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Internet Printing Protocol/1.0 & 1.1: **IPP Event Notification**

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Abstract

This document describes an extension to the IPP/1.0 & IPP/1.1 model that allows end users to subscribe to printing related events as part of job submission. This type of subscription is called a "Job Submission Subscription".

A subscription includes:

- the names of ~~groups of~~ events that are of interest to the subscriber
- the delivery methods and addresses to use for event reports (socket, email, etc.)

A simple method is provided for subscribing to printing related events:

- Two new subscription attributes are supplied by the client as part of an IPP create request (Print-Job, Print-URI, Create-Job, Validate-Job)

An event is some occurrence (either expected or unexpected) within the printing system. Events can be classified ~~using~~ along two dimensions:

- Either as Job Events or Device Events, and
- Either as Errors, Warnings, or Reports

When the event occurs, an event report is generated and delivered using the information specified in the job's subscription which was submitted with the job.

The full set of IPP documents includes:

Design Goals for an Internet Printing Protocol [IPP-REQ]
Rationale for the Structure and Model and Protocol for the Internet Printing Protocol [IPP-RAT]
Internet Printing Protocol/1.~~0~~1: Model and Semantics ~~(this document)~~ [IPP-MOD]
Internet Printing Protocol/1.~~0~~1: Encoding and Transport [IPP-PRO]
Internet Printing Protocol/1.0: Implementer's Guide [IPP-IIG]
Mapping between LPD and IPP Protocols [IPP LPD]

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. Operator and administrator requirements are out of scope for version 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 specifications, and gives background and rationale for the IETF working group's major decisions.

The "Internet Printing Protocol/1.~~0~~1: Model and Semantics", 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.~~0~~1: Encoding and Transport" document is a formal mapping of the abstract operations and attributes defined in the model document onto HTTP/1.1. 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 a new scheme named 'ipp' for identifying IPP printers and jobs. Finally, this document defines interoperability rules for supporting IPP/1.0 clients.

The "Internet Printing Protocol/1.0: Implementer's Guide" document gives insight and advice to implementers of IPP clients and IPP objects. It is intended to help them understand IPP/1.0 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.

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1 Summary of the Event Notification specification

This Event Notification specification MAY be implemented by IPP clients and objects.
Implementations conforming to this notification specification MUST support the following new REQUIRED attributes and MAY support the following new OPTIONAL attributes:

1. Two new REQUIRED multi-valued subscription Operation attributes and Job Description attributes:

attribute name	**Syntax**
"notify-recipients"	1setOf uri
~~"notify-format"~~	~~1setOf mimeMediaType~~
"notify-event~~-group~~s"	1setOf type2 keyword

   The presence of the "notify-recipients" indicates that notification is desired. The values of "notify-recipients" are URIs that identify the notification delivery method and delivery address to use for event reports (See Section 4.1.1). The delivery method dictates the event report content type to be used. For example, 'mailto' uses "~~text/plain~~multipart/report" and 'ipp-tcp-notify' uses "application/ipp". The values for "notify-event~~-group~~s" are keywords representing job event~~-group~~s or device event~~-group~~s (See Section 4.1.2). Each event~~-group~~s implies a set of attributes to be sent in the event report. Some delivery methods imply a fixed subset of the event~~-group~~s. For example, the 'mailto' delivery method only uses the 'job-completed~~ions-basic~~' event~~-group~~.

   These subscription operation attributes can be supplied by the client in any of the IPP job submission operations: Print-Job, Print-URI, Create-Job, and Validate-Job. Subscriptions that include interest in job event~~-group~~s apply only to the job being submitted and no other job.

   A subscription does *not* include:

   - complicated lists and sets of names of individual events that are of interest to the subscriber
   - arbitrary lists of additional attributes to be returned in the event report
   - specification of which format to use in the event report

2. REQUIRED "notify-recipients" and "notify-event~~-group~~s" Job Description attributes are populated from the corresponding create request Operation attributes of the same names.

3. REQUIRED Printer Description attributes: "notify-recipients-schemes-supported" and "notify-event~~-group~~s-supported" that describe the notification delivery methods and the event~~-group~~s that it supports, respectively.

4. REQUIRED Job Description attributes: "job-trigger-events" and "job-trigger-time" that store the current/last job event and its time in seconds since the device was started; "previous-job-state" and "previous-job-state-reasons" that store the job state and job state reasons before the event occurred.

5. OPTIONAL Job Description attribute~~s~~: "job-trigger-date-time"

6. CONDITIONAL Job Description attribute: ~~and~~ "job-trigger-message" if "status-message" is supported as an Operation attribute.

~~6.~~7. REQUIRED Printer Description attributes: "device-trigger-events" and "device-trigger-time" that store the current/last device event and its time in seconds since the device was started; "previous-printer-state" and "previous-printer-state-reasons" that store the device state and device state reasons before the event occurred.

~~7.~~8. OPTIONAL Printer Description attribute~~s~~: "device-trigger-date-time" ~~and~~

9. CONDITIONAL Printer Description attribute: "device-trigger-message" that MUST be supported if "status-message" is supported as an Operation attribute.

There are two steps that IPP notification must take regarding each event – an internal event recording, and an external event reporting. 1) As events occur, the printer internally records in the job objects and the printer objects those events which are required to be supported by the system and those that are subscribed to by a notification recipient. 2) As events occur, for each event the Printer searches the set of subscriptions for any interest in that event. As the Printer finds that some notification recipient is interested in that event (the notification recipient is subscribed to the ~~group of~~ event~~s to which the event belongs~~), an event report is generated and delivered using the methods and target addresses identified in the subscription.

Note: New operations to subscribe and unsubscribe to event notification that is independent of job submission is outside the scope of this proposal, but is being developed as a separate extension (see [ipp-sub]).

2 Terminology

Capitalized terms, such as MUST, MUST NOT, REQUIRED, SHOULD, SHOULD NOT, MAY, NEED NOT, and OPTIONAL, have special meaning relating to conformance. These terms are defined in [ipp-mod section 13.1 on conformance terminology, most of which is taken from RFC 2119 [RFC2119].

Job Submitting End User - A ~~human~~ end user who submits a print job to an IPP Printer.

IPP Client - The software component on the client system which implements the IPP protocol.

Job Recipient - A human who is the ultimate consumer of the print job. In many cases this will be the same person as the Job Submitting End User, but need not be.

Job Recipient Proxy - A human acting on behalf of the Job Recipient. In particular, the Job Recipient Proxy physically picks up the printed document from the Device, if the Job Recipient cannot perform that function.

Subscription - The set of attributes that indicate the "what, where, who, and how" for notification. Events Reports are generated for certain events (what) and delivered using various delivery methods (how) to certain addresses (where and who).

Notification Recipient - Any entity identified as a recipient within a subscription. Some notification recipients are Job Submitting End Users and others are interested third parties, such as the Job Recipient or Job Recipient Proxy.

Notification Recipient Agent - A program which receives event reports on behalf of the notification recipient.

Event - An event is some occurrence (either expected or unexpected) within the printing system. A property of an event is that it only occurs at one instant in time and does not span the time the

physical event takes place. For instance, jam-occurred and jam-cleared are two distinct events. The jam-occurred event is reported only when the jam initially occurs. Each event is recorded internally when it occurs. In addition the event is reported externally if there is one or more event subscriptions outstanding for that event.

Events can be classified ~~using~~ along two dimensions:

- Either as Job Events or Device Events, and
- Either as Errors, Warnings, or Reports

A Job event is some interesting state change in the Job object, and a Device event is some interesting change in the Printer object.

A report event is purely informational, such as 'job-completed' or 'accepting-jobs'. A warning is not serious and processing continues. An error is serious and either the job is aborted or the device stops. These are typical uses of the terms report, warning, and error, although the actual usage is implementation dependent.

An event occurs for a job or device whether any entity is registered to be notified for that event or not. The most recent event(s) of all possible events are recorded in a job object and a device object, and an event report is only generated depending on the set of subscriptions ~~created by notification recipients.~~ outstanding.

Event Report - When an event occurs, an event report is generated that fully describes the event (what the event was, where it occurred, when it occurred, etc.).~~.~~ Event reports are delivered to all the notification recipients that are subscribed to that event, if any. The event report is delivered to the address of the notification recipient using the notification delivery method defined in the subscription. However, an Event Report is sent ~~only~~ ONLY if there is a corresponding subscription.

Notification Delivery Method (or **Delivery Method** for short**)** - Event reports are delivered using a method, such as email, TCP/IP, etc.

Immediate Notification - Event reports that are delivered using a delivery method which is not store-and-forward (e.g. TCP connection, UDP datagram).

Queued Notification - Event reports that are delivered using a delivery method which has some sort of store-and-forward mechanism (e.g., email).

Human Consumable Event Report - Event reports that are intended to be consumed by human end users only.

Machine Consumable Event Report - Event reports that are intended for consumption by a program only**.**

Mixed Format Event Report - A mixed event report may contain both human consumable and machine consumable information.

3 Model for Job and Device Event Notification

Figure 1 shows the model.

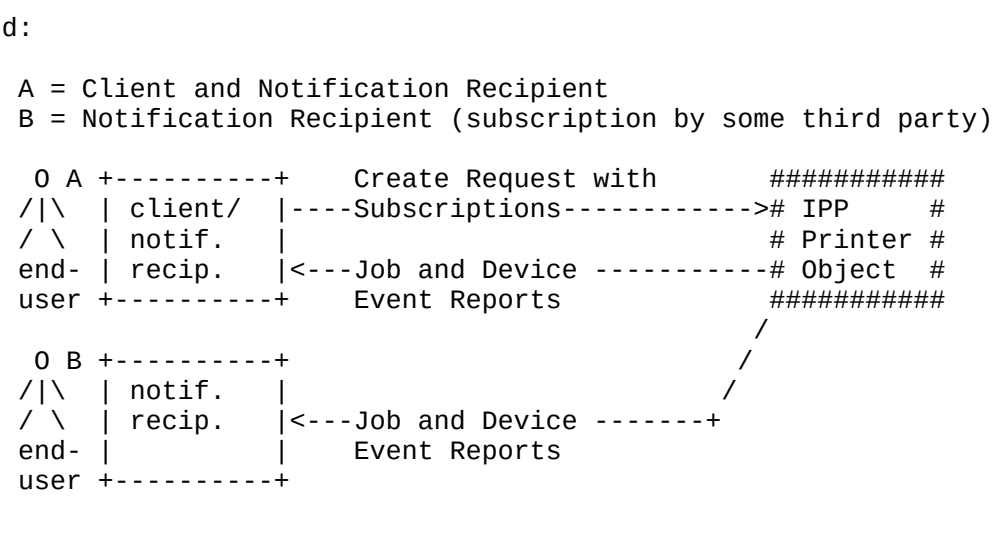
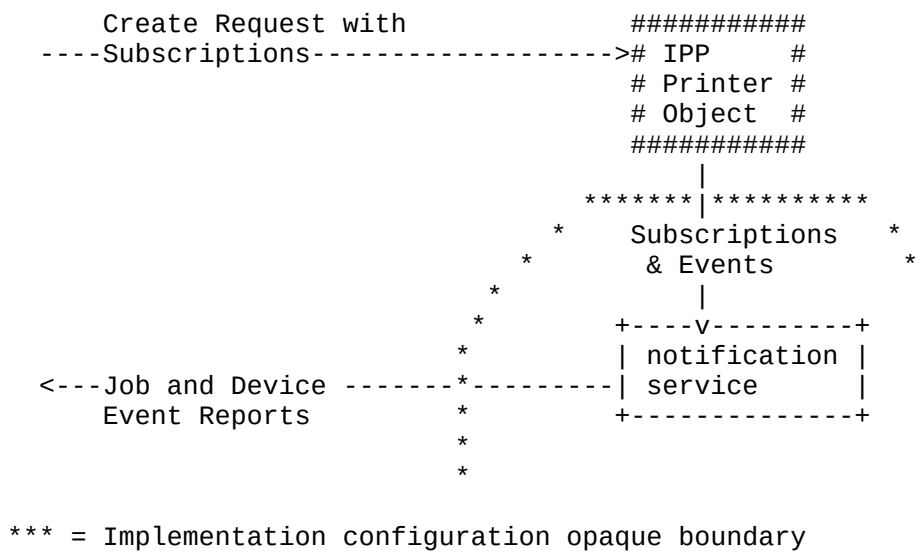


Figure 1 - Model for Job and Device Notification

Note: This model does not mandate that the IPP Printer object implement the full semantics of subscription, report generation, and multiple delivery methods. A simple (embedded) implementation may be configured to use some notification service. Figure 2 shows this partitioning.



~~Figure 3~~ Figure 2 - Opaque Use of a Notification Service

4 New subscription Operation attributes

This section specifies two new subscription operation attributes. A client subscribes to event ~~group~~s by supplying these attributes in any create request (i.e., a Print-Job Request, Print-URI Request, Validate-Job Request, or a Create-Job Request). These attributes are multi-valued attributes; the client can supply more than one value. If the client does not supply these attributes in the operation, there is no subscription made (either implicitly or explicitly).

The following rules apply:

1. Any subscription can contain job event ~~group~~s, device event ~~group~~s, or both.
2. The Job Submission Subscription is only valid while the job is "~~active~~not-completed". The job is "~~active~~not-completed" while it is in the 'pending', 'pending-held', 'processing', and 'processing-stopped' states. The job ~~ceases to be active when it enters the 'pending-held' state or until the time~~changes from being "not-completed" to "retained" when it is done processing and enters any of the 'completed', 'canceled', or 'aborted' states. The job becomes ~~active~~ "not-completed" again when it is ~~released from the 'pending-held' state or is~~ restarted using the Restart-Job operation (see [ipp-ops-set1]). Since no job is created for the Validate-Job operation, the only purpose of supplying the subscription operation attributes in the Validate-Job operation is to validate that the values are supported; the Printer object does not establish a notification subscription as a result of the Validate-Job operation.
3. Since a Job Submission Subscription is included within a job submission operation, any interest in job events is limited to "this job" only (the Job object created because of this job creation operation). There is no mechanism to subscribe to events for all jobs or specifically some job other than this job in a create operation. But see [ipp-sub] for such a mechanism to subscribe persistently for job and printer events independently of any particular job submission.
4. Event recording internal to the system must always occur for required event ~~group~~s and subscribed event ~~group~~s. Event reporting only occurs when a notification recipient has specified a subscription to any event ~~group~~(s).

ISSUE 1 – Can event ~~recording~~ reporting be dropped if the device is too busy? Can a subscriber specify that events are allowed to be dropped if the device is too busy or should that be a policy of the Printer established by the Administrator or implementation? Should we add the event device-dropping-events?

4.1 ~~Two s~~Subscription operation attributes

Two subscription operation attributes are OPTIONALLY supplied by the client in create operations: Print-Job, Print-URI, Create-Job, and Validate-Job. Both operation attributes are REQUIRED to be supported by Printer objects that support this notification specification.

4.1.1 notify-recipients (1setOf uri)

The client supplies this operation attribute in a create request in order to subscribe for job events while this job is ~~active~~"not-completed". In order to claim conformance to this notification specification, the Printer object MUST support this attribute. This attribute describes both where (the address) and how (the delivery method) event reports are to be delivered when any of the events specified in the "notify-

events" attribute occur. If the client does not supply this attribute in a create request, the Printer object MUST ~~not~~ NOT provide any job-based notification for this job.

Some notification delivery methods (such as 'mailto') imply a fixed set of events ~~group~~, and so ignore the supplied values of "notify-event~~-group~~s". These delivery methods may be used with other delivery methods that do not have such restrictions. Unless specified otherwise, a delivery method may be used with any event and an even may be used with any delivery method ~~group~~.

~~Likewise, some notification delivery methods imply a certain event report content format, and so ignore the supplied value(s) of "notify-format".~~

IPP Printer objects MUST support the **'ipp-tcp-notify'** and **'ipp-udp-notify'** delivery methods in order to conform to this notification specification. Support of the other methods is OPTIONAL.

Standard uriScheme values are:

'mailto': a 'multipart/report' [RFC1892] message is sent via email to the specified email address. It MUST consist of both a ~~The~~ "text/plain" part for display to a user and an 'application/ipp' part which is an event report that a program can process~~content format is typically used for this method~~ (see Section 5). This delivery method ignores the supplied values of the "notify-event~~-group~~s" attribute and implies the 'job-complet~~ed~~~~ions-basic~~' event ~~-group~~ (new state is '~~job-~~completed', '~~job-~~aborted', or '~~job-~~canceled' ~~-events~~). The notification recipient does not acknowledge receipt of the mail message.

'http': an IPP event report is sent using an HTTP POST to the indicated URL.

ISSUE 2 - Should we make the 'http' notification method (using POST) REQUIRED, instead of 'ipp-tcp-notify' and 'ipp-udp-notify'? Then we don't need to register anything for the two REQUIRED methods.

'ipp-tcp-notify': (REQUIRED) an IPP ~~notification~~ event report is sent via a TCP/IP socket that is opened by the Printer object on the IP address specified in the URI using the specified port using the "host:port" HTTP convention. For example:

ipp-tcp-notify://foo.com:6000

If the port is omitted, the default port is TBD (see Registration of ipp-tcp-notify scheme for use with IPP~~Appendix C: Registration of ipp-tcp-notify scheme for use with IPP~~). The "application/ipp" event report content format is used for this method (see Section 5). The event recipient does not respond or acknowledge the event report.

'snmpv1-notify': an ~~notification~~ event report is sent as an SNMPv1 trap to the host specified as the address in the URI. The notification recipient does not acknowledge receipt of the notification event report (trap).

'snmpv2-notify': an ~~notification~~ event report is sent as an SNMPv2 inform to the host specified as the address in the URI. The notification recipient does acknowledge receipt of the notification event report (inform).

'snmpv3-notify': an ~~notification~~ event report is sent as an SNMPv3 inform to the host specified as the address in the URI. The notification recipient does acknowledge receipt of the notification event report (inform).

ISSUE 3 – Is SNMP support even necessary?

'ipp-udp-notify': (REQUIRED) an IPP ~~notification~~ event report is sent via a UDP datagram that is opened by the Printer object on the IP address specified in the URI using the specified port using the "host:port" HTTP convention. For example:

ipp-udp-notify://bar.com:6000

If the port is omitted, the default port is TBD (see Registration of ipp-udp-notify scheme for use with IPP). The UDP datagram contains the "application/ipp" event report content format (see Section 5). The notification recipient does not acknowledge receipt of the notification event report.

'ndps-notify': an IPP ~~notification~~ event report is sent via NDPS notification mechanism. See ???.

ISSUE 4 - Need reference to NDPS documentation. Also need more description here, such as which end opens, does the recipient acknowledge, and any salient information about the transport.

'sense-notify': an ~~notification~~ event report is sent as a SENSE UDP datagram [sense] that is opened by the Printer object or notification service on the IP address specified in the URI using the specified port using the "host:port" HTTP convention. The notification recipient does acknowledge receipt of the notification event report.

ISSUE 5 - Can we get rid of most of these notification methods? Having a large number means that we don't have much interoperability.

If the client specifies a "notify-recipients" URI scheme that is not supported by the device, the Printer MUST return the [new] 'client-error-notify-uri-scheme-not-supported' ~~a status code of CLIENT_ERROR_URI_SCHEME_NOT_SUPPORTED must be returned~~ in the IPP response in reply to the create request.

ISSUE 6 - Which URL parameters should we mention (which like SLP) are removed before being used?

~~notify-format (1setOf mimeMediaType)~~

~~The client OPTIONALLY supplies this operation attribute in a create request. In order to claim conformance to this notification specification, the Printer object MUST support this attribute. This attribute identifies the event report content format that is desired by a notification recipient. If the client does not supply this attribute in a create request, but does supply the "notify-recipients", the Printer object uses the default mimeMediaType defined for the appropriate uriScheme as listed in section 4.1.1.~~

~~1.1.2~~4.1.2 notify-event~~-group~~s (1setOf type2 keyword)

The client OPTIONALLY supplies this operation attribute in a create request. In order to claim conformance to this notification specification, the Printer object MUST support this attribute. This attribute identifies the event~~-group~~s for which a notification event report is desired. If the client does not supply this attribute in a create request, but does supply the "notify-recipients", the Printer object ~~assumes the 'job-completions-basic'~~uses the "notify-event~~-group~~s-default" event~~-group~~ value.

~~ISSUE 5 Would it be better to just use lists of individual events instead of groups?~~

There are both job events and device events. Each job and device event is assigned a keyword to use in this attribute and in the event report.

~~Each event is assigned to one or more event groups. Each event group is assigned a keyword. The 'basic' suffix indicates that only the basic set of attributes are to be included in the event report.~~

Standard event ~~group~~ keyword values are:

See the values of the "job-trigger-events" Job Description attribute and the "device-trigger-events" Printer Description attribute.

~~Special event groups:~~

~~**'none':** no notifications of any events (an IPP object can use this value to indicate that it is configured not to support event notification; a client would not subscribe to this group).~~

~~Job Event Groups (See section 6.1 for a description of each job event):~~

~~**'job-state-changes-basic':** includes 'job-received'created', 'job-held', 'job-released', 'job-started-processing', 'job-stopped', 'job-continued'resumed-processing', 'job-purged', 'job-state-reason-added', 'job-state-reason-removed'~~

~~**'job-completions-basic'**: includes 'job-completed', 'job-aborted', 'job-canceled'~~

~~**'job-warnings-basic':** includes 'job-warning' and some 'job-state-reason-added' which are any implementation-specific job warning events~~

~~**'job-errors-basic':** includes 'job-aborted' and some 'job-state-reason-added' depending on and any implementation-specific job errors~~

~~Note: The 'job-aborted' event appears in both the 'job-completions-basic' and 'job-errors-basic' event groups, since it is both a completion and an error.~~

~~ISSUE 63 - which event groups are REQUIRED besides 'job-completion-basic' and possibly job-errors-basic?~~

~~Device Event Groups (See section 7.17.1 for a description of each job device event):~~

~~**'device-reports-basic':** includes 'device-started-processing', 'device-became-idle', 'device-state-reason-removed', 'device-state-reason-added', 'device-accepting-jobs', and 'device-powered-up', 'device-media-changed', 'device-config-changed', 'ready-for-job', and 'ready-for-just-in-time-job'~~

~~**'device-warnings-basic':** includes 'device-state-reason-warning-added' and - 'device-not-accepting-jobs'~~

~~**'device-errors-basic':** includes 'device-stopped', 'device-state-reason-error-added', and 'device-powering-down'~~

~~ISSUE 74 - which device event groups are REQUIRED, if any besides 'device-errors-basic'?~~

~~ISSUE 5 - This simplified proposal no longer includes returning the Printer MIB alert codes, but relies on "device-trigger-event' and IPP/1.0 [ipp-mod] "printer-state-reasons" keywords, which contain most of the Printer MIB alert codes, except for the generic ones. Ok?~~

5 Event Report Content

Some of the notification delivery methods dictate the event report content type to be used. For example, 'mailto' uses "~~text/plain~~multipart/report" and 'http' and 'ipp-tcp-notify' use~~s~~ "application/ipp".

~~ISSUE 8 - Need to decide whether the 'mailto:' delivery method uses the 'multi-part/alternative' MIME type or 'text/plain' with an 'application/ipp' attachment. Also, some users may want to parse the 'text/plain' format sent in a mail note. There will be interoperability and localization problems if applications attempt to parse text mail notes. Should we allow other formats?~~

Once a client's create request is successful, the device adds the "notify-recipients"~~, "notify-format"~~ and "notify-event~~-group~~s" attribute values to its subscription information on the Job object and returns the appropriate create response. Subsequently~~Then~~, event reports are asynchronously sent based on the subscription information stored by the device. The following descriptions give more detail on how the event reports are formed for each type.

Event reports are generated using the following content formats:

'application/ipp' - machine consumable event report content using the 'application/ipp' MIME media type [ipp-mod] using the Get-Job-Attributes response encoding for job events and Get-Printer-Attributes for device events. The attributes listed in section 5.1 are sent in an ~~notification~~ event report for job events. The attributes listed in section 5.2 are sent in an ~~notification~~ event report for device events. For any string in any event report, the charset and natural language rules that apply to all IPP operations apply to the event report strings as well, since they are represented as operation responses. The event content is filled in as follows:

Response Parameters:

"version-number" - the same version number as returned in the create response.

"status-code" parameter - the status code: ~~"~~'basic-job-event'~~"~~ - 0x600 for job events, and ~~"~~'basic-device-event'~~"~~ - 0x601 for device events.

"request-id" - 0, since there is no request to which this "response" is associated.

ISSUE 7 - Should each subscription have a running event counter that increments by 1 so that a notification recipient can detect events that arrive out of order? Should we put that counter into the 16-bit "request-id" field in the report?

Operation attributes:

"attributes-charset" and "attributes-natural-language" Operation attributes - the same charset and natural language as the response to the original create request.

"status-message" - is not sent as an Operation attribute (the "job-trigger-message" and "device-trigger-message" are sent in the Job Object Attributes and the Printer Object Attributes groups, respectively.

Unsupported Attributes Group:

Is not sent.

Job Object Attributes Group and Printer Object Attributes Group:

See section 5.1 and 5.2, respectively.

'text/plain' - human consumable event report content type. The text message SHOULD include information about the attributes in section 5.1 for job events or in section 5.2 for device events. If the charset to be used in the mail message is other than US-ASCII, the /charset parameter must be included in the value of this content-type header and in the event report content [RFC2046].

~~The notification delivery method dictates the event report content type to be used. For example, 'mailto' uses "text/plain" and 'ipp-tcp-notify' uses "application/ipp".~~

~~ISSUE 6 - Need to decide whether the 'mailto:' delivery method uses the 'multi-part/alternative' MIME type or 'text/plain' with an 'application/ipp' attachment.~~

~~1.1~~5.1 Basic Job event report content

This section lists the parameters and attributes that are included in ~~any~~ the Basic Job event report content ~~for each job event group~~. Additional job event ~~group~~s can be registered which use the Basic Job Event report content. If ~~include~~ additional attributes are needed~~.~~ , additional Job Event Report content formats will be defined and assigned a new status code to be used in the report in order to distinguish each report format. ~~However, i~~For example of another Job Event Report content format, see [ipp-prog] for 'job-progress-events'.

If notification is ~~implemented~~supported, ~~all job event groups~~ the implementation MUST ~~include~~ support the following REQUIRED ~~"basic"~~ job object attributes, MUST support the following CONDITIONAL job object attributes, if the condition is true, and MAY ~~include~~ support the following OPTIONAL ~~"basic"~~ job object attributes ~~in any job event report~~. Any of the following Job Description attributes that are supported MUST be included in an event report. All job event reports MUST use the Get-Job-Attributes response syntax. The Basic Job Event Report MUST ~~. The~~include the following response parameters and ~~"basic"~~ job object attributes. ~~are sent in the job event report as~~ The Job Attributes MAY be in any order:

Job object parameter/attribute	REQUIRED~~?~~ IN REPORT?	reference
version-number	REQUIRED	[ipp-mod] 3.1.1
status-code (with the value: basic-job-event(600))	REQUIRED	[ipp-mod] 3.1.1
request-id (with a 0 value)	REQUIRED	[ipp-mod] 3.1.1
job-printer-uri (uri)	REQUIRED	[ipp-mod] 4.3.3
job-id (integer(1:MAX))	REQUIRED	[ipp-mod] 4.3.2
job-trigger-events (1setOf type2 keyword)	REQUIRED	6.1
job-trigger-message* (text(255))	~~OPTIONAL~~ CONDITIONAL	6.4
job-trigger-time (integer(1:MAX))	REQUIRED	6.5
job-trigger-date-time (dateTime)	~~OPTIONAL~~ RECOMMENDED	6.6
job-state (type1 enum)	REQUIRED	[ipp-mod] 4.3.7
previous-job-state (type1 enum)	REQUIRED	6.7
job-state-reasons (1setOf type2 keyword)	~~OPTIONAL~~ REQUIRED	[ipp-mod] 4.3.8
previous-job-state-reasons (1setOf type2 keyword)	REQUIRED	6.8
~~job-impressions-completed**~~ ~~(integer(0:MAX))~~	~~OPTIONAL~~ CONDITIONAL	~~[ipp-mod] 4.3.21~~
subscription-id** (integer(1:MAX))	CONDITIONAL	[ipp-sub] 4.2

Figure 3 - Basic Job Event Report Content

Conditional attributes in the event report:

*If "status-message" is supported as an Operation attribute in operation responses, then "job-trigger-message" MUST be supported in the event report content.

~~** If "job-impressions-completed" is supported as a Job Description attribute, then it MUST be supported in event report content.~~

**~~*~~ If Job Independent Subscriptions [ipp-sub] is implemented and the event report is caused by an independent subscription request, the "subscription-id" MUST be ~~supported~~supplied in the event report content.

If the values of any of the attributes sent in an event report content are not known, the value sent in the report content is the out-of-band 'unknown' value, rather than omitting the attribute. See [ipp-mod] section 4.1.

~~1.2~~5.2 Basic Device event report content

This section lists the parameters and attributes that are included in ~~any~~ the Basic Device event report content ~~for each device event group~~. Additional device event ~~group~~s can be registered which use the Basic Job Event report content. If ~~include~~ additional attributes are needed, ~~.~~ additional Device Event report content formats will be registered and assigned a new status code to be used in the report in order to distinguish each report format. ~~However, i~~

If notification is ~~implemented~~supported, the implementation ~~all device event groups~~ MUST supported ~~include~~ the following REQUIRED ~~"basic"~~ attributes, MUST supported the following CONDITIONAL job object attributes, if the condition is true, and MAY supported ~~include~~ the following OPTIONAL ~~"basic" job~~ Printer object attributes in any device event report. ~~-~~Any of the following Printer Description attributes that are supported MUST be included in an event report. All device event reports MUST use the Get-Printer-Attributes response syntax. The Basic Device Event Report MUST ~~. The~~ include the following response parameters and ~~"basic"~~ Printer object attributes. ~~are sent in the device event report as~~ The Printer Attributes MAY be in any order:

Printer object paramater/attribute	REQUIRED IN REPORT?	reference
version-number	REQUIRED	[ipp-mod] 3.1.1
status-code (with the value: basic-device-event(601))	REQUIRED	[ipp-mod] 3.1.1
request-id (with a 0 value)	REQUIRED	[ipp-mod] 3.1.1
printer-uri-supported (uri)	REQUIRED	[ipp-mod] 4.4.1
device-trigger-events (1setOf type2 keyword)	REQUIRED	7.1
device-trigger-message* (text(255))	~~OPTIONAL~~ CONDITIONAL	7.2
device-trigger-time (integer(1:MAX))	REQUIRED	7.3
device-trigger-date-time (dateTime)	OPTIONAL	7.4
printer-state (type1 enum)	REQUIRED	[ipp-mod] 4.4.10
previous-printer-state (type1 enum)	REQUIRED	7.5
printer-state-reasons (1setOf type2 keyword)	~~OPTIONAL~~ REQUIRED	[ipp-mod] 4.4.11
previous-printer-state-reasons (1setOf type2 keyword)	REQUIRED	7.6
~~printer-is-accepting-jobs (boolean)~~	~~REQUIRED~~	~~[ipp-mod] 4.4.20~~
subscription-id** (integer(1:MAX))	CONDITIONAL	[ipp-sub] 4.2

Figure 4 - Basic Device Event Report Content

Conditional attributes in the event report:

* If "status-message" is supported as an Operation attribute in operation responses, then "device-trigger-message" MUST be supported in the event report content.

** If Job Independent Subscriptions [ipp-sub] is implemented and the event report is caused by an independent subscription request, the "subscription-id" MUST be ~~supported~~supplied in the event report content.

If the values of any of the attributes sent in an event report content are not known, the value sent in the report content is the out-of-band 'unknown' value, rather than omitting the attribute. See [ipp-mod] section 4.1.

6 Job Description Attributes

The following Job Description attributes are defined for use with notification:

6.1 notify-recipients (1setOf uri)

This REQUIRED attribute describes both where (the address) and how (the delivery method) event reports are to be delivered when any of the events specified in the "notify-event~~-group~~s" attribute occur. The Printer object MUST populate this Job Description attribute from the corresponding Operation attribute supplied by the client in the create request. See section 4.1.1 for more description of this attribute.

~~1.2~~6.2 notify-event~~-group~~s (1setOf type2 keyword)

This REQUIRED attribute identifies the event~~-group~~s for which a notification event report is desired for this job. The Printer object MUST populate this Job Description attribute from the corresponding Operation attribute supplied by the client in the create request. If the client does not supply this attribute in a create request, but does supply the "notify-recipients" attribute, the Printer object populates this attribute with the ~~'job-completions-basic'~~notify-event~~-group~~s-default' event~~-group~~ value. See section 4.1.2 for more description of this attribute.

~~1.3~~6.3 job-trigger-events (1setOf type2 keyword)

This REQUIRED attribute indicates the most recent job event(s) that occurred for this job. Multiple values MAY be used when more than one event occurs at the same time. In order to claim conformance to this notification specification, the Printer object MUST support this Job Description attribute. The Printer object supplies ~~a copy of~~ this attribute in every job event report that it sends to a notification recipient. This attribute is also available to any client using a Get-Job-Attributes or Get-Jobs operation for this job. The first job event for a job is the 'job-created~~received~~' event, so this Job Description attribute always has a value.

~~This table maps the keyword values to their event groups and whether the printer must support the keyword. Supporting the keyword means the event MUST be recorded in the job-trigger-events attribute if it's the most recent job event, but not necessarily report the event unless a subscription requires it.~~

Keyword value	Event groups	REQ TO SUPPORT?
job-created	job-state-changes-basic	REQ
job-held	job-state-changes-basic	OPT
job-released	job-state-changes-basic	OPT
job-started-processing	job-state-changes-basic	REQ
job-stopped	job-state-changes-basic	OPT
job-resumed-processing	job-state-changes-basic	OPT
job-warning	job-state-changes-basic	OPT
job-completed	job-state-completions-basic	REQ
job-aborted	job-state-completions-basic	REQ
	job-errors-basic	REQ
job-canceled	job-state-completions-basic	REQ
job-purged	job-state-changes-basic	OPT
job-state-reason-added	job-state-changes-basic	OPT
	job-warnings-basic	OPT
	job-errors-basic	REQ
job-state-reason-removed	job-state-changes-basic	OPT
	job-warnings-basic	OPT
	job-errors-basic	REQ

A Printer MUST support the events indicated as "REQUIRED". The standard keyword values are:

'none': REQUIRED - no notifications of any events (an IPP object can use this value to indicate that it is configured not to support event notification; a client would not subscribe to this event).

'job-~~received'~~created': REQUIRED - ~~when~~ the Printer object has accepted~~s~~ the create operation and the job's "job-time-at-creation" attribute value is set (i.e., when the job is created no matter whether it puts the job in the 'pending' or 'pending-held' or 'processing' states). ~~This event is required to be recorded~~The IPP Printer MUST record this event.

'job-completed': REQUIRED - the job has reached one of the completed states, i.e., the value of the job's "job-state" attribute has changed to: 'completed', 'aborted', or 'canceled'. The job's "time-at-completed" and/or "date-time-at-completed" attributes are set. The IPP Printer MUST record this event.

Issue 8 - Should there be more job attributes in the 'job-completed' event report, such as "impressions-completed" and "sheets-completed"?

'**job-state-changed**': the job has changed from any state to any other state, except to any of the "completed" job states, i.e., the value of the job's "job-state" attribute changes to any value, except 'completed', 'aborted', or 'canceled'. Therefore, this event include neither the 'job-created' nor the 'job-completed' event. A client that wants to subscript to all job state changes, including creation and completion, includes the 'job-created', 'job-changed', and 'job-completed' in the notification subscription. When a job is finally removed from the Job History (see [ipp-mod] 4.3.7.1) no event is generated, i.e., neither a 'job-state-changed' event nor a 'job-purged' event is generated.

'**job-state-reasons-changed**': one or more values have been added to or removed from the Job's "job-state-reasons" attribute, such as 'job-queued' or 'job-printing'. This event often happens at the same time as a 'job-state-changed' or job-completed' event, but can also happen when there is no change in job state. This event is REQUIRED to be recorded if the job-state-reason is an error.

~~'**job-held**': when the job enters the 'pending-held' state using some protocol operation, such as Hold-Job (see [ipp-ops-set1]), or the system or device holds the job because of some requirement that cannot be met and other jobs could be processed, if there are any.~~

~~'**job-released**': when the job leaves the 'pending-held' state and enters the 'pending' or 'processing' states due to the user, operator, or system releasing the held job using some protocol operation, such as Release-Job (see [ipp-ops-set1]), or some internal or local operation.~~

~~'**job-started-processing**': the Printer starts processing the Job and the job-time-at-processing is set (i.e., when the job leaves the 'pending' or other state and enters the 'processing' state). This occurs both after a create-job operation and a Restart-Job operation. This is event is required to be recorded.~~

~~'**job-stopped**': The Printer stopped processing the job and the job entered the 'processing-stopped' state.~~

~~'**job-continued**'~~**~~resumed-processing~~**~~'~~: ~~The Printer continues processing the job, i.e., the job leaves the 'processing-stopped' state and re-enters the 'processing' state.~~

~~'**job-warning**': when the job encounters a condition which does not abort the job and does not require human intervention, (such as the interpreter encountering a request for a missing font, but for which it is able to perform font substitution.) """~~

~~'**job-completed**': when the job completes processing and the job-time-at-completion is set (with or without errors or warnings) and enters the 'completed' state. This is event is required to be recorded.~~

~~'**job-aborted**': when the job was aborted by the system while in the 'processing' or 'processing-stopped' state, due to some encountered problem that cannot be remedied by human intervention. This is event is required to be recorded.~~

~~'**job-canceled**': when the job was canceled by the user or operator using the Cancel-Job operation while the job was in any state. This is event is required to be recorded.~~

'**job-purged**': when a 'not-completed' job was purged from the printer using the Purge-Jobs operation. No event, including this event is generated when a job is aged out of the Job History.

ISSUE 9 - any other events that are REQUIRED?

~~ISSUE 10 – Instead of an event for every job state change, should we just have a job-state-change event with attributes to denote old job state and new job state?~~

~~1.4~~6.4 job-trigger-message (text(255))

This OPTIONAL attribute provides a short textual description of the most recent job event(s). The "job-trigger-events" attribute is intended for use by automata, and the "job-trigger-message" is intended for the human end user. If job-trigger-events is multi-valued, then it is left up to the implementation if it concatenates event messages or combines the events to provide a single message.

~~ISSUE 8 – Ok if "job-trigger-message" stays as a single value while "job-trigger-event" is multi-valued? When there are multiple codes, the message contains the concatenation of the messages.~~

If the Printer object supports the "job-trigger-message" Job Description attribute, the Printer object MUST be able to generate this message in any of the natural languages identified by the Printer object's "generated-natural-language-supported" attribute (see the "attributes-natural-language" operation attribute specified in [ipp-mod] section 3.1.4.1). As described in [ipp-mod] section 3.1.4.1 for any returned 'text' attribute, if there is a choice for generating this message, the Printer object uses the natural language indicated by the value of the "attributes-natural-language" in the client create request if supported, otherwise the Printer object uses the value in the Printer object's own "natural-language-configured" attribute.

~~1.5~~6.5 job-trigger-time (integer(~~MIN~~1:MAX))

This REQUIRED attribute indicates the point in time specified in seconds since the device was last started at which the most recent job event occurred for this job. In order to populate this attribute, the Printer object uses the value in its "printer-up-time" attribute at the time the event occurred. Since the device could support persistent jobs, a value of zero or less is available to show that the last event occurred before the last device restart.

In order to claim conformance to this notification specification, the Printer object MUST support this Job Description attribute. The Printer object MUST supply ~~a copy of~~ this attribute in every event report that it sends to a notification recipient. This attribute is also available to any client using a Get-Job-Attributes or Get-Jobs operation for this job. The first job event for a job is the 'job-received' event when the job is created. Therefore, this job attribute always has a value.

If IPP Printers relay jobs to other IPP Printers, the time of the event is intended to be at the IPP Printer object at which the event occurred, not subsequent times of relaying jobs in the forward direction or relaying notification event reports in the reverse direction. Therefore, each Printer along the request/response path MUST adjust the values of the time tick attributes accordingly.

~~1.6~~6.6 job-trigger-date-time (dateTime)

This OPTIONAL attribute indicates the point in time at which the most recent job event occurred for this job. In order to claim conformance to this notification specification, the Printer object MUST support this Job Description attribute if it also supports the "printer-current-time" Printer Description attribute (which also requires a date). The Printer object MUST supply ~~a copy of~~ this attribute in every event report that it sends to a notification recipient, if it supports this attribute. This attribute is also available to any client using a Get-Job-Attributes or Get-Jobs operation for this job. The first job event

for a job is the 'job-received' event when the job is created. Therefore, this job attribute always has a value.

If IPP Printers relay jobs to other IPP Printers, the time of the event is intended to be at the IPP Printer object at which the event occurred, not subsequent times of relaying jobs in the forward direction or relaying notification event reports in the reverse direction. However, since the date and time are absolute, each Printer does not need to change the values of the dateTime attributes as they are passed along the request/response path.

6.7 previous-job-state (type1 enum)

This REQUIRED attribute contains the previous state of the job, i.e., the value of the job's "job-state" attribute before the event occurred. See [ipp-mod] section 4.3.7 for the description of the values for this attribute. In an event report, the "job-state" attribute contains the current state of the job, i.e., the state of the job after the event occurred. This attribute is also available to any client using a Get-Job-Attributes or Get-Jobs operation for this job.

~~1.8~~6.8 previous-job-state-reasons (1setOf type2 keyword)

This REQUIRED attribute contains the previous values of the job's "job-state-reasons" attribute, i.e., the values before the event occurred. See [ipp-mod] section 4.3.8 for the description of the values for this attribute. In an event report, the "job-state-reasons" attribute contains the current values of the job's "job-state-reasons" attribute, i.e., the values after the event occurred. This attribute is also available to any client using a Get-Job-Attributes or Get-Jobs operation for this job.

~~6.7job-trigger-message (text(255))~~

~~This OPTIONAL attribute provides a short textual description of the event. The "job-trigger-events" attribute is intended for use by automata, and the "job-trigger-message" is intended for the human end user.~~

~~If the Printer object supports the "job-trigger-message" Job Description attribute, the Printer object MUST be able to generate this message in any of the natural languages identified by the Printer object's "generated-natural-language-supported" attribute (see the "attributes-natural-language" operation attribute specified in [ipp-mod] section 3.1.4.1). As described in [ipp-mod] section 3.1.4.1 for any returned 'text' attribute, if there is a choice for generating this message, the Printer object uses the natural language indicated by the value of the "attributes-natural-language" in the client request if supported, otherwise the Printer object uses the value in the Printer object's own "natural-language-configured" attribute.~~

7 Printer Description Attributes

The following Printer Description attributes are defined for use with notification:

7.1 device-trigger-events (1setOf type ~~2~~ keyword)

This attribute indicates the most recent device event(s) that occurred for this device. Multiple values MAY be used when more than one event occurs at the same time. In order to claim conformance to this notification specification, the Printer object MUST support this Printer Description attribute. The Printer object supplies ~~a copy of~~ this attribute in every device event report that it sends to a notification recipient. This attribute is also available to any client using a Get-Printer-Attributes request for this Printer object. The first device event for a device is 'powered-up', so this printer attribute always has a value. When all the Job Submission Subscriptions from a particular notification recipient on a device expire, and that recipient has no Job Independent Subscriptions on this device, the device event reports are no longer sent to that notification recipient.

~~This table maps the keyword values to their event groups and whether the printer must support the keyword. Supporting the keyword means the event MUST be recorded in the device-trigger-events attribute if it's the most recent device event, but not necessarily report the event unless a subscription requires it.~~

Keyword value	Event groups	REQ TO SUPPORT?
device-started-processing	device-reports-basic	OPT
device-became-idle	device-reports-basic	OPT
device-state-reason-removed	device-reports-basic	OPT
device-state-reason-added	device-reports-basic	OPT
device-accepting-jobs	device-reports-basic	OPT
device-powered-up	device-reports-basic	REQ
device-media-changed	device-reports-basic	OPT
device-config-changed	device-reports-basic	OPT
ready-for-job	device-reports-basic	OPT
ready-for-just-in-time-job	device-reports-basic	OPT
device-state-reason-warning-added	device-warnings-basic	OPT
device-not-accepting-jobs	device-warnings-basic	OPT
device-stopped	device-errors-basic	REQ
device-state-reason-error-added	device-errors-basic	REQ
device-powering-down	device-errors-basic	REQ

A Printer MUST support the events indicated as "REQUIRED". The standard keyword values are:

Device-report events include:

'none' - REQUIRED - no notification of any events (an IPP object can use this value to indicate that it is configured not to support event notification; a client would not subscribe to this event.

'device-state-change' - REQUIRED - the device changed state, i.e., the value of the Printer's "printer-state" attribute changed.

~~**'device-started-processing'** - when the Printer object enters the 'processing' state.~~

~~**'device-became-idle'** - when the Printer object enters the 'idle' state~~

~~**'device-state-reason-removed'** - when any value is removed from the Printer's "printer-state-reasons" attribute, such as 'toner-low-warning' or 'media-jam'~~

’**device-state-reason-changed~~added~~**’ - ~~when any value~~ one or more values have been ~~is~~ added to or removed from the Printer’s "printer-state-reasons" attribute, such as ’moving-to-paused~~-report~~’ or ’connecting-to-device~~-report~~’. This event is REQUIRED to be recorded if the job-state-reason is an error

~~’**device-accepting-jobs**’ - when the Printer starts accepting jobs, i.e., when the value of the Printer object’s "printer-is-accepting-jobs" attribute changes to ’true’~~

’**device-powered-up**’ - when the device is powered up.

’**device-powering-down**’ - when the device is being powered down.

’**device-media-changed**’ – when the media loaded on a device has been changed. The client must check the media-ready attribute separately to find out what new media was loaded.

’**device-config-changed**’ – when the configuration of a device has changed, e.g., any "xxx-supported" values or the Printer’s "printer-is-accepting-jobs" attribute value has changed. The client would have to perform a Get-Printer-Attributes to find out the new attributes. This would be useful for GUI clients and drivers to update the available device capabilities to the user.

’**ready-for-job**’ – when there is more than one client feeding a printer/server (fan-in), and the Printer may still printing but has acquired more buffer space to accept jobs. This event only occurs when the Printer did not have room to accept jobs previously.

’**ready-for-just-in-time-job**’ – when a spooler is feeding more than one printer/server (fan-out), and the spooler holds jobs until a printer requests them, rather than committing jobs to devices before it is necessary. This event may be used for a printer to request a new job from any subscribers sufficiently ahead of time so that the device does not run out of work between jobs.

~~ISSUE 11 – Shall we add other events for spoolers feeding multiple printers? Such as ready-for-just-in-time-data when a job is sent in data chunks (chunk transfer)?~~

~~From [ipp-mod] section 4.4.11, device reports are indicated as "printer-state-reasons" keywords with a '-report' suffix. An implementation may choose to omit some or all device-reports. Some device-reports specify finer granularity about the printer state; others serve as a precursor to a warning. A 'device-report' event MUST not NOT indicate anything that affects the printed output.~~

~~Note: Printer MIB equivalent events that fall in this report group include the alertRemovalOfBinaryChangeEntry(1801) alert that indicates that a binary change event entry row has been removed from the Alert Table and any event with the prtAlertSeverityLevel value set to noInterventionRequired(7).~~

~~Device-warning events include:~~

~~’**device-state-reason-warning-added**’ - when a warning value is added to the Printer's "printer-state-reasons" attribute, such as 'media-low-warning', i.e., any 'xxx-warning' value'~~

~~’**device-not-accepting-jobs**’ - when the Printer ceases to accept jobs, i.e., when the value of the Printer's "printer-is-accepting-jobs" attribute changes to 'false'~~

~~From [ipp-mod] section 4.4.11, device warnings are indicated as "printer-state-reasons" keywords with a '-warning' suffix.~~

~~Note: Printer MIB equivalent examples of device warnings include: inputMediaSupplyLow(807) and markerTonerAlmostEmpty(1104) prtAlertCode values.~~

~~Device error events include:~~

- ~~**'device stopped'** - when the Printer object enters the 'stopped' state~~
- ~~**'device state reason error added'** - when an error value is to the Printer's "printer-state-reasons" attribute, such as 'media-empty-error', 'media-empty', or 'media-jam'. Note: [ipp-mod] section 4.4.11 indicates that the 'error' suffix MAY be omitted for errors.~~
- ~~**'device powering down'** - when the device is being powered down.~~

~~From [ipp-mod] section 4.4.11, device errors are indicated as "printer-state-reasons" keywords with an '-error' suffix or with no suffix at all. For example, 'media-jam-error', 'media-jam' or 'paused'.~~

~~Note: Printer MIB equivalent examples of the device errors include: jammed(8) and markerTonerEmpty(1101) prtAlertCode values.~~

~~ISSUE 9 - Events still needs work to reflect the agreements at the meeting and comparison with Printer MIB and "printer-state-reasons" and other sources of events.~~

7.2 device-trigger-message (text(255))

This OPTIONAL attribute provides a short textual description of the most recent device event(s). The "device-trigger-events" attribute is intended for use by automata, and the "device-trigger-message" is intended for the human end user. If device-trigger-events is multi-valued, then it is left up to the implementation if it concatenates event messages or combines the events to provide a single message.

ISSUE 10 - Ok if "device-trigger-message" stays as a single value while "device-trigger-event" is multi-valued? When there are multiple codes, the message contains the concatenation of the messages or is a combined message, depending on implementation.

If the Printer object supports the "device-trigger-message" Printer Description attribute, the Printer object MUST be able to generate this message in any of the natural languages identified by the Printer object's "generated-natural-language-supported" attribute (see the "attributes-natural-language" operation attribute specified in [ipp-mod] section 3.1.4.1). As described in [ipp-mod] section 3.1.4.1 for any returned 'text' attribute, if there is a choice for generating this message, the Printer object uses the natural language indicated by the value of the "attributes-natural-language" in the client create request if supported, otherwise the Printer object uses the value in the Printer object's own "natural-language-configured" attribute.

7.3 device-trigger-time (integer(MIN~~1~~:MAX))

This REQUIRED attribute indicates the point in time specified in seconds since the device was last started at which the most recent printer event occurred for this device. In order to populate this attribute, the Printer object uses the value in its "printer-up-time" attribute at the time the event occurred. Since the device could possibly store its most recent event(s), a value of zero or less is available to show that the last event occurred before the last device restart.

In order to claim conformance to this notification specification, the Printer object MUST support this Printer Description attribute. The Printer object MUST supply ~~a copy of~~ this attribute in every event report that it sends to a notification recipient. This attribute is also available to any client using a Get-Printer-Attributes request for this Printer object. The first printer event for a Printer is when it is powered up. Therefore, this printer attribute always has a value.

If IPP Printers relay jobs to other IPP Printers, the time of the event is intended to be at the IPP Printer object at which the event occurred, not subsequent times of relaying jobs in the forward direction or relaying notification event reports in the reverse direction.

7.4 device-trigger-date-time (dateTime)

This OPTIONAL attribute indicates the point in time at which the most recent printer event occurred for this device. In order to claim conformance to this notification specification, the Printer object MUST support this Printer Description attribute if it also supports the "printer-current-time" Printer Description attribute (which also requires a date). The Printer object MUST supply ~~a copy of~~ this attribute in every event report that it sends to a notification recipient, if it supports this attribute. This attribute is also available to any client using a Get-Printer-Attributes request for this Printer object. The first printer event for a Printer is when it is powered up. Therefore, this printer attribute always has a value.

If IPP Printers relay jobs to other IPP Printers, the time of the event is intended to be at the IPP Printer object at which the event occurred, not subsequent times of relaying jobs in the forward direction or relaying notification event reports in the reverse direction.

7.5 previous-printer-state (type1 enum)

This REQUIRED attribute contains the previous state of the device, i.e., the value of the Printer's "printer-state" attribute before the event occurred. See [ipp-mod] section 4.4.11 for the description of the values for this attribute. In an event report, the "printer-state" attribute contains the current state of the device, i.e., the state of the device after the event occurred.

7.6 previous-printer-state-reasons (1setOf type2 keyword)

This REQUIRED attribute contains the previous values of the job's "job-state-reasons" attribute, i.e., the values of the Printer's "printer-state-reasons" attribute before the event occurred. See [ipp-mod] section 4.4.12 for the description of the values for this attribute. In an event report, the "printer-state-reasons" attribute contains the current values of the device's "printer-state-reasons" attribute, i.e., the values after the event occurred.

~~7.5~~7.7 notify-recipients-schemes-supported (1setOf uriScheme)

This attribute describes the notification delivery methods supported by this Printer object. Standard values are defined in Section 4.1.1). In order to claim conformance to this notification specification, the Printer object MUST support this Printer Description attribute.

~~notify-format-supported (1setOf mimeMediaType)~~

~~This attribute describes the event report content format supported by this Printer object. Standard values are defined in Section). In order to claim conformance to this notification specification, the Printer object MUST support this Printer Description attribute.~~

7.8 notify-event-~~group~~s-default (1setOf type2 keyword)

This attribute ~~describes~~identifies the event-~~groups~~ values if the client does not supply the "notify-events" operation attribute-~~notify-event-groups~~. All the values in this attribute must also appear in the notify-event-~~group~~s-supported attribute.

~~7.6~~7.9 notify-event-~~group~~s-supported (1setOf type2 keyword)

This attribute ~~describes~~ identifies the event-~~group~~s supported by this Printer object. In order to claim conformance to this notification specification, the Printer object MUST support this Printer Description attribute. Standard values are defined in Section 4.1.2.~~)~~

8 Status Codes

Add the following status code for handling the error in the "notify-recipients" operation attribute:

13.1.4.? client-error-uri-scheme-not-supported (0x04??)

The scheme of the client-supplied URI in a "notify-recipients" operation attribute in a create operation is not supported. See [ipp-mod] section 3.1.7.

9 References

[draft-prtmib]
Turner, R., "Printer MIB", <draft-ietf-printmib-mib-info-04~~3~~.txt>, work in progress, ~~March~~ January 22, 199~~8~~.

[ipp-mod]
deBry, R., , Hastings, T., Herriot, R., Isaacson, S., Powell, P., "Internet Printing Protocol/1.1~~0~~: Model and Semantics", < draft-ietf-ipp-model-v11-02~~11~~.txt>, work in progress, ~~November 16~~May 10, 199~~8~~.

[ipp-ops-set1]
Bergman, R., Hastings, T., Herriot R., Moore, P., "Internet Printing Protocol/1.0: Additional Optional Operations - Set 1", <ipp-ops-set1-990221~~981023~~.txt>, work in progress, ~~October 23~~February 21, 199~~8~~.

[ipp-sub]
Isaacson, S., Martin, J., deBry, R., Hastings, T., Shepherd, M., "Job Independent Subscriptions for IPP", <ipp-notification-printer-~~980701~~990517>, work in progress, ~~July 1~~May 17, 199~~8~~.

[ipp-prog]
Hastings, T., Bergman, R., Lewis, H., "Proposed Job Progress Attributes for IPP", <ipp-job-prog-attr-990518.txt> work in progress, May 18, 1999.

[RFC1759]
Smith, R., Wright, F., Hastings, T., Zilles, S., and Gyllenskog, J., "Printer MIB", RFC 1759, March 1995.

[RFC1892]
Vaudreuil, G., "The Multipart/Report Content Type for the Reporting of Mail System Administrative Messages, RFC 1892, January 1996.

[RFC2046]
Multipurpose Internet Mail Extensions (MIME) Part Two: Media Types. N. Freed & N. Borenstein. November 1996. (Obsoletes RFC1521, RFC1522, RFC1590), RFC 2046.

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

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

[sense]
Martin, J. et all., "System Event Notification System Environment (SENSE)", ftp://ftp.pwg.org/pub/pwg/sense/, work in progress, Spring 1996.

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11 Appendix A: Registration Forms to be filled out and submitted to IANA

11.1 Registration of ipp-tcp-notify scheme for use with IPP

This appendix contains the information that IANA requires for registering a URL scheme for use with the "application/ipp" MIME media type. The information following this paragraph will be forwarded to IANA to register 'ipp-tcp-notify' whose contents are defined in Section 4.1.1 "notify-recipients (1setOf uri)" in this document:

TBD

Required parameters: none

Optional parameters: none

Encoding considerations:

Security considerations:

IPP/1.0 protocol requests/responses do not introduce any security risks not already inherent in the underlying transport protocols. Protocol mixed-version interworking rules in [ipp-mod] as well as protocol encoding rules in [ipp-pro] are complete and unambiguous.

Interoperability considerations:

TBD

Published specification:

[ipp-not] Isaacson, S., Martin, J., deBry, R., Hastings, T., Shepherd, M., "Internet Printing Protocol/1.0 & 1.1: IPP Event Notification" draft-ietf-ipp-notification-00.txt, ~~January~~May, 1999.

Applications which use this URL scheme:

TBD

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~~1.2~~11.2 Registration of ipp-udp-notify scheme for use with IPP

This appendix contains the information that IANA requires for registering a URL scheme for use with the "application/ipp" MIME media type. The information following this paragraph will be forwarded to IANA to register 'ipp-udp-notify' whose contents are defined in Section 4.1.1 "notify-recipients (1setOf uri)" in this document:

TBD

Required parameters: none

Optional parameters: none

Encoding considerations:

Security considerations:

IPP/1.0 protocol requests/responses do not introduce any security risks not already inherent in the underlying transport protocols. Protocol mixed-version interworking rules in [ipp-mod] as well as protocol encoding rules in [ipp-pro] are complete and unambiguous.

Interoperability considerations:

TBD

Published specification:

[ipp-not] Isaacson, S., Martin, J., deBry, R., Hastings, T., Shepherd, M., "Internet Printing Protocol/1.0 & 1.1: IPP Event Notification" draft-ietf-ipp-notification-00.txt, ~~January~~May, 1999.

Applications which use this URL scheme:

TBD

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11.3 Registration of multipart/report type, 'print-notification'

We may have to register a particular report sub-type for use with 'multipart/report' [RFC 1892]. See RFC 2298 for a similar kind of registration. The use of 'multipart/report' needs more understanding and work.

~~11Appendix E: Full Copyright Statement~~

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12 Appendix ~~E~~B: Change History

Changes are listed in reverse chronological order:

12.1 Changes to the May 17, 1999 to make the May 18, 1999 (T Hastings, R Bergman)

1. Removed concept of event groups. Subscribe to individual events. Much simpler. The event determines what data is sent in the event report. Also allows the client to query the device to see what events are supported, rather than which groups.
2. Replaced all of the job state transition events with a single 'job-state-changed' event. The report contains the old job state and the new job state.
3. Removed the notification-format attribute to keep the proposal simple.
4. Added the 'client-error-notify-uri-scheme-not-supported' status code.
5. Added REQUIRED "previous-job-state", "previous-job-state-reasons", previous-printer-state", and "previous-printer-state-reasons" Job Description attributes.
6. Removed the "job-impressions-completed" from the Basic Job Event Report Content. Bring it back with the "job-progress" events.
7. Removed the "printer-is-accepting-jobs" from the Basic Printer Event Report Content. Its changing is part of the "config-change" event.
8. Changed the 'job-state-changed' event, so that it doesn't include 'job-created', 'job-completed', or 'job-purged' events.
9. Made the event names mostly consistent by being in the past tense to reflect the fact that events reports happen after the internal event has completed.
10. Combined the 'job-state-reasons-added' and 'job-state-reasons-removed' into a single event: 'job-state-reasons-changed'. Same for 'device-state-reasons-changed'.
11. Changed 'mailto' notification method to REQUIRE 'multipart/report' which all mail agents understand, at least the text part.

12. Deleted the 'job-warning' and 'job-error' events, since they are covered by the 'job-state-reasons-changed, 'job-state-changed' and/or 'job-completed' events.

12.2 Changes to the January 20, 1999 to make the May 17, 1999 version (M Shepherd)

1. Changed references to IPP 1.0 to IPP 1.1
2. Implementing the notification specification is optional.
3. Refined the definition of Event
4. Changed 'notification report' to 'event report' for consistent terminology
5. Changed the terminology of an 'active' job to 'not-complete'. Included the 'pending-held' state in the 'not-complete' super-state.
6. Introduced notify-event-groups-default.
7. Changed job-trigger-message and job-impressions-completed to be CONDITIONAL in the event report, job-trigger-date-time to be RECOMMENDED, and job-state-reasons to be REQUIRED.
8. Changed device-trigger-message to be CONDITIONAL in the event report, and printer-state-reasons to be REQUIRED.
9. Created a table to map job-trigger-events keywords to event-groups and required status.
10. Modified job-continued to be job-resumed-processing, and job-received to be job-created. Added job-purged, job-state-reason-removed, and job-state-reason-added keywords.
11. Modified job-trigger-time and device-trigger-time to use values less than zero.
12. Created a table to map device-trigger-events keywords to event-groups and their required status.
13. Added ready-for-job and device-state-reason-added to device-trigger-events keywords.
14. Updated References section
15. Added notify-format and notify-format-supported attributes.
16. Added subscription-id to the event report attributes of job and device.
17. Made job-errors-basic and device-errors-basic REQUIRED to be supported.
18. Added device-media-changed, device-config-changed, and ready-for-just-in-time-job to device events.
19. Added Author's Addresses.

~~12.1~~12.3 Changes to the January 18, 1999 to make the January 20, 1999 version

The following changes were made to the January 18, 1999 to make the January 20, 1999 version:

1. Made this an INTERNET-DRAFT.
2. Indicated that a new default port is needed for the delivery methods.
3. Added Appendices in which to put the registration information for the URL schemes for each delivery method.

4. Clarified which parameters, Operation attributes, and Job/Printer attributes are supplied in an event content: the request-id is 0, the status-code is new 'job-event' 0x600 or 'device-event' 0x601.
5. Changed "job-trigger-event" and "device-trigger-event" to be 1setOf so that multiple events that occur at the same time MAY be send as one event content.
6. Added "job-trigger-time" as a REQUIRED Job Description and event content attribute which is in seconds since power up.
7. Changed "job-trigger-date-time" and "job-state-reasons" to OPTIONAL.
8. Changed "status-message" to be an OPTIONAL "job-trigger-message" event content attribute and also made it a Job Description attribute.
9. Added "device-trigger-time" as a REQUIRED Printer Description and event content attribute which is in seconds since power up.
10. Changed "device-trigger-date-time" and "printer-state-reasons" to OPTIONAL.
11. Changed "status-message" to be an OPTIONAL "device-trigger-message" event content attribute and also made it a Printer Description attribute.
12. Removed the "job-id" attribute from the device event content.

~~12.2~~12.4 Changes to the December 10, 1998 to make the January 18, 1999 version

The following changes were made to the December 10, 1998 to make the January 18, 1999 version:

1. Changed the names of the REQUIRED notify-recipient keywords from: 'ipp-tcp-socket' and 'ipp-udp-socket' to 'ipp-tcp-notify' and 'ipp-udp-notify'.
2. Added '-notify' to the OPTIONAL 'snmpv1', 'snmpv2', and 'snmpv3' delivery method names.
3. Changed the OPTIONAL 'sense-datagram' to 'sense-notify' to be consistent.
4. Added 'ndps-notify' as an OPTIONAL keyword.
5. Deleted the 'all-basic', 'all-job-events-basic', and 'all-device-events-basic'. Clients should be explicit about which groups they want. If new groups are added, the clients won't know what to do with them, if they had subscribed to 'all-xxx' groups.
6. Changed the names of "job-last-event" and "job-last-date-time-of-event" to "job-trigger-event" and "job-trigger-date-time" events, since the events trigger the notification delivery, but the attribute values remain after the event has been delivered.
7. Added "status-message" as an OPTIONAL event report content attribute.
8. Changed "job-impressions-completed" to OPTIONAL.
9. Indicated that OPTIONAL attributes are not sent in the event report content if they are not supported.
10. Required that "status-message" and/or "job-impressions-completed" be sent in an event report content if they are supported as an Operation attribute and a Job Description attribute, respectively.
11. Added REQUIRED "device-trigger-event", REQUIRED "job-id", and OPTIONAL "status-message" to the device event report content.

12. Specified the "device-trigger-event" Printer Description attribute, naming each event.

13. Deleted the 'sheet-completed' and 'collated-copy-completed', since these events are not part of any 'xxx-basic' event group. They can be added back when we have an event group that uses them.

~~12.3~~12.5 Changes to the July 1, 1998 to make the December 10, 1998 version

The following changes made from the July 1, 1998 to make the December 10, 1998 version:

1. Clarified the terminology so that an "event" doesn't necessarily mean that a notification report is delivered.
2. Removed many of the job and printer attributes for being sent in a notification event report, so that we can get agreement on a basic set of event report content. Only attributes really needs are included, including what may be needed for FAX. Changed the names of the event groups by adding the suffix '-basic' to indicate that these event groups return only basic information. Additional event groups can be registered in order to get more attributes as needed for accounting and more detailed job monitoring purposes.
3. Deleted the "job-progress" event group. We can bring it back when we agree to all of the extra attributes. Its not very useful with only the basic attributes.
4. The printer events are indicted using the "printer-state-reasons" values, instead of the Printer MIB alert codes. Since most of the Printer MIB alert codes, except for the generic ones, have equivalent IPP keyword reason values, this should be a problem and makes IPP more readably implemented in a server that doesn't have the Printer MIB.
5. Added the "job-last-event" job description attribute to give the job event some persistence.
6. Changed the job's "time-at-event (integer)" to "job-last-date-time-of-event (dateTime)" to give an absolute date and time, in case events are being relayed back through multiple servers, such as in FAX. Also made it a Job Description attribute to give it persistence.
7. Changed the printer's "time-at-event(integer)" to "printer-last-date-time-of-event(dateTime)" to give an absolute date and time, in case events are being relayed back through multiple servers, such as in FAX. Also made it a Printer Description attribute to give it persistence.
8. Added the IPP/1.0 "printer-is-accepting-jobs" to the event report, since changes in its value are really device state changes.
9. Added the complete semantics for each job event under the "last-job-event" Job Description attribute.

13 Appendix C: Full Copyright Statement