hal~~s~~~~,~~ a printd policy thaten~~~~ provides ~~the t~~a broadl~~e~~rt sewit~~h~~ ofthe~~~~ print ~~ch~~options~~ces~~ thanvailable~~~~ theo~~~~ defDuncaultsn~~, whi~~ch i~~ncludinges~~~~ 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 ~~wit~~o~~h~~ his meetingwork~~.~~

Figure 3.2 illustrates this use case with a sequence diagram.

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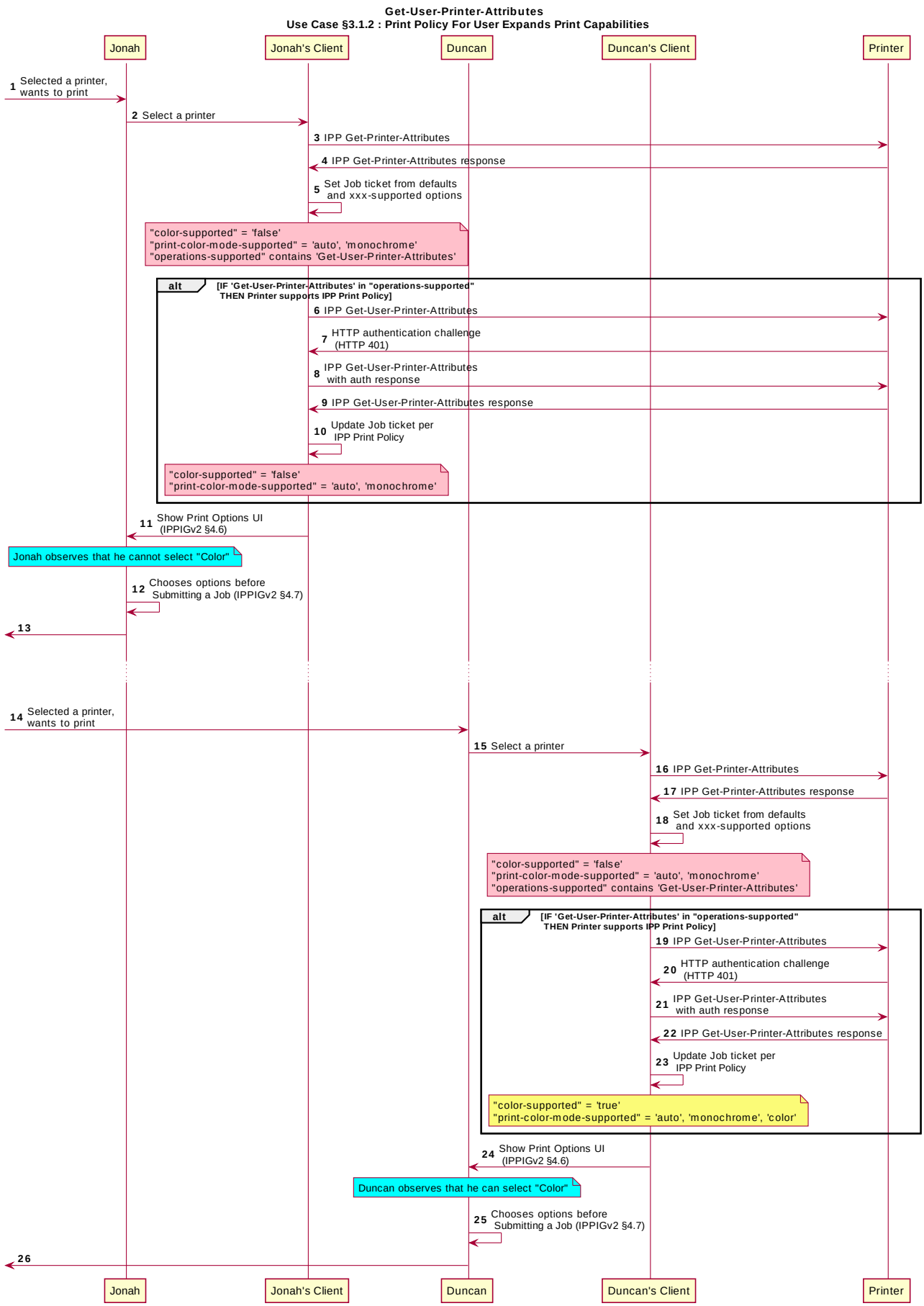

Figure 3.2 : Use Case 3.1.2 Sequence Diagram

3.1.3 Print Policy Matching Job Accounting Attributes

~~Later,~~ Duncan rgeceives some pictures via MMS text message from his wife, with the message that she would like him to print thsome ~~fa~~mily ~~pictures~~ on the office printer. He opens the pictures in his photo app, taps to print, and selects the same princteur hes~~,~~ wtaps using earlier. The netwo ~~p~~rk administrator~~,~~ has restrilecteds the Printer frosam processing print jobs that were~~,~~ creatend using the photo app. Duncan is presented only with the option to print in monochrome. He abandons printing the photos.

Figure 3.3 illustrates this use case with a sequence diagram.

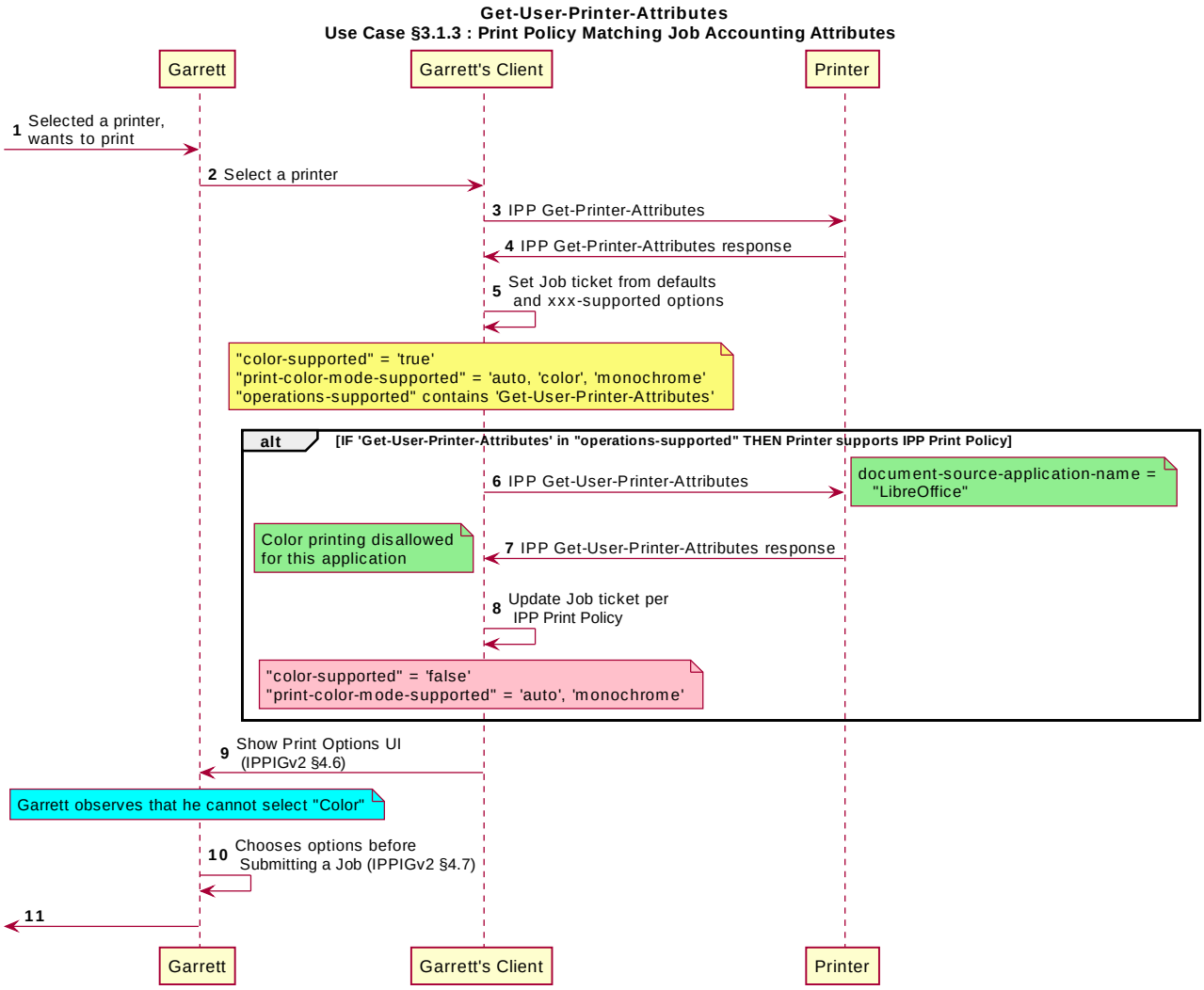

Figure 3.3 : Use Case 3.1.3 Sequence Diagram

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3.1.4 User Print Policy from Separate Print Policy Servicer

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 is at his office, and needs to print a 10 page slide set that contains color graphs. He has been granted permission to print in color from his office applications by his office network administrator. Garrett opens the document on his laptop, chooses to print, and selects the desired Printer, which is in his office. The Printer authenticates the laptop using Garrett's credentials, and then provides the tablet with the print choices available to Duncan, which includes the option to print in color or monochrome. His network administrator has implemented a separate “print policy server”.~~

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 3.4 illustrates this use case with a sequence diagram.

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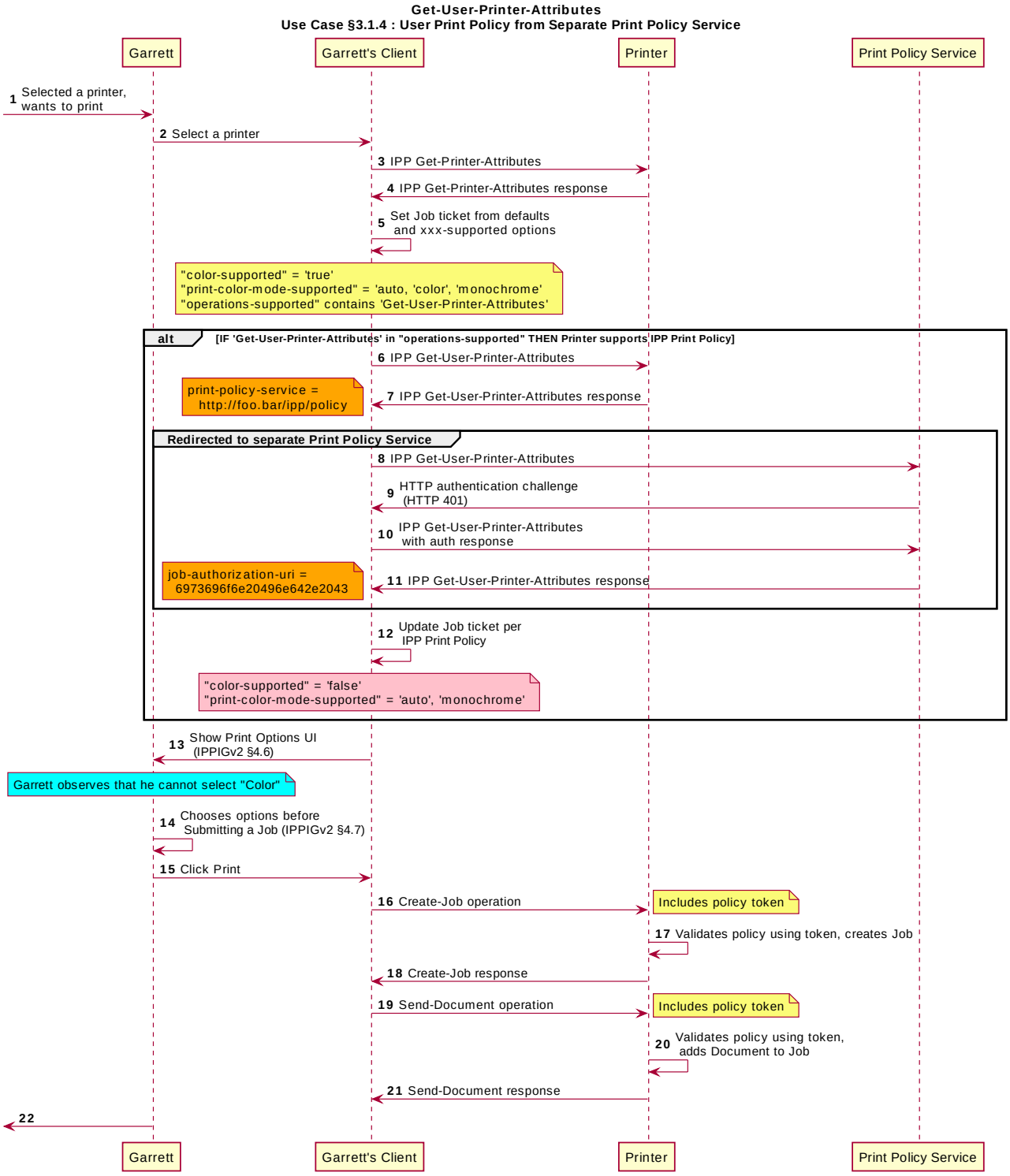

Figure 3.4 : Use Case 3.1.4 Sequence Diagram

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3.1.5 User Not Listed In Print Policy or Legacy ClienBut 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 3.5 illustrates this use case with a sequence diagram.

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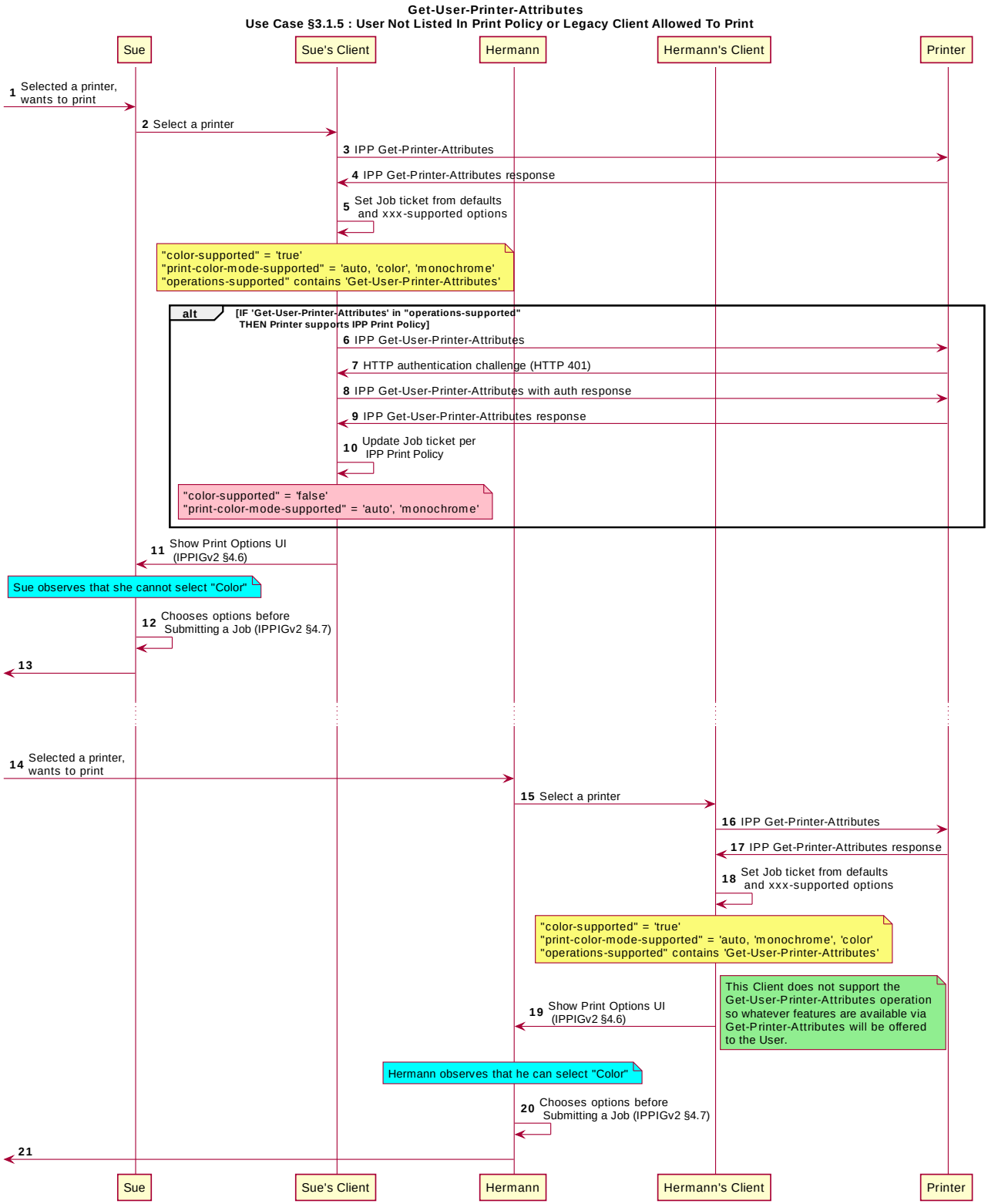

Figure 3.5 : Use Case 3.1.5 Sequence Diagram

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~~Ed is visiting Garrett's office and needs to print a 12 page document that contains color diagrams. 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 Garrett. The laptop is challenged to authenticate but has no valid credentials. The Printer provides Ed's laptop with the print choices available to unknown users, which does not include the option to print in color. Ed prints the document in grayscale and he and Garrett go to their meeting.~~

User Not Listed in Print Policy ~~and~~ Denied Ability to Print

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.

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 is challenged to authenticate but has no valid credentials. The Printer indicates to Ed via his laptop that he has no rights to print from this Printer.

Figure 3.6 illustrates this use case with a sequence diagram.

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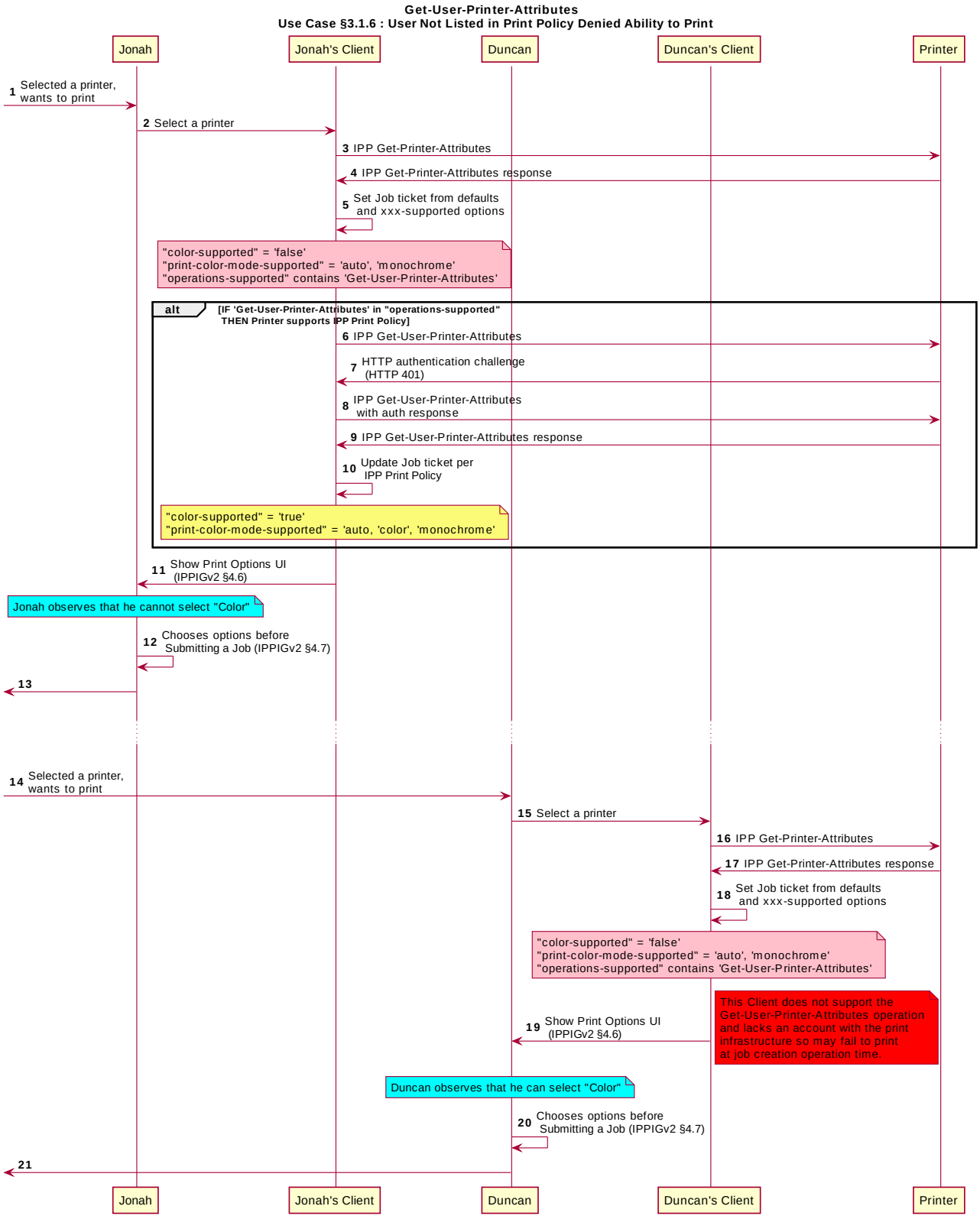

Figure 3.6 : Use Case 3.1.6 Sequence Diagram

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3.2 Exceptions

There are no exceptions to the use cases in section .

3.3 Out of Scope

The following are considered out of scope for this document:

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

3.4 Design Requirements

The design requirements for this document are:

1. IdDefintifye an mechappropriate setm fofr IPP operations that allows a Client to acquire the set of print features available from a particular Printer for a particular User.
    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.
2. Identify an appropriate set of IPP operations and attributes that allow 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. Define the appropriate mechanism to refer a Client to a separate IPP Print Policy Server.
4. Register all attributes and operations with IANA.

The design recommendations for this document are:

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

4 Technical Solutions/Approaches

The existing Get-Printer-Attributes operation itself has the correct semantics, but the expectation of all legacy Clients is that the Printer will not respond to a Get-Printer-Attributes operation with an HTTP challenge. Adding additional operation attributes to the Get-Printer-Attributes operation to allow that operation to be used for this purpose was similarly deemed inappropriate. As such, a new operation was deemed necessary.

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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].

6 IPP Attributes

6.1 user-options-token (integer)

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.

7 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].

8 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].

9 References

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

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11 Change History

11.1 April 4, 2017

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

11.2 February 1, 2017

Editorial changes.

11.3 January 30, 2017

Initial draft.

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