Updates: [get-method]

The Printer Working Group
Standard for Internet Printing Protocol (IPP): Distributed Notification Service and IPPGET Client Behavior

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The Printer Working Group Standard for Internet Printing Protocol (IPP): Distributed Notification Service and IPPGET Client Behavior

Abstract: This document specifies an OPTIONAL IPP Distributed Notification Service for use with the “Internet Printing Protocol (IPP): Event Notifications and Subscriptions” specification (ipp-ntfy). This IPP Distributed Notification Service enables multiple trusted IPP Printers to off-load IPP Event Notification Delivery to a shared Notification Server for any Event Delivery Method. The Notification Server (instead of the Printer) deals with the burden of delivering Event Notifications. For the IPPGET Delivery Method (get-method), the Notification Server, rather than the IPP Printer, takes over the burden of keeping a large number of long duration connections open for outstanding Get-Notifications operations.

This document also specifies additional REQUIRED behavior for *any* client supporting the IPPGET Delivery Method.

Conformance: This extension is REQUIRED for *all* IPP clients that support the IPPGET Event Notification Delivery Method. This extension is OPTIONAL for IPP Printers that support the IPPGET or any other Event Notification Delivery Method.

This document is available electronically at:

ftp://ftp.pwg.org/pub/pwg/ipp/new_NOT/ipp-dist-not-service.pdf, .doc, .rtf

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```
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end
```

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Contents

1 Introduction

This document specifies an OPTIONAL IPP Distributed Notification Service for use with the "Internet Printing Protocol (IPP): Event Notifications and Subscriptions" specification [ipp-ntfy]. This IPP Distributed Notification Service enables multiple trusted IPP Printers to off-load IPP Event Notification Delivery to a shared Notification Server for any Event Delivery Method. The Notification Server (instead of the Printer) deals with the burden delivering Event Notifications. For the IPPGET Delivery Method [get-method], the Notification Server, rather than the IPP Printer, takes over the burden of keeping a large number of long duration connections open for use with the outstanding Get-Notifications operations that are using Event Wait Mode (see [get-method).

For Push Delivery Methods, the use of a Notification Server by a Printer is transparent to the IPP Client and to the IPP Notification Recipient. However, for the IPPGET Pull Delivery Method, the client implementation MUST be prepared to receive the redirection on a Get-Notifications response and re-issue the Get-Notifications request to the redirected site. Therefore, this document also specifies additional REQUIRED behavior for *any* client supporting the IPPGET Delivery Method in order to be able to interoperate with any Printer that is implemented as part of a Distributed Notification Service.

Conformance: This extension is REQUIRED for *all* IPP clients that support the IPPGET Event Notification Delivery Method [get-method]. This extension is OPTIONAL for IPP Printers that support the IPPGET or any other Event Notification Delivery Method.

Note: This extension using a Notification Server was envisioned in [ipp-ntfy] in an Informative appendix.

1.1 Scope

This specification defines the following:

1. The "**printer-notify-server-uri**" Printer Description attribute configured to specify one or more Notification Servers that, in combination with the Printer, provides a Distributed Notification Service.

2. The '**redirection-other-site**' status code returned in a Get-Notifications operation response.

3. The "**redirect-uri**" operation attribute returned in a Get-Notifications operation response to indicate the site to which the client is to redirect subsequent Get-Notifications operation requests (see [get-method]).

4. The **conformance requirements** for: (1) clients that support the IPPGET Delivery Method, (2) Printers that use a Notification Server to delivery Events Notifications with any Delivery Method, (3) Printers that support the IPPGET Delivery Method with redirection to such Notification Servers, and (4) Notification Servers that, in combination with a Printer, provides a Distributed Notification Service.

The Informative Appendix in section 15 summarizes IPP extensions for a protocol between a trusted IPP Printer and a Notification Server, called Printer to Notification Server (PNSP) [pnsp]. A Printer that supports PNSP forwards Subscription operations and Events to a Notification Server which delivers the Event Notifications to Notifications Recipients. A Printer and Notification Server that support PNSP meet the conformance requirements for a Distributed Notification Service specified in this document.

2 Terminology

This section defines the following terms that are used throughout this document.

2.1 Conformance Terminology

Capitalized terms, such as **MUST, MUST NOT, REQUIRED, SHOULD, SHOULD NOT, MAY, NEED NOT,** and **OPTIONAL**, have special meaning relating to conformance as defined in RFC 2119 [RFC2119] and [RFC2911] section 12.1. If an implementation supports the extension defined in this document, then these terms apply; otherwise, they do not. For example, statements of the form “the Printer MUST ...” only apply if the Printer conforms to this document, since this extension is OPTIONAL for Printers to support. Statement of the form “the IPP Client MUST ...” apply if the client supports the IPPGET Event Delivery Method, since this extension is REQUIRED if the client supports the IPPGET Delivery Method.

2.2 Other Terminology

This document uses the same terminology as [RFC2911], such as “**client**”, “**Printer**”, “**attribute**”, “**attribute value**”, “**keyword**”, “**operation**”, “**request**”, “**response**”, “**status code**”, and “**support**” with the same meaning.

This document also uses the same terminology as [ipp-ntfy], such as “**Subscription (object)**”, “**Job Creation operation**”, “**Notification Recipient**”, “**Event**”, “**Event Notification**”, “**Event Wait Mode**”, “**Pull Delivery Method**”, and “**Push Delivery Method**” with the same meanings.

This document introduces the following terms:

IPPGET Client - any client that supports the IPPGET Delivery method, that is, any client that requests **Event Notifications** by sending the Get-Notifications operation request (see [get-method]).

Notification Server - the network entity that delivers IPP **Event Notifications** on behalf of a trusted Printer in which the **Events** occurred.

Distributed Notification Service - the combination of an IPP Printer and one or more **Notification Servers** that the Printer is configured to use to deliver **Event Notifications**.

3 Model and Operation

See [ipp-ntfy] section 2 “Models for Notification” and [get-method] section 3 “Model and Operation”. In particular, [ipp-ntfy] section 2.3 “Distributed Model for Notification” and [ipp-ntfy] Section 17 “Appendix B - Distributed Model for Notification” covers the use of a Notification Server.

4 Printer Description attributes

This section defines Printer Description attributes.

4.1 printer-notify-server-uri (1setOf uri)

The “printer-notify-server-uri” Printer Description attribute contains one or more URIs of Notification Servers that this Printer is currently configured to use. The Printer MUST support this attribute. The Printer MUST NOT change these values to indicate the current Notification Server(s) being used even if the Printer is currently unable to contact them. The values of this attribute MUST be an ‘ipp’ schemed URL according to [uri-scheme]. The values MUST NOT be any of the URIs of the Printer itself, that is, MUST NOT be any of the values of the Printer’s “printer-uri-supported” Printer Description attribute (see [RFC2911] section 4.4.1).

The Printer MUST support this Printer Description attribute with at least one value. Note: According to [RFC2911] section 4.1, if the administrator has not configured the value of this attribute, the Printer returns a 'no-value' out-of-band value.

5 Redirect extension to the IPP Get-Notification operation

This section defines the redirection extension to the IPP Get-Notifications operation which the Printer MAY support and the IPPGET client MUST support.

5.1 Get-Notifications operation response - redirect

In any Get-Notifications operation response, the Printer or the Notification Server MAY redirect the client. In order to redirect the IPPGET Client, the Printer or Notification Server MUST return in Group 1 both (1) the 'redirection-other-site' status code (see section 6.1) and (2) the "redirect-uri" operation attribute (see section 5.2). The Printer or the Notification Server SHOULD return the "notify-get-interval" operation attribute (see [get-method]) with a zero value in the redirect response.

A Printer MAY redirect the client in a Get-Notifications operation response to a Notification Server for any implementation defined reason. For example, the number of connections currently in use or the authenticated identify of the client. A Notification Server MAY redirect the client in a Get-Notifications operation response to another Notification Server or back to the original Printer. Note: redirecting back to the original Printer supports a flexible redirection lifetime without imposing any additional burden on the IPPGET Client.

5.2 redirect-uri (uri) operation attribute

The "redirect-uri" operation attribute contains the URI of another target for the Get-Notifications operation. If the Printer returns this operation attribute, the value MUST contain a copy of one of the values of the Printer's "printer-notify-server-uri" Printer Description attribute. If the Notification Server returns this operation attribute, the value MUST be either the URI of another Notification Server or the original Printer.

A Printer or Notification Server MAY return this operation attribute in a Get-Notifications response or in a new operation suitably defined in the future. A Printer or Notification Server MUST NOT return this operation attribute in any other operation response that has been previously defined unless a new IPP specification has been published with the minor version number of the protocol incremented (see [RFC2911] section 3.1.8). Otherwise, existing clients would be adversely affected and would not operate as expected by the Printer.

Note: Currently, the "redirect-uri" operation attribute is only defined for use in a Get-Notifications operation response.

5.3 Client behavior on receiving a Get-Notifications operation response redirect

An IPPGET Client that receives the 'redirection-other-site' status code in a Get-Notifications operation response:

(1) MUST disconnect from the Printer or Notification Server; and

(2) MUST use the value of the "redirect-uri" operation attribute returned in the response as the Target in the next and subsequent Get-Notifications request for this Subscription, until redirected otherwise.

Note: According to [RFC2910], the Printer disconnects, in case the client does not disconnect.

6 Status Codes

The section defines status codes as IPP extensions.

6.1 redirection-other-site (0x0300)

This status code means that the Printer or Notification Server supports this operation by redirection to another site indicated in an operation attribute defined for this operation response. The Printer returns this status code to indicate that the client is to retry the operation at the site indicated in the operation attribute returned in the same response.

A Printer or Notification Server MAY return this status code in a Get-Notifications response or in a new operation suitably defined in the future. A Printer or Notification Server MUST NOT return this status code in any other operation response that has been previously defined unless a new IPP specification has been published with the minor version number of the protocol incremented (see [RFC2911] section 3.1.8). Otherwise, existing clients would be adversely affected and would not operate as expected by the Printer.

Note: Currently, the ‘redirection-other-site’ status code is only defined for use in a Get-Notifications operation response.

7 Conformance Requirements

This section specifies the conformance requirements for Printers, IPP Clients, and Notification Servers.

7.1 Printer conformance requirements

In order to conform to this specification, a Printer:

1. MUST meet the conformance requirements for Printers specified in [RFC2911], [ipp-ntfy], and [get-method] including support of all of the Subscription operations REQUIRED for Printers.

2. MUST support the “printer-notify-server-uri” (1setOf uri) Printer Description attribute as defined in Section 4.1.

3. MUST support Get-Notifications operation responses as defined in section 5.1.

7.2 Client conformance requirements

In order to conform to this specification, an IPP Client:

1. MUST meet the conformance requirements for clients specified in [RFC2911], [ipp-ntfy], and [get-method].

2. MUST act on receiving the ‘redirection-other-site’ status code as defined in section 5.3.

7.3 Notification Server conformance requirements

In order to conform to this specification, a Notification Server in combination with a Printer that forms a Distributed Notification Service:

1. SHOULD support multiple trusted Printers concurrently.

2. MUST authenticate each Printer as a trusted Printer

3. MUST accept the trusted Printer's identification of the original requesting user in any forwarded operation.

4. MUST support means for each trusted Printer to create corresponding Job and Printer Subscription objects on the Notification Server with the same Subscriptions Ids as each Printer uses for its own corresponding Job and Printer Subscription objects.

5. MUST support means for the trusted Printer to renew and cancel its corresponding Subscription objects on the Notification Server.

6. MAY support additional Subscription object operations from clients that are not a trusted Printer, provided that the Notification server sends corresponding operations to the trusted Printer that keep the Printer's parallel Subscription objects in synchronization with those kept by the Notification Server.

Note: This specification does not define a protocol between the Printer and the Notification Server. However, see Section 15 "Appendix A: Summary of the Printer to Notification Server Protocol (PNSP) (Informative)" for a summary of such a protocol and [pnsp] for a specification of such a protocol.

8 Normative References

[get-method]
Herriot, R., Hastings, T., and H. Lewis, "Internet Printing Protocol (IPP): The 'ippget' Delivery Method for Event Notifications", <draft-ietf-ipp-notify-get-08.txt>, September 10, 2002.

[ipp-ntfy]
Herriot, R., and T. Hastings, "Internet Printing Protocol/1.1: Event Notifications and Subscriptions", <draft-ietf-ipp-not-spec-10.txt>, September 10, 2002.

[RFC2119]
S. Bradner, "Key words for use in RFCs to Indicate Requirement Levels", RFC 2119 , March 1997

[RFC2910]
Herriot, R., Butler, S., Moore, P., Tuner, R., "Internet Printing Protocol/1.1: Encoding and Transport", RFC 2910, September 2000.

[RFC2911]
Hastings, T., Herriot, R., deBry, R., Isaacson, S., and P. Powell, "Internet Printing Protocol/1.1: Model and Semantics", RFC 2911, September 2000.

[uri-scheme]
Herriot, R., and I. McDonald, "IPP URL Scheme", <draft-ietf-ipp-url-scheme-05.txt>, work in progress, May 20, 2002.

9 Informative References

[indp-method]
Parra, H., and T. Hastings, "Internet Printing Protocol (IPP): The 'indp' Delivery Method for Event Notifications and Protocol/1.0", <draft-ietf-ipp-indp-method-06.txt>, work in progress, July 17, 2001.

[notify-req]
Hastings, T., deBry, R., and H. Lewis, "Internet Printing Protocol (IPP): Requirements for IPP Notifications"**, <**draft-ietf-ipp-not-06.txt>, work in progress, July 17, 2001.

[pnsp]
McDonald, I., and T. Hastings, “Internet Printing Protocol (IPP): Printer to Notification Server Protocol (PNSP)”, <draft-mcdonald-ipp-dist-not-00.txt>, work in progress, September 13, 2002.

[RFC2565]
Herriot, R., Butler, S., Moore, P., and R. Turner, "Internet Printing Protocol/1.0: Encoding and Transport", RFC 2565, April 1999.

[RFC2566]
R. deBry, T. Hastings, R. Herriot, S. Isaacson, and P. Powell, "Internet Printing Protocol/1.0: Model and Semantics", RFC 2566, April 1999.

[RFC2567]
Wright, D., "Design Goals for an Internet Printing Protocol", RFC 2567, April 1999.

[RFC2568]
Zilles, S., "Rationale for the Structure and Model and Protocol for the Internet Printing Protocol", RFC 2568, April 1999.

[RFC2569]
Herriot, R., Hastings, T., Jacobs, N., Martin, J., "Mapping between LPD and IPP Protocols", RFC 2569, April 1999.

[RFC2616]
R. Fielding, J. Gettys, J. Mogul, H. Frystyk, L. Masinter, P. Leach, T. Berners-Lee, “Hypertext Transfer Protocol - HTTP/1.1”, RFC 2616, June 1999.

[RFC3196]
Hastings, T., Manros, C., Zehler, P., Kugler, C., and H. Holst, “Internet Printing Protocol/1.1: Implementer’s Guide”, RFC 3196, November 2001.

10 IANA Considerations

This section contains the exact information for IANA to add to the IPP Registry according to the procedures defined in RFC 2911 [RFC2911] section 6. The resulting registrations will be published in the http://www.iana.org/assignments/ipp-registrations registry.

10.1 Attribute Registrations

The following table lists the attributes defined in this document. These attributes are to be registered according to the procedures in RFC 2911 [RFC2911] section 6.2.

Printer Description attributes:	Reference	Section:
printer-notify-server-uri (1setOf uri)	IEEE-ISTO 5101.6	4.1
Operation attributes:	**Reference**	**Section:**
redirect-uri (uri)	IEEE-ISTO 5101.6	5.2

10.2 Status code Registrations

The following table lists the status code defined in this document. This status code is to be registered according to the procedures in RFC 2911 [RFC2911] section 6.6.

Status codes:	Reference	Section:
redirection-other-site (0x0300)	IEEE-ISTO 5101.6	6.1

11 Internationalization Considerations

The internationalization considerations for Printers and clients are the same as those described in [get-method] section 16.

12 Security Considerations

The security considerations for Printers and clients are the same as those described in [get-method] section 17. In addition, the extension described in this document requires that the Printer be a trusted network entity of the Notification Server, since the Printer has to convey the ownership of Subscription objects that it creates to the Notification Server in such a way that the Notification Server can perform the same access control as the Printer would have performed. In addition, the Printer has to forward additional information and Subscription operations to the Notification Server (see section 15).

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15 Appendix A: Summary of the Printer to Notification Server Protocol (PNSP) (Informative)

This appendix summarizes the extensions to the IPP protocol necessary for the Printer to Notification Server Protocol (PNSP). PNSP allows a trusted Printer to interoperate with a Notification Server to provide the Distributed Notification Service specified in this document. See [pnsp] for a complete specification of PNSP. Using the PNSP protocol:

1. The Printer (acting in the role of a operator) registers once at its startup time with the Notification Server as a trusted Printer using a new register operation.

2. The Printer supports all of the Subscription object operations as specified in [ipp-ntfy].

3. The Printer implements the following Subscription object operations locally: Get-Subscription-Attributes and Get-Subscriptions according to [ipp-ntfy].

4. The Printer accepts and forwards to the Notification Server the following Subscription object operation requests: Create-Job-Subscription, Create-Printer-Subscription, Renew-Subscription, and Cancel-Subscription.

5. The Printer accepts Job Creation operation requests and submits corresponding Create-Job-Subscription operations to the Notification Server for any Subscriptions supplied by the client in the Job Creation request. Note: [ipp-ntfy] defines Job Creation operations as: Print-Job, Print-URI, and Create-Job.

6. When forwarding the Subscription operations, the Printer copies the following Subscription Description attributes from its Subscription object and passes them in the Subscription Attributes group (along with the original Subscription Template attributes supplied by the client). The Notification Server accepts the values of these Subscription Description attributes since the Printer is a trusted Printer:

    a. Create-Job-Subscription: “notify-printer-uri”, “notify-job-id”, and “notify-subscriber-user-name”.

    b. Create-Printer-Subscription: “notify-printer-uri”, and “notify-subscriber-user-name”.

    c. Renew-Subscription: “notify-subscriber-user-name”

    d. Cancel-Subscription: “notify-subscriber-user-name”

7. When an Event occurs, the Printer forwards the Event to the Notification Server, using another new operation. See the Send-Notifications operation defined for the INDP Delivery Method [indp-method]. The Notification Server scans its Subscription objects and delivers the Events appropriate for the Delivery Method indicated in each Subscription object, including responding to Get-Notifications requests for the IPPGET Event Delivery Method [get-method].

8. The Printer can omit sending events to the Notification Server when they occur if the Printer knows that none of its outstanding Subscription objects are subscribed to that event. Since the Printer must maintain each Subscription object in order to support all Subscription operations (except Get-Notifications), keeping the union of the events of interest isn't too difficult for the Printer. Such a filter would be more important for a high end Printer that generates Events at a high rate, such as page completion events.

16 Appendix B: Description of Base IPP documents (Informative)

The base set of IPP documents includes:

Design Goals for an Internet Printing Protocol [RFC2567]
Rationale for the Structure and Model and Protocol for the Internet Printing Protocol [RFC2568]
Internet Printing Protocol/1.1: Model and Semantics [RFC2911]
Internet Printing Protocol/1.1: Encoding and Transport [RFC2910]
Internet Printing Protocol/1.1: Implementer's Guide [RFC3196]
Mapping between LPD and IPP Protocols [RFC2569]

The "Design Goals for an Internet Printing Protocol" document takes a broad look at distributed printing functionality, and it enumerates real-life scenarios that help to clarify the features that need to be included in a printing protocol for the Internet. It identifies requirements for three types of users: end users, operators, and administrators. It calls out a subset of end user requirements that are satisfied in IPP/1.0. A few OPTIONAL operator operations have been added to IPP/1.1.

The "Rationale for the Structure and Model and Protocol for the Internet Printing Protocol" document describes IPP from a high level view, defines a roadmap for the various documents that form the suite of IPP specification documents, and gives background and rationale for the IETF working group's major decisions.

The "Internet Printing Protocol/1.1: Model and Semantics" document describes a simplified model with abstract objects, their attributes, and their operations that are independent of encoding and transport. It introduces a Printer and a Job object. The Job object optionally supports multiple documents per Job. It also addresses security, internationalization, and directory issues.

The "Internet Printing Protocol/1.1: Encoding and Transport" document is a formal mapping of the abstract operations and attributes defined in the model document onto HTTP/1.1 [RFC2616]. It defines the encoding rules for a new Internet MIME media type called "application/ipp". This document also defines the rules for transporting over HTTP a message body whose Content-Type is "application/ipp". This document defines the 'ipp' scheme for identifying IPP printers and jobs.

The "Internet Printing Protocol/1.1: Implementer's Guide" document gives insight and advice to implementers of IPP clients and IPP objects. It is intended to help them understand IPP/1.1 and some of the considerations that may assist them in the design of their client and/or IPP object implementations. For example, a typical order of processing requests is given, including error checking. Motivation for some of the specification decisions is also included.

The "Mapping between LPD and IPP Protocols" document gives some advice to implementers of gateways between IPP and LPD (Line Printer Daemon) implementations

17 Appendix C: Change Log (to be removed when this document is published)

The following changes have been made (in reverse chronological order):

17.1 Changes from [get-method] to make version 0.1

1. Invented the title: "The Printer Working Group Standard for Internet Printing Protocol (IPP): Distributed Notification Service and IPPGET Client Behavior"

2. Removed this redirection functionality from the IETF IPPGET [get-method] specification and put it in this document.

3. Section 2.2: Defined "IPPGET Client", "Notification Server", and "Distributed Notification Service" terms.

4. Clarified that this specification is the Interface between an IPP Client and a Distributed Notification Service, in case the IPP Printer exercises the option of using a Notification Server to deliver Event Notifications.

5. Section 5.3: Maintained the client requirement to support the redirection for *any* client that supports the IPPGET Event Delivery Method (see [get-method]). In other words, *any* client that supports the Get-Notifications operation is required to support the redirection in case the Printer exercises this option.

6. Clarified that this Notification Server may deliver Event Notifications for any Push Delivery Method and for the IPPGET Pull Delivery Method.

7. Section 4.1: Added the "printer-notify-server-uri" (1setOf uri) Printer Description attribute so that the Printer could be configured for none ('no-value' out-of-band value), one, or more than one Notification Server.

8. Sections 5.2 and 6.1: Clarified that the "redirect-uri" (uri) operation attribute and the 'redirection-other-site' status code are for use with the Get-Notifications operation response only, but could be used by operations defined in the future or existing operations if the IPP protocol minor version number incremented.

9. Section 5.1: Clarified that the Printer MAY return the "redirect-uri" (uri) operation attribute depending on any implementation-defined reasons which could be dynamically varying. Gave examples, such as on the number of open channels and the authorization of the user.

10. Section 7.3: Added conformance requirements for a Notification Server, acting in combination with a Printer, to provide a Distributed Notification Service.

11. Section 15: Added the Informative Appendix that describes PNSP.

