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Internet Printing Protocol/1.0 & 1.1 (IPP):  
IPP Event Notification Specification

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29 **Abstract**

30 This document describes an extension to the IPP/1.0, & IPP/1.1, and future versions model that allows a  
31 client to subscribe to printing related events. Subscriptions include "Per-Job subscriptions" and "Per-Printer  
32 subscriptions". One or more Per-Job Submission subscriptions are specified by the client when submitting  
33 a job. Additional Per-Job and Per-Printer subscriptions are created by performing separate explicit Create-  
34 Job-Subscription Create-Printer-Subscription operations, respectively. Subscriptions are modeled as  
35 Subscription objects. Four other operations are defined for Subscription objects: Get-Attributes, Get-  
36 Subscriptions, Renew-Subscription, and Cancel-Subscription.

37 A subscription request and the Subscription object includes: the names of Job and/or Printer events, the  
38 Notification Recipient URL, the ~~text format if Human Consumable notification is requested~~ Notification  
39 Content format, if several are supported, possibly some opaque data, and the charset and natural language.  
40 In addition, the subscription request includes: the requested lease time and persistency for the subscription.  
41 When the event occurs, a notification is generated and delivered using the information specified in the  
42 subscription.

43 The full set of IPP documents includes:

44 Design Goals for an Internet Printing Protocol [[RFC2567IPP-REQ](#)]

45 Rationale for the Structure and Model and Protocol for the Internet Printing Protocol [[RFC2568IPP-](#)  
46 [RAT](#)]

47 Internet Printing Protocol/1.1: Model and Semantics [IPP-MOD]

48 Internet Printing Protocol/1.1: Encoding and Transport [IPP-PRO]

49 Internet Printing Protocol/1.10: Implementer's Guide [IPP-IIG]

50 Mapping between LPD and IPP Protocols [[RFC2569IPP-LPD](#)]

51

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

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

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

65 The "Internet Printing Protocol/1.1: Encoding and Transport" document is a formal mapping of the abstract  
66 operations and attributes defined in the model document onto HTTP/1.1. It defines the encoding rules for a  
67 new Internet MIME media type called "application/ipp". This document also defines the rules for  
68 transporting over HTTP a message body whose Content-Type is "application/ipp". This document defines  
69 a new scheme named 'ipp' for identifying IPP printers and jobs. Finally, this document defines  
70 interoperability rules for supporting IPP/1.0 clients.

71 The "Internet Printing Protocol/1.10: Implementer's Guide" document gives insight and advice to  
72 implementers of IPP clients and IPP objects. It is intended to help them understand IPP/1.0 and some of  
73 the considerations that may assist them in the design of their client and/or IPP object implementations. For  
74 example, a typical order of processing requests is given, including error checking. Motivation for some of  
75 the specification decisions is also included.

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

78  
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183

## 184 1 Introduction

185 This IPP notification specification is an extension to IPP/1.0 [RFC2568, RFC2569] and IPP/1.1 [ipp-mod,  
186 ipp-pro]. This document in combination with the following documents is intended to meet the notification  
187 requirements described in [ipp-not-req]:

188 Internet Printing Protocol/1.0 & 1.1: "Collection Attribute Syntax" [ipp-coll]

189 Internet Printing Protocol/1.0 & 1.1: "Job Progress Attributes" [ipp-prog]

190 Internet Printing Protocol/1.0 & 1.1: "Notification Change History" [ipp-not-hist]

191 In addition, each notification delivery method, whether REQUIRED or OPTIONAL, is described in  
192 separate documents:

193 Internet Printing Protocol/1.0 & 1.1: "Notification Delivery Method xxx [TBD]

194 Internet Printing Protocol/1.0 & 1.1: "Notification Delivery Method yyy [TBD]

195

196 The rest of this document is laid out as follows:

- 197 - The rest of Section 1.1 is an overview of IPP Notification.
- 198 - Section 2 is the model for network entities that use IPP notification, including clients (desktop and  
199 servers), IPP Printers (servers and devices), and Notification Recipients.
- 200 - Section 3 is the terminology used throughout the document.
- 201 - Section 4 is the object model for notification, including Job, Printer, and Subscription objects.
- 202 - Section 5 defines the Subscription object and its attributes.
- 203 - Section 6 defines the Printer Description attributes
- 204 - Section 7 defines the Notification content of Human Consumable and Machine Consumable Event  
205 formats.
- 206 - Sections 8 and 9 define the Per-Job and Per-Printer Subscription operations.
- 207 - Section 10 defines the out-of-band values.
- 208 - Section 11 and 12 define the conformance requirements and IANA requirements, respectively.
- 209 - Section 13 - 15 cover Internationalization, Security, and Status codes.
- 210 - Appendix A is a summary of the Notification Attribute usage
- 211 - Appendix B is a Change History

### 212 1.1 Notification Overview

213 A client can establish an event notification subscription so that when one of the specified events occurs, an  
214 asynchronous Notification is sent to a specified Notification Recipient.

215 One or more Per-Job Submission subscriptions are specified by the client when submitting a job. One or  
216 more Per-Job or Per-Printer subscriptions are created by performing separate explicit Create-Job-  
217 Subscription or Create-Printer-Subscriptions operations, respectively.

218 A Per-Job or Per-Printer subscription request includes:

- 219 1. the names of Job and/or Printer events that are of interest to the Notification Recipient
- 220 2. the delivery method and address to use to deliver the notification to one Notification Recipient
- 221 3. if Human Consumable notification content is to be sent, which text format
- 222 4. some opaque data that the subscriber wants to be sent to the Notification Recipient in the  
223 Notification, perhaps to identify either the subscriber or the ultimate recipient
- 224 5. the charset to use in the Notification, if it is to be different than the one used in the request that  
225 created the subscription
- 226 6. the natural language to use in the Human Consumable Notification, if it is to be different than the  
227 one used in the request that created the subscription
- 228 7. the requested lease time in seconds for the subscription
- 229 8. whether or not the subscription is requested to be persistent across power cycles.

230 For Per-Job subscriptions, a client requests job and printer event notification using the "job-notify"  
231 operation attribute when creating a job with any of the Job Creation operation: Print-Job, Print-URI, and  
232 Create-Job. The "job-notify" operation attributes may be submitted to the Validate-Job in order to be  
233 validated. The "job-notify" operation attribute contains one or more collection values, each consisting of a  
234 number of member attributes that specify a subscription, so that a Job can have more than one Per-Job  
235 subscription. The 'collection' is a new attribute syntax (see [ipp-coll]). The member attributes of each  
236 collection value are copied to separate Subscription objects to populate the corresponding Subscription  
237 Description attributes.

238 For Per-Printer subscriptions and Per-Job subscriptions created after the Job has been created, a client  
239 requests job and printer event notification using new operations independent of any job. The Printer keeps  
240 each subscription in a separate Subscription object. The Create-Job-Subscription and Create-Printer-  
241 Subscription operations create an instance of the Subscription object supplying these new operation  
242 attributes and returns a subscription-id (analogous to a job-id for a Job object). These operation attributes  
243 are copied to the Subscription object as Subscription Description attributes and so may be queried using the  
244 Get-Subscription-Attributes and Get-Subscriptions operations. The subscriber requests a lease time for  
245 each Per-Printer subscription which MAY be infinite. The Printer grants a lease time according to its  
246 configured policy. A client MUST renew the Subscription before the granted lease time expires using the  
247 Renew-Subscription operation.

248 Table 1 summarizes the Per-Job and Per-Printer Subscription operations, [assigns their operation-id \(see](#)  
249 [\[ipp-mod\] section 4.4.15\)](#) and their salient input operation attributes.

250

**Table 1 - Summary of Per-Job and Per-Printer Subscription operations**

Operation:	Oper. ID	Per-Job	Per-Printer	<u>Brief Description</u> salient inputs beside printer-uri:
Print-Job, Print-URI, Create-Job	<a href="#">see [ipp-mod]</a>	yes	no	<u>Create one or more Per-Job Subscriptions as part of the Job Creation operations</u> 1setOf {recipient, [events,] [ <del>text-format,</del> ] [user-data,] [charset,] [natural-language]}
Validate-Job	<a href="#">see [ipp-mod]</a>	yes	no	<u>Check that the Job Creation operation would be accepted including the Subscription</u> 1setOf {recipient, [events,] [ <del>text-format,</del> ] [user-data,] [charset,] [natural-language]}
Create-Printer-Subscription	<a href="#">0x0016</a>	no	yes	<u>Create a Per-Printer Subscription</u> recipient, [events,] [ <del>text-format,</del> ] [user-data,] [charset,] [natural-language,] [lease-time-requested,] [persistence-requested]
Create-Job-Subscription	<a href="#">0x0017</a>	yes	no	<u>Create a Per-Job Subscription</u> recipient, job-id, [events,] [ <del>text-format,</del> ] [user-data,] [charset,] [natural-language,]
Get-Subscription-Attributes	<a href="#">0x0018</a>	yes	yes	<u>Get specified Subscription attributes of the specified Subscription object</u> subscription-id, [requested-attributes]
Get-Subscriptions	<a href="#">0x0019</a>	yes	yes	<u>Get the specified Subscription attributes from all my or all of the Subscription objects</u> [job-id], [my-subscriptions,] [requested-attributes]
Renew-Subscription	<a href="#">0x001A</a>	yes	yes	<u>Renew the Subscription lease</u> subscription-id, [lease time-requested]
Cancel-Subscription	<a href="#">0x001B</a>	yes	yes	<u>Cancel the Subscription</u> subscription-id

251

252 There are two steps that IPP notification must take regarding each event — an internal event recording, and  
 253 an external notification:

254 1) As an events occurs, the printer internally records in the job objects and the printer objects those  
 255 events which are required to be supported by the system and those that are subscribed to by a  
 256 notification recipient.

257 2) As an events occurs, the Printer searches the set of subscriptions for any interest in that event. As  
 258 the Printer finds that some notification recipient is interested in that event (the notification recipient  
 259 is subscribed to the event), the Printer increments the Subscription object's "subscription-request-id"  
 260 (integer (0:MAX)) attribute~~sequence number for that event is incremented~~ and a notification is  
 261 generated and delivered using the methods and target addresses identified in the subscription,  
 262 passing the incremented "request-id". The "subscription-request-id" sequence number permits a



263 Notification Recipient to detect duplicate notifications due either to duplicate subscriptions or  
264 retries and to detect dropped notifications.

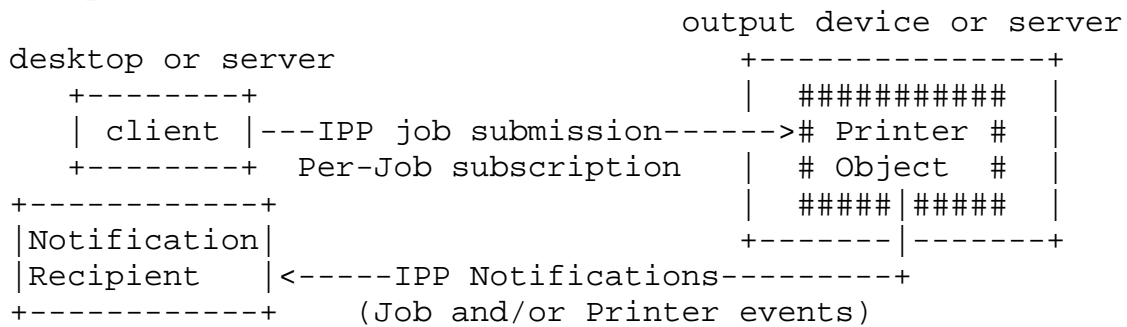
## 265 2 Model for Per-Job and Per-Printer Subscription and Event Notification

### 266 2.1 Model for Per-Job Subscription and Notification

267 Per-Job subscriptions are created by a client (desktop or server acting as a client) as part of creation of the  
268 job in an IPP Printer (printing device or server). More than one subscription may be submitted with a job.  
269 Additional subscriptions may be associated with the job using the Create-Job-Subscription operation. The  
270 IPP Printer object delivers a Notifications to the Notification Recipient supplied by the Client in each  
271 subscription. A Notification Recipient can be the Job submitter or a third party.

272 Figure 1 shows the Per-Job subscription notification model for a simple Client - Printer relationship.

273  
274 embedded printer:



284 **Figure 1 - Client-Printer Per-Job Subscription and Notification Model**

285 Figure 2 shows a (spooling or non-spooling) Server that implements two Printer objects (1 and 2) that  
286 represent two devices. The devices A and B in turn each implement an IPP Printer object (3 and 4,  
287 respectively). The Server implementation has three choices for how to support Per-Job subscriptions to the  
288 client (and itself):

- 289 1. forward the Per-Job subscriptions to the down stream IPP Printer and let it perform the  
290 notification directly to the Notification Recipients supplied by the Client (Notifications(C)) and  
291 use Per-Printer Subscriptions for the Server's own purposes.
- 292 2. save the client-supplied Per-Job subscription on the Job object in the server and substitute its  
293 own Per-Job subscription with the Server as the Notification Recipient (Notifications(B)). Then  
294 the Server relays Notifications to the client-supplied Notification Recipients (Notifications(A)).
- 295 3. A combination of 1 and 2 in which the Server adds its own Per-Job subscriptions to those  
296 supplied by the client. Thus the IPP Job that goes to Printer object 4 has a combination of  
297 subscription information from both the Client and the Server. This latter approach is sometimes  
298 called "piggy-backing" because the Server is adding its Per-Job subscription information to that  
299 supplied by the client. Piggy-backing is especially useful, if device B also accepts (IPP or non-  
300 IPP) requests from other servers. Then when all the jobs from Server S have been completed by  
301 device B, there will be no more Job events sent to Server S. (Server S could still maintain a

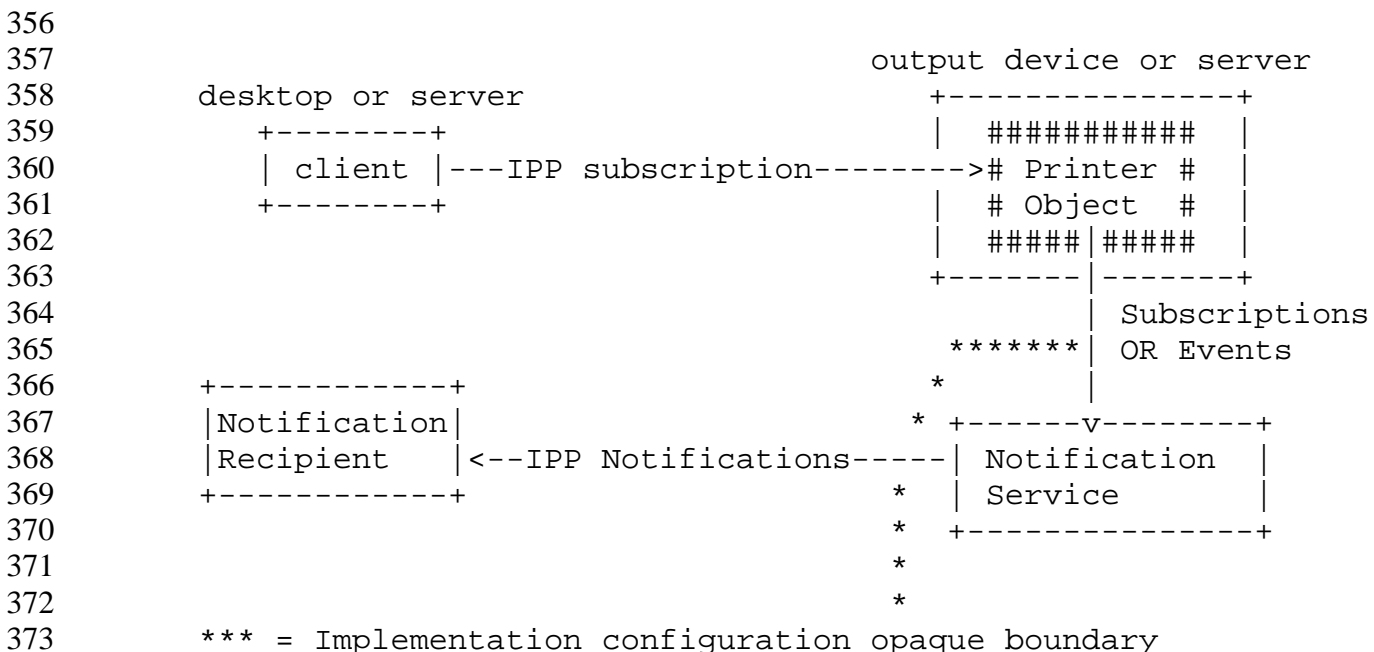


## 345 2.3 Relationship between the Printer object and the Notification Delivery Service

346 The IPP Notification model does not mandate that the IPP Printer object implement the full semantics of  
 347 subscription, report generation, and multiple delivery methods itself. This section describes two methods  
 348 of using third party notification services. The first is transparent to the client and the second is transparent  
 349 to the IPP Printer.

### 350 2.3.1 Use of a Notification Service transparently to clients

351 An implementation may be configured to use some other notification service to either (1) delivery the  
 352 Notifications to the Notification Recipient(s) specified in the IPP Subscription or (2) keep the  
 353 Subscriptions, accept events, possibly format the notification in the natural language of the Notification  
 354 Recipient when a Human Consumable text format is used, and deliver the Notifications to the Notification  
 355 Recipient(s) indicated in the IPP Subscription. Figure 4 shows this partitioning.



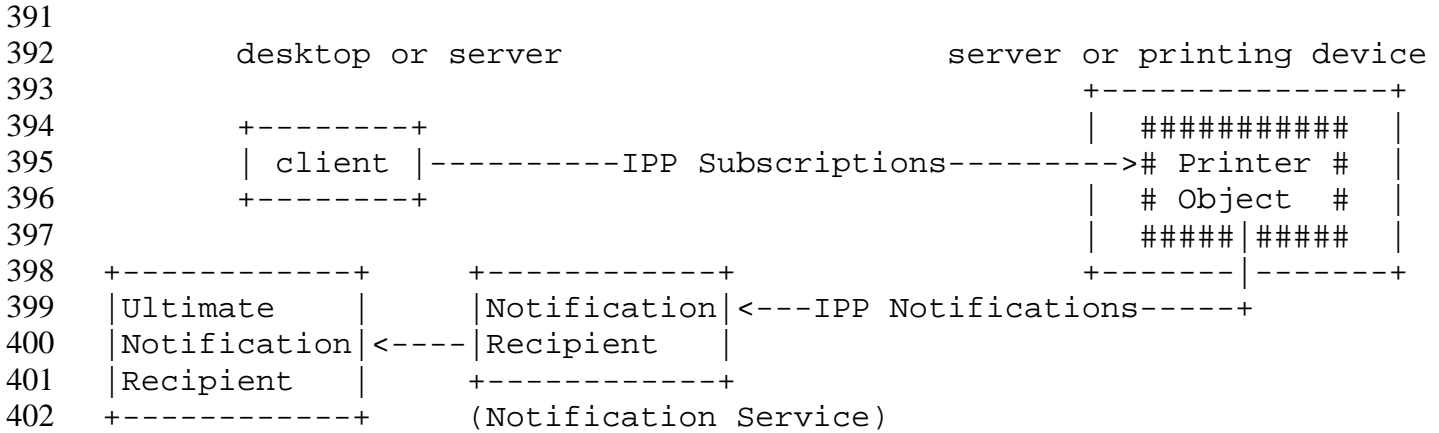
375 **Figure 4 - Opaque Use of a Notification Service Transparent to the Client**

376 In any case, the interface between the IPP Printer and the other notification service is outside the scope of  
 377 this document and is intended to be transparent to the client and this specification.

### 378 2.3.2 Use of Notification Service transparently to the IPP Printer

379 Another way that a Notification Service can be used is if the Notification Recipient indicated in the IPP  
 380 Subscription is a notification service (transparent to the IPP Printer), which in turn forwards the  
 381 Notification to the Ultimate Notification Recipient using additional parameters in the IPP Subscription  
 382 (URI parameters or subscriber user data). In such cases, the Ultimate Notification Recipient has also  
 383 subscribed directly with the other notification service (by means outside this document). As far as the IPP  
 384 Printer is concerned, the IPP Subscription indicated that the IPP Printer is to delivery Notifications to the  
 385 Notification Recipient (Notification Service) using the specified notification delivery method. The method  
 386 that the Notification Recipient uses for delivering the notification to the Ultimate Notification Recipient is

387 beyond the scope of this document and is transparent to the IPP Printer. However, the client does have to
388 know how to pass additional information to the Notification Recipient in the IPP Subscription using either
389 extra parameters in the URI or subscriber user data. Examples of this latter approach are paging,
390 immediate messaging services, and NOS vendors infrastructure. Figure 5 shows this approach.



403 **Figure 5 - Use of a Notification Service transparent to the IPP Printer**

404 **3 Terminology**

405 This section defines terminology used throughout this document.

406 **3.1 Conformance Terminology**

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

411 *Since support of this entire notification specification is OPTIONAL for conformance to*
412 *IPP/1.0 or IPP/1.1, the use of the term REQUIRED (R) in this document means*
413 *"REQUIRED if this notification specification is implemented". Likewise, the term*
414 *RECOMMENDED means "RECOMMENDED if this notification specification is*
415 *implemented" and OPTIONAL (O) means OPTIONAL if this notification specification is*
416 *implemented.*

417 **REQUIRED** - an adjective used to indicate that a conforming IPP Printer implementation **MUST**
418 **support the indicated operation, object, attribute, attribute value, status code, or out-of-band value in**
419 **requests and responses. See [ipp-mod] "Appendix A - Terminology for a definition of "support".**

420 *Since support of this entire notification specification is OPTIONAL for conformance to IPP/1.0*
421 *or IPP/1.1, the use of the term REQUIRED in this document means "REQUIRED if this*
422 *OPTIONAL notification specification is implemented".*

423 **RECOMMENDED** - an adjective used to indicate that a conforming IPP Printer implementation is
424 **recommended to support the indicated operation, object, attribute, attribute value, status code, or**
425 **out-of-band value in requests and responses. Since support of this entire notification specification**
426 **is OPTIONAL for conformance to IPP/1.0 or IPP/1.1, the use of the term REQUIRED in this**

427 document means "RECOMMENDED if this OPTIONAL notification specification is  
428 implemented".

429 OPTIONAL - an adjective used to indicate that a conforming IPP Printer implementation MAY, but is  
430 NOT REQUIRED to, support the indicated operation, object, attribute, attribute value, status code,  
431 or out-of-band value in requests and responses.

432 settable - an adjective used to indicate that a Printer implementation supports setting the value(s) of an  
433 attribute using the Set-Job-Attributes or Set-Printer-Attributes operations (see [ipp-set]).

434 READ-ONLY - an adjective used in an attribute definition to indicate that an IPP Printer ~~an attribute~~  
435 that MUST NOT support the attribute as being settable using the Set-Job-Attributes or Set-Printer-  
436 Attributes operations (see [ipp-set2]).

## 437 3.2 Other terminology

438 **Job Submitting End User** - A human end user who submits a print job to an IPP Printer. This person  
439 may or may not be within the same security domain as the Printer. This person may or may not be  
440 geographically near the printer.

441 **Administrator** - A human user who established policy for and configures the print system.

442 **Operator** - A human user who carries out the policy established by the Administrator and controls the  
443 day to day running of the print system.

444 **Job Submitting Application** - An application (for example, a batch application), acting on behalf of a  
445 Job Submitting End User, which submits a print job to an IPP Printer. The application may or may  
446 not be within the same security domain as the Printer. This application may or may not be  
447 geographically near the printer.

448 **Security Domain** - The set of network components which can communicate without going through a  
449 proxy or firewall. A security domain may be geographically very large, for example - anyplace  
450 within IBM.COM.

451 **IPP Client (or client)** - The software component (desktop or server) that sends an IPP operation  
452 request to an IPP Printer object (server or printing device) and accepts the resulting operation  
453 response from the IPP Printer object.

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

456 Example: If I use IPP to print a document on a printer in a business partner's office, I am the Job  
457 Submitting End User, while the person I intend the document for in my business partner's office is  
458 the Job Recipient. Since one of the goals of IPP is to be able to print near the Job Recipient of the  
459 printed output, we would normally expect that person to be in the same security domain as, and  
460 geographically near, the Printer. However, this may not always be the case. For example, I submit a  
461 print job across the Internet to a Kinko's print shop. I am both the Submitting End User and the Job  
462 Recipient, but I am neither near nor in the same security domain as the Printer.

463 **Job Recipient Proxy** - A human acting on behalf of the Job Recipient. In particular, the Job Recipient  
464 Proxy physically picks up the printed document from the Printer, if the Job Recipient cannot  
465 perform that function. The Proxy is **by definition** geographically near and in the same security  
466 domain as the printer.

467 Example: I submit a print job from home to be printed on a printer at work. I'd like my secretary to  
468 pick up the print job and put it on my desk. In this case, I am acting as both Job Submitting End  
469 User and Job Recipient. My secretary is acting as a Job Recipient Proxy

470 **Notification Subscriber (or Subscriber)** - A client that requests the IPP Printer to send Event  
471 Notifications to one or more Notification Recipients. A Notification Subscriber may be:

1. a Job Submitting End User or Job Submitting Application (desktop or server) that is submitting a job or
2. an End User, an Operator, or an Administrator that is not submitting a job.

**Subscription** - A request by a Notification Subscriber to the IPP Printer to send Event Notifications to a specified Notification Recipient when the event occur. A Subscription is represented as a set of attributes that indicate the "what, where, who, and how" for notification. Notifications are generated for certain events (what) and delivered using various delivery methods (how) to certain addresses (where and who).

**Per-Job Subscription** - A Subscription that a client specifies as part of a create job operation (Print-Job, Print-URI, Create-Job), a Validate-Job operation, or an explicit Create-Job-Subscription operation with a Job object as the target.

**Per-Printer Subscription** - A Subscription that a client specifies using an explicit Create-Printer-Subscription operation with a Printer object as the target.

**Notification Source** - The entity that sends Event Notifications. It MAY be the IPP Printer itself or the IPP Printer MAY be configured to use a Notification Service to delivery Notifications transparently to the subscribing clients (see Figure 4).

**Notification Recipient** - The entity identified as a recipient within a subscription that receives IPP Notifications about Job and/or Printer events (see Figure 4 and Figure 5). A Notification Recipient may be a: Job Submitting End User, Job Submitting Application (desktop or server), Job Recipient, Job Recipient Proxy, a Notification Service, an Operator, or Administrator, etc., and their representative or log file or usage statistics gathering application or other active or passive entities. A Java Listener is an example of a Notification Recipient.

**Ultimate Notification Recipient** - The entity to which the Notification Recipient (stores and) forwards an IPP Notification when the Notification Recipient is a Notification Service (see Figure 5).

**Event** - An event is some occurrence (either expected or unexpected) within the printing system of a change of state, condition, or configuration of a Job or Printer object. 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 and only if there is one or more event subscriptions outstanding for that event.

Events can be classified along two dimensions:

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

A Job event is some interesting state change in the Job object, and a Printer 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 printer stops. These are typical uses of the terms report, warning, and error, although the actual usage is implementation dependent.

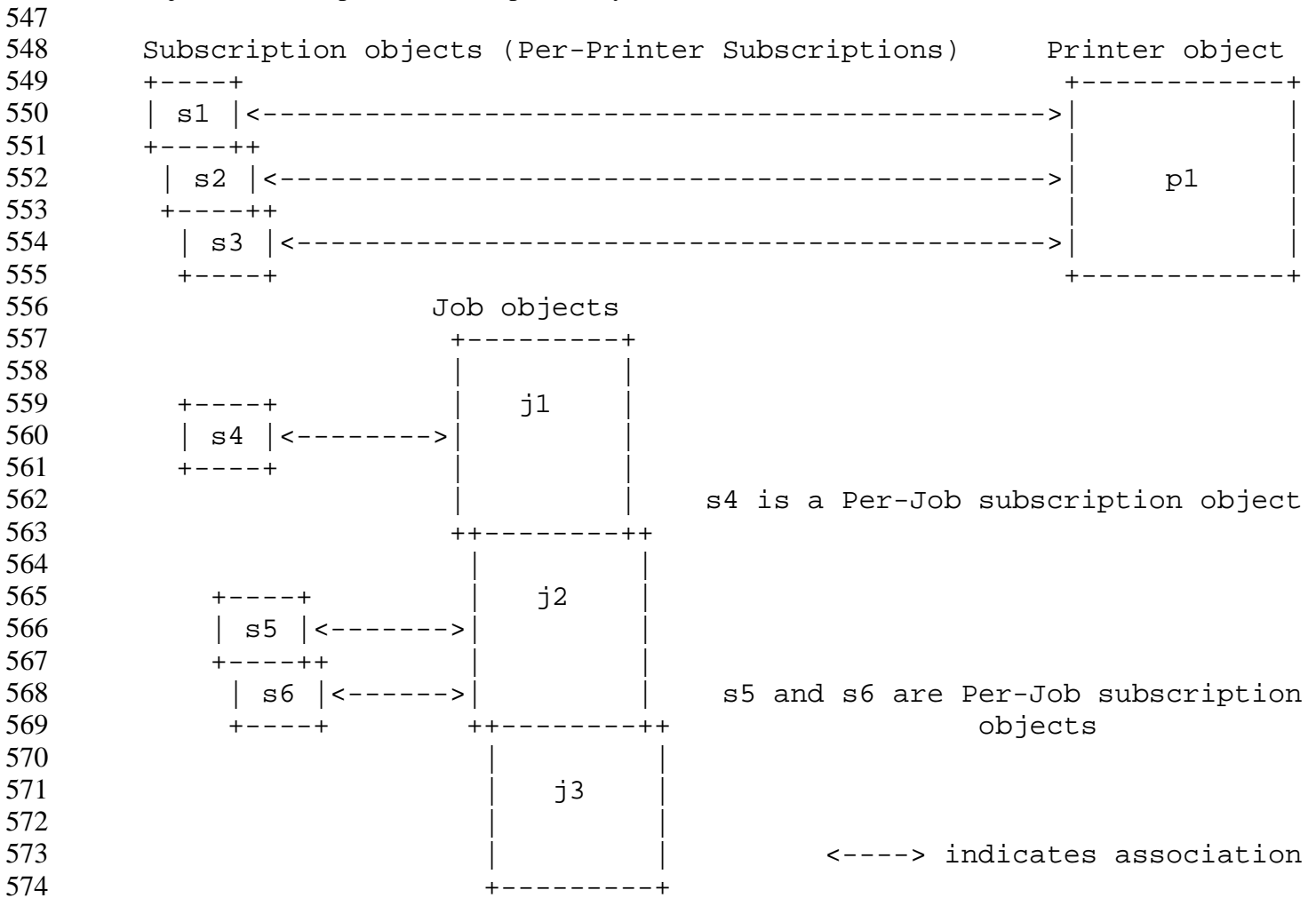
An event occurs for a job or printer whether any entity has subscribed to be notified for that event or not. A notification is only generated depending on the set of subscriptions outstanding.

518 **Notification** - When an event occurs, a Notification is generated that fully describes the event (what  
519 the event was, where it occurred, when it occurred, etc.). Notifications are delivered to each  
520 Notification Recipient that has a subscription that includes the event, if any. The Notification is  
521 delivered to the address of the Notification Recipient using the notification delivery method defined  
522 in the subscription. However, a Notification is sent ONLY if there is a corresponding subscription.  
523 **Notification Delivery Method** (or **Delivery Method** for short) - Notifications are delivered using a  
524 method, such as email, TCP/IP, etc.  
525 **Immediate Notification** - Notifications that are delivered using a delivery method which is not store-  
526 and-forward (e.g. TCP connection, UDP datagram). This can be on the order of several minutes  
527 subject to network latency.  
528 **Store and Forward Notification** - A Notification which are not necessarily delivered to Notification  
529 Recipients immediately, but is queued for delivery by some intermediate network application, for  
530 later retrieval. Email and Instant Messaging services are examples of a store and forward  
531 notification delivery method.  
532 **Human Consumable Notification** - Notifications that are intended to be consumed by human End  
533 Users only. They are simple text that has been localized for the Notification Recipient as specified  
534 in the subscription. Programs are not intended to parse Human Consumable Notification, since it is  
535 localized and the content depends on implementation. There is no standardized format.  
536 **Machine Consumable Notification** - Notifications that are intended for consumption by a program  
537 only. They use the encoding of an IPP response. The Notification Recipient must localize the  
538 contents, if displaying it to a human.  
539 **Subscription Creation operation** - One of the operations that creates a Subscription object: Job  
540 Creation operations (Create-Job, Print-Job, and Print-URI), Create-Job-Subscription, and Create-  
541 Printer-Subscription.

## 542 4 Object Model for Notification

543 This section describes the notification object model that adds a REQUIRED Subscription object which  
544 together with the Job and Printer object provide the complete notification semantics.  
545

546 The object relationships can be seen pictorially as:



575 **Figure 6 - Object Model for Notification**

576 s1, s2, and s3 are Per-Printer Subscription objects and can identify Printer and/or Job events.

577 s4, s5, and s6 are Per-Job subscription objects and can identify Printer and/or Job events.

578 **4.1 Object relationships**

579 This sub-section defines the object relationships between the Printer, Job, and Subscription objects.  
580 Whether Per-Printer Subscription objects are actually contained in a Printer object or are just bi-  
581 directionally associated with them in some way is IMPLEMENTATION DEPENDENT and is transparent  
582 to the client. Similarly, whether Per-Job Subscription objects are actually contained in a Job object or are  
583 just bi-directionally associated with them in some way is IMPLEMENTATION DEPENDENT and is  
584 transparent to the client. The object relationships are defined as follows:

585 **4.1.1 Printer object and Per-Printer Subscription objects**

- 586 1. The Printer object contains (is associated with) zero or more Per-Printer Subscription objects (p1  
587 contains s1-s3 Per-Printer Subscription objects).



- 588 2. A Per-Printer Subscription object (s1-s3) cannot be contained in (or associated with) more than one  
589 Printer object (p1).
- 590 3. Each Per-Printer Subscription object (s1, s2, and s3) is contained in (or is associated with) one  
591 Printer object (p1) and each represents one Per-Printer subscription.
- 592 4. Each Per-Printer Subscription object identifies one or more Job and/or Printer events. Such Job  
593 events are for *all* jobs on the Printer. Such Printer events are for *any* Printer event, no matter which  
594 job is processing and when no jobs are processing.

#### 595 **4.1.2 Job object and Per-Job Subscription objects**

- 596 5. A Job object (j1, j2, j3) contains (is associated with) zero or more Per-Job subscription objects (s4-  
597 s6). Job j1 is associated with Per-Job subscription object s4, Job j2 is associated with Per-Job  
598 subscription objects s5 and s6, and Job j3 is not associated with any Per-Job subscription object.
- 599 6. A Per-Job Subscription object cannot be contained in (or associated with) more than one Job object.
- 600 7. Each Per-Job Subscription object is contained in (or associated with) one Job object and each  
601 represents one Per-Job Subscription.
- 602 8. Each Per-Job Subscription object identifies one or more Job and/or Printer events. Such Job events  
603 are only for *this* job (different than "per-Printer" Subscriptions). Such Printer events are for *any*  
604 Printer event, no matter which job and when no jobs are processing (same as for "per-Printer"  
605 Subscriptions).

## 606 **5 Subscription Object attributes**

607 ~~The following notification attributes are defined for the~~ Table 2 lists the Subscription object attributes  
608 defined in this section and the related Printer Description attributes defined in section 6, if any. The  
609 definitions of the object attributes are specified here in this section so that they can be referred to from the  
610 subsequent definitions of the operations that set them. -All of the Subscription object attributes are  
611 READ-ONLY. They can be set only by specific operations that create or perform operations on  
612 Subscription objects (see section 8).

613

**Table 2 - Subscription object attributes**

Subscription object attributes: <u>Set by client input to a Subscription Creation operation</u>	Printer support	<u>Related Printer Description attribute(s)</u>
notify-recipient (uri)	REQUIRED	<u>notify-schemes-supported (1setOf uriScheme)</u>
notify-events (1setOf type2 keyword)	REQUIRED	<u>notify-events-default (1setOf type2 keyword)</u> <u>notify-events-supported (1setOf type2 keyword)</u> <u>max-events-supported (integer(5:MAX))</u>
notify-text-format (mimeMediaType)	REQUIRED	<u>notify-format-supported (1setOf mimeMediaType)</u>
subscriber-user-data (octetString(63))	REQUIRED	
notify-charset (charset)	OPTIONAL	<u>charset-supported (1setOf charset)</u>
notify-natural-languages (1setOf naturalLanguage)	OPTIONAL	<u>generated-natural-language-supported (1setOf naturalLanguage)</u>

614

<u>Subscription object attributes:</u> <u>Printer initializes to 0, increments at beginning of each event</u>	<u>Printer support</u>	<u>Related Printer Description attribute(s)</u>
<u>subscription-request-id (integer(0:MAX))</u>	REQUIRED	

615

<u>Subscription object attributes:</u> <u>Printer sets as part of Subscription Creation operation</u>	<u>Printer support</u>	<u>Related Printer Description attribute(s)</u>
subscription-id (integer(1:MAX))	REQUIRED	<u>max-job-subscriptions-supported (integer(0:MAX))</u> <u>max-printer-subscriptions-supported (integer(0:MAX))</u>
notify-lease-expiration-time (integer(0:MAX))	REQUIRED	<u>notify-lease-time-default (integer(0:MAX))</u> <u>notify-lease-time-supported (rangeOfInteger(0:MAX))</u>
printer-uri (uri)	REQUIRED	
subscriber-user-name (name(MAX))	<del>OPTIONAL</del> <u>REQUIRED</u>	

616

<u>Subscription object attributes: Returned by Printer on Subscription Creation operation</u>	<u>Printer support</u>	<u>Related Printer Description attribute(s)</u>
notify- <del>printer</del> server-up-time (integer(1:MAX))	REQUIRED	<u>printer-up-time (integer(1:MAX))</u>
notify-persistence-granted (boolean)	REQUIRED	<u>persistent-subscriptions-supported (boolean)</u>

617 Note: The Subscription object does not contain the "job-id" Subscription Description attribute. The Get-  
618 Subscriptions operation has the "job-id" as an input operation attribute, so the "job-id" isn't returned in the  
619 response. If an implementation needs such a link between Subscription objects and Job objects, then it  
620 keeps such a link as an internal attribute. The intent is that whether Per-Job Subscription objects are  
621 actually contained in a Job object or are just associated with them in some way is IMPLEMENTATION  
622 DEPENDENT and is transparent to the client.

## 623 5.1 notify-recipient (uri)

624 This REQUIRED READ-ONLY Subscription object attribute describes both where (the address of the  
625 Notification Recipient) and how (the delivery method) notifications are to be delivered to the Notification  
626 Recipient when any of the events specified in the "notify-events" attribute occur.

627 There are potentially many different notification delivery methods for IPP notifications, standardized as  
628 well as proprietary. This document does not define any of these delivery mechanisms; they will each be  
629 described in separate complementary documents.

630 Each of the notification delivery method documents must provide at least the following information:

- 631 1) The URI scheme used.
- 632 2) The supported and default delivery format, and if not one of the specified types in Section 5.3,  
633 description of the notification content.
- 634 3) Any content length restrictions imposed by the delivery protocol.
- 635 4) The latency of the delivery protocol used.
- 636 5) The reliability of the transport and delivery protocol used.
- 637 6) The security aspects of the transport and delivery protocol used, e.g. how it is handled in firewalls.
- 638 7) How the delivery protocol is initiated, e.g. does it have to be initiated by the receiving user (pull), or  
639 is it initiated by the notification service (push).

640 The following notification delivery schemes are defined in other documents for use as part of the URI value  
641 of this attribute:

- 642 'ipp:' - The Notification Recipient uses server directed polling to pull Notifications [ipp-method-poll]
- 643 'indp:' - The Notification Source sends Send-Notifications operations to the Notification Recipient [ipp-  
644 method-indp]
- 645 'mailto:' - The Notification Source sends a email message using SMTP with possible attachments  
646 containing Machine Consumable Notification Content [ipp-method-mailto]
- 647 'snmp:' - The Notification Source sends SNMP traps and/or informs to the Notification Recipient [ipp-  
648 method-snmp]

649 **ISSUE 01** - Ok to include the notification delivery scheme names 'ipp:', 'indp:', 'mailto:', and 'snmp:' that  
650 are in progress as example values of the "notify-recipient" (uri) attribute?

651 **ISSUE 02** - Once a number of delivery solutions have been developed and evaluated, we may want to  
652 make one or several of them REQUIRED for implementation to ensure a minimum set of interoperability.  
653 Which one or ones should be REQUIRED?

## 654 5.2 notify-events (1setOf type2 keyword)

655 This REQUIRED READ-ONLY Subscription object attribute identifies the job and/or printer events that  
656 are to be delivered to the Notification Recipient as Notifications as defined in section 7. If the client did  
657 not supply this attribute when supplying the subscription, the Printer object populates this attribute with its  
658 "notify-events-default" attribute value (see section 6.2).

659 There are both job events and printer events. Each job and printer event is assigned a keyword to use in  
660 this attribute and in the Notification. Job and printer events have the following semantics depending on  
661 whether the subscription is a Per-Job or a Per-Printer subscription:

662 Job events: The semantics for job events depends on whether the subscription is a Per-Job  
663 Subscription or a Per-Printer Subscription. For Per-Job Subscriptions, the Printer MUST  
664 generate Notifications only for the job events of the job with which the Subscription is  
665 associated. For Per-Printer Subscriptions, the Printer MUST generate Notifications for the  
666 job events for any job submitted to the Printer.

667 For example, consider the event when there are 10 'pending' jobs, one 'processing' job, and  
668 30 'completed' jobs and the 'processing' job completes. The Printer MUST generate a 'job-  
669 completed' job event Notification if the job has a Per-Job Subscription that contained the  
670 'job-completed' event in this attribute. The Printer MUST NOT generate Notifications for  
671 any other jobs whose Per-Job Subscriptions contain the 'job-completed' event in this  
672 attribute.

673 Printer events: The semantics for printer events does not depend on whether the subscription is a  
674 Per-Job or a Per-Printer Subscription. For both Per-Job Subscriptions and Per-Printer  
675 Subscriptions, the Printer MUST generate Notifications for printer events, no matter what  
676 job is processing, including when no jobs are processing.

677 For example, consider the event when there are 10 'pending' jobs, one 'processing' job, and  
678 30 'completed' jobs and the Printer enters the 'stopped' state. The Printer MUST generate a  
679 'printer-state-changed' printer event Notification for each of the 11 'pending' and 'processing'  
680 jobs whose Per-Job Subscriptions contain the 'printer-state-changed' event in this attribute.  
681 The Printer MUST NOT generate Notifications for any of the 'completed' jobs' whose Per-  
682 Job Subscriptions contain the 'printer-state-changed' event in this attribute.

683 The events are defined to be disjoint. For example, the 'job-state-changed' event does not include the 'job-  
684 created' and 'job-completed' events. In order to get all three events, the client supplies all three keywords in  
685 this attribute.

686 A Printer MUST support the events indicated as "REQUIRED" and MAY support of the events indicated  
687 as "OPTIONAL".

688 The standard job event keyword values are:

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

691 **'job-created'**: REQUIRED - the Printer object has accepted a Job Creation operation (Print-Job, Print-  
692 URI, or Create-Job) and the job's "time-at-creation" attribute value is set (see [ipp-mod] section  
693 4.3.14.1). The Printer puts the job in the 'pending', 'pending-held' or 'processing' states.

694 Note: This event is separate from the 'job-state-changed' event so that it can be subscribed to  
695 without having to get every job state change event for a Notification Recipient that is only  
696 interested in when the job is first created.

697 **'job-completed'**: REQUIRED - the job has reached one of the completed states, i.e., the value of the  
698 job's "job-state" attribute has changed to: 'completed', 'aborted', or 'canceled'. The Job's "time-at-  
699 completed" and "date-time-at-completed" (if supported) attributes are set (see [ipp-mod] section  
700 4.3.14).

701 Note: This event is separate from 'job-state-changed' so that it can be subscribed to without having  
702 to get every job state change event for a Notification Recipient that is only interested in when the  
703 job is completed.

704 **'job-state-changed'**: REQUIRED - the job has changed from any state to any other state and/or a  
705 value has been added or removed from the job's "job-state-reasons" attribute, except when the job is  
706 created or when the job moves to any of the "completed" job states ('completed', 'aborted', or  
707 'canceled').

708  
709 This event also indicates that one or more values have been added to or removed from the Job's  
710 "job-state-reasons" attribute, such as 'job-queued' or 'job-printing', whether or not the job's state has  
711 changed. If job state reasons are added when the job is created, only the 'job-created' event is  
712 generated, in order to keep the events disjoint. If job state reasons are added or removed when the  
713 job is completed, only the 'job-completed' event is generated, in order to keep the events disjoint.

714  
715 A client that wants to subscribe to all job state changes, including creation and completion, includes  
716 the 'job-created', 'job-state-changed', and 'job-completed' in the notification subscription. When a  
717 job is finally removed from the Job History (see [ipp-mod] 4.3.7.1) no event is generated, i.e.,  
718 neither a 'job-state-changed' event nor a 'job-purged' event is generated.

719 **'job-config-changed'**: OPTIONAL — when the configuration of a job has changed, i.e., the value of  
720 the "job-message-from-operator" or any of the non-READ-ONLY Job attributes have changed, such  
721 as any of the job template attributes or the "job-name" attribute. **Typically Often**, such a change is  
722 the result of the user or the operator performing a Set-Job-Attributes operation (see [ipp-set2]) on  
723 the Job object. The client performs a Get-Job-Attributes to find out the new values of the changed  
724 attributes. This event is useful for GUI clients and drivers to update the job information to the user.

725 **'job-purged'**: OPTIONAL - when a 'not-completed' job (i.e., not 'completed', 'canceled', or 'aborted')  
726 was purged from the printer using the Purge-Jobs operation. No event, including this event, is  
727 generated when a job is aged out of the Job History or moved out explicitly with the Purge-Jobs  
728 operation.

729 **'job-progress'** - a sheet or copy has completed. See separate [ipp-prog] spec.

730

731 The standard Printer event keywords values are:

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

- 734 **'printer-restarted'**: OPTIONAL - when the printer is powered up or the Restart-Printer operation is  
735 performed (see [ipp-set2mod]).  
736 Note: This event is separate from the 'printer-state-changed' event so that it can be subscribed to  
737 without having to get every printer state change event, for a Notification Recipient that is only  
738 interested in when the Printer first comes up.
- 739 **'printer-shutdown'**: OPTIONAL - when the device is being powered down or the Shutdown-Printer  
740 operation has been performed ~~with either power off or standby options~~ (see [ipp-set2]).  
741 Note: This event is separate from 'printer-state-changed' so that it can be subscribed to without  
742 having to get every Printer state change event, for a Notification Recipient that is only interested in  
743 when the Printer is powered down or shutdown.
- 744 **'printer-state-changed'**: REQUIRED - the Printer changed state, i.e., the value of the Printer's  
745 "printer-state", "printer-state-reasons" (whether "printer-state" changed or not), and/or "printer-is-  
746 accepting-jobs" attributes changed, except when the Printer starts up or is shutdown. If printer state  
747 reasons are added when the Printer is started up, only the 'printer-restarted' event is generated, in  
748 order to keep the events disjoint. If printer state reasons are added or removed when the printer is  
749 powered-down or shutdown, only the 'printer-shutdown' event is generated, in order to keep the  
750 events disjoint.  
751
- 752 A client that wants to subscribe to all printer state changes, including restart and power-  
753 down/shutdown, includes the 'printer-restarted', 'printer-state-changed', and 'printer-shutdown' in the  
754 notification subscription.
- 755 **'printer-media-changed'**: OPTIONAL —\_ when the media loaded on a printer has been changed, i.e.,  
756 the "media-ready" attribute has changed. This event includes both an actual media change and  
757 filling an empty input tray with the same or different media. The client must check the "media-  
758 ready" Printer attribute (see [ipp-mod] section 4.2.11) separately to find out what new media was  
759 loaded or filled.
- 760 **'printer-config-changed'**: OPTIONAL —\_ when the configuration of a Printer has changed, i.e., the  
761 value of the "printer-message-from-operator" or any non-READ-ONLY Printer attribute has  
762 changed, except for "media-ready" (which has its own event), whether through the Set-Printer-  
763 Attributes operation or by other means and whether initiated by a human or not. For example, any  
764 "xxx-supported", "xxx-default", "printer-message-from-operator", etc. values have changed. The  
765 client has to perform a Get-Printer-Attributes to find out the new values of these changed attributes.  
766 This event is useful for GUI clients and drivers to update the available printer capabilities to the  
767 user.
- 768 **'printer-queue-changed'**: OPTIONAL - the order of jobs in the Printer's queue has changed, so that an  
769 application that is monitoring the queue can perform a Get-Jobs operation to determine the new  
770 order. This event does not include when a job enters the queue (the 'job-created' event covers that)  
771 and does not include when a job leaves the queue (the 'job-completed' event covers that).
- 772 **'printer-no-longer-full'**: OPTIONAL —\_ when the Printer can now accept a Print-Job, Print-URI,  
773 Create-Job, Send-Document, or Send-URI request. This event is used when there is more than one  
774 client feeding a printer/server (fan-in), and the Printer may still be printing but has acquired more  
775 buffer space to accept jobs. This event only occurs when the Printer did not have room to accept  
776 jobs previously and rejected a Print-Job, Print-URI, Create-Job, Send-Document, or Send-URI  
777 operation.
- 778 **'printer-almost-idle'**: OPTIONAL —\_ when the Printer needs another Job in order to stay busy. This  
779 event is used when a spooler is feeding more than one printer/server (fan-out), and the spooler holds

780 jobs until a Printer requests them, rather than committing jobs to IPP Printers before it is necessary.  
781 This event MAY be used by a Printer implementation to request a new job from any subscribers  
782 sufficiently ahead of time so that the device does not run out of work between jobs.  
783

### 784 5.3 ~~notify-text-format~~ (mimeMediaType)

785 This REQUIRED READ-ONLY Subscription object attribute indicates the MIME Media type of Human  
786 Consumable and/or Machine Consumable format content that is to be sent in the Notifications for the  
787 Notification Content that is under control of the Subscriber. Depending on the delivery method definition  
788 document-~~f~~, this attribute MAY specify the MIME Media type for the entire Notification Content, or just a  
789 portion that is controllable by the subscriber, if there is a fixed part as well. For example, if the entire  
790 Notification Content is always a fixed Machine Consumable MIME Media type, such as the 'ipp:' delivery  
791 method which uses the 'application/ipp' MIME Media type (see [indp-method]), then this attribute controls  
792 the format of the ~~the Human Consumable format is represented either (1) as the entire Notification content,~~  
793 ~~instead of the Machine Consumable format defined for the notification scheme, if any, (2) the value of the~~  
794 "human-readable-report" (text(MAX)) Notification Content attribute (see section 7.2) in the Machine  
795 Consumable form. As another example, if the Notification Content is always a Human Consumable format  
796 content with a MIME Media attachment, such as with the 'mailto:' delivery method [ipp-method-mailto],  
797 this attribute controls the format of the attachment. Most delivery methods are defined to have a particular  
798 Machine Consumable forms of notification content type and to permit Human Consumable forms as well.  
799 An implementation MAY support one or more Human Consumable formats, i.e., 'text' MIME media types,  
800 for those delivery methods that permit the Human Consumable form.

801 If the 'text' MIME media type registration permits a charset parameter, than such a specification MUST be  
802 used (instead of the "notify-charset" attribute - see section 5.5) in order to indicate the charset to be used in  
803 the notification content.

804 If the Subscriber did not supply this attribute when requesting the subscription, the Printer object populates  
805 this Subscription object attribute with either the 'none' out-of-band value (see section 10.1) or one of the  
806 values of the Printer's "notify-~~text-format-supported~~" attribute (see section 6.5), depending on the delivery  
807 method and implementation, as follows: ~~If the delivery method defines a Machine Consumable form~~  
808 ~~without a "human-readable-report" attribute, the Printer sets the 'none' out-of-band value. Otherwise, the~~  
809 ~~Printer sets the attribute to one of its "notify-text-format-supported" attribute values. In the latter case, the~~  
810 ~~value selected depends on the implementation,~~ since there is no "notify-~~text-format-default~~" defined in this  
811 document.

812 Standard mimeMediaType values are:

- 813 'none': This out-of-band value (see section 10.1) indicates that the Subscriber-controllable part of the  
814 Notification content is not to be sent to be any of the text types, i.e., that the Machine Consumable,  
815 not the Human Consumable, form is to be sent. Furthermore, the Machine Consumable Notification  
816 content MUST NOT include the "human-readable-report" attribute, if defined for the delivery  
817 method.
- 818 'text/plain; charset=utf-8': Human Consumable plain text containing characters from ISO 10646  
819 represented as UTF-8 [RFC2279] as defined in section 7.1.1.
- 820 'text/html': Human Consumable HTML data [RFC1866] as defined in section 7.1.1.
- 821 'text/xml': Machine Consumable XML data [RFC2376????] as defined in section 7.1.2.

822 ['application/ipp': Machine Consumable IPP request as defined in section 7.1.2 data encoded as in \[ipp-](#)  
823 [pro\].](#)  
824 ['application/postscript': Human Consumable PostScript \[RFC2046\]](#)  
825 ['image/tiff': Human Consumable image data \[RFC2302\]](#)  
826

#### 827 **5.4 subscriber-user-data (octetString(63))**

828 This REQUIRED READ-ONLY Subscription object attribute holds opaque information being sent from  
829 the Subscriber to the Notification Recipient, such as the identify of the Subscriber or a path or index to  
830 some Subscriber information. Or it MAY contain a key that the Notification Recipient needs in order to  
831 process the Notification, such as the ultimate recipient, if the Notification Recipient is a general application  
832 that in turn forwards notifications and the ultimate recipient isn't included in the value of the "notify-  
833 recipient" attribute. An Instant Messaging Service is an example of such a general application where the  
834 "subscriber-user-data" might be the user's id for that messaging service and the "notification-recipient" is  
835 the URL of the messaging service.

#### 836 **5.5 notify-charset (charset)**

837 This OPTIONAL READ-ONLY Subscription object attribute specifies the charset to be used in the  
838 Notification content sent to the Notification Recipient, whether the notification content is Machine  
839 Consumable or Human Consumable. This attribute MUST NOT be used when the "notify-text-format"  
840 attribute value specifies the charset parameter in its MIME media type value, e.g., 'text/plain; charset=utf-  
841 8'.

#### 842 **5.6 notify-natural-language (naturalLanguage)**

843 This OPTIONAL READ-ONLY Subscription object attribute specifies the natural language for the IPP  
844 object to use in the Notification content that is sent to the Notification Recipient, whether the notification  
845 content is Machine Consumable or Human Consumable.

#### 846 **5.7 subscription-request-id**

847 This REQUIRED READ-ONLY Subscription object attribute holds the most recent request-id sequence  
848 number delivered in a Notification content to the Notification Recipient. A value of 0 indicates that no  
849 Notifications have been sent for this subscription. The first request-id sent for a subscription MUST be 1.  
850 Each Notification Recipient [has-receives](#) its own monotonically increasing series of request-ids [operation](#)  
851 [parameters \(see \[ipp-mod\] section 3.1.2\)](#), i.e., no gaps, in order to be able to detect a missing notification.

#### 852 **5.8 subscription-id (integer (1:MAX))**

853 This REQUIRED READ-ONLY Subscription object attribute uniquely identifies this Subscription object  
854 instance on this Printer object or this Job object. The Printer object, on acceptance of a Create-Job-  
855 Subscription or Create-Printer-Subscription request, generates an ID which identifies the new Subscription  
856 object on that Printer or Job. The Printer returns the value of the "subscription-id" attribute as part of the



857 response to a Create-Job-Subscription or Create-Printer-Subscription request. The 0 value is not included  
858 to allow for compatibility with "job-id" and with SNMP index values which also cannot be 0.

859 It is RECOMMENDED that Per-Printer Subscription objects be persistent. Then the Subscription objects  
860 including the subscription-id remains unique across power-cycles. Even if an implementation does not  
861 make Per-Printer subscription objects persist, the implementation SHOULD make every attempt not to re-  
862 use subscription ids that subscribers might still think are valid. In other words, the Printer SHOULD at  
863 least keep the next subscription-id to be assigned in non-volatile memory. Note: it is assumed that Per-Job  
864 subscriptions are persistent if Jobs are persistent, in order to be consistent with the persistency of Job  
865 objects. The [ipp-mod] RECOMMENDS that Job objects be persistent.

## 866 **5.9 notify-lease-expiration-time (integer(0:MAX))**

867 This REQUIRED READ-ONLY Subscription object attribute specifies the time in the future when the  
868 subscription lease will expire, i.e., the "printer-up-time" value at which the lease will expire. When the  
869 Printer object creates a Per-Printer Subscription object, it populates this attribute with the appropriate value.  
870 When the indicated time arrives, the Printer MUST delete the Per-Printer Subscription object. Per-Job  
871 Subscription objects always return a value of 0 since Per-Job Subscriptions don't have a lease, but exist for  
872 the life-time of the Job instead.

873 A client is able to extend a lease of a Per-Printer subscription using the Renew-Subscription operation (see  
874 section 8.3.3). A value of 0 indicates an infinite time, if such a policy is supported as indicated in the  
875 "notify-lease-time-supported" (integer(0:MAX)) Printer Description attribute (see section 6.8) and the  
876 subscriber is authorized to request an infinite lease. A Per-Job subscription cannot be renewed.

877 Note: In order to compute the number of seconds remaining in a Per-Printer Subscription lease, a client can  
878 subtract the "notify-~~printer~~server-up-time" Subscription object attribute (see section 5.12) from the "notify-  
879 lease-expiration-time" Subscription object attribute.

## 880 **5.10 printer-uri (uri)**

881 This REQUIRED READ-ONLY Subscription object attribute identifies the Printer object that created this  
882 Subscription object. When a Printer object creates a Subscription object, it populates this attribute with the  
883 Printer object URI that was used in the create request. This attribute permits a client to identify the Printer  
884 object URI that was used to create this Subscription object, i.e., what security scheme was used.

## 885 **5.11 subscriber-user-name (name(MAX))**

886 This ~~OPTIONAL~~REQUIRED READ-ONLY Subscription object attribute contains the name of the user  
887 that created the Subscription object. The Printer object sets this attribute to the most authenticated printable  
888 name that it can obtain from the authentication service over which the IPP operation was received. This  
889 attribute is intended to help a human user determine for which Per-Printer Subscriptions they are the  
890 Subscriber. Only if such is not available, does the Printer object use the value supplied by the client in the  
891 "requesting-user-name" operation attribute of the create operation (see [IPP-MOD] Sections 4.4.2, 4.4.3,  
892 and 8). For Per-Job subscriptions created as part of the Job creation operation, the value of the "subscriber-  
893 user-name" is the same as the "job-originating-user-name" Job attribute (see [ipp-mod] section 4.3.6).

894 The value of the "subscriber-user-name" is implementation dependent when a server accepts a request and  
895 forwards it to a downstream IPP Printer (see Figure 2 and the [ipp-iig]).

896 Note: The Printer object needs to keep an internal originating user id of some form, typically as a  
 897 credential of a principal, with the Subscription object. Since such an internal attribute is implementation-  
 898 dependent and not of interest to clients, it is not specified as a Subscription Description attribute. This  
 899 originating user id is used for authorization checks (if any) on all subsequent operations.

## 900 5.12 notify-~~printer~~server-up-time (integer(1:MAX))

901 This REQUIRED READ-ONLY Subscription object attribute indicates the amount of time (in seconds)  
 902 that the Printer or Notification Delivery Service implementation has been up and running. This attribute is  
 903 an alias for the Printer's "printer-up-time" attribute" (see [ipp-mod] section 4.4.29) if the Printer is keeping  
 904 the Subscription objects or is the up time for the Notification Delivery Service if the Printer has delegated  
 905 the responsibility for keeping Subscription objects to a notification delivery service, in an analogous way  
 906 that the Job's "job-printer-up-time" is an alias for "printer-up-time" Printer attribute (see [ipp-mod] section  
 907 4.3.13.4).

908 Note: The purpose of this attribute is so that A-a client can request this attribute in a Get-Subscription-  
 909 Attributes or Get-Subscriptions request and use the value returned in combination with the "notify-lease-  
 910 expiration-time" (see section 5.9) in order to display the wall clock time equivalent to the user. The  
 911 difference between this attribute and the 'integer' value of the "notify-lease-expiration-time" attribute is the  
 912 number of seconds in the future that the subscription will expire. A client can compute the wall-clock time  
 913 at which the subscription will expire by adding this difference to the client's wall-clock time.

## 914 5.13 notify-persistence-granted (boolean)

915 This REQUIRED READ-ONLY Subscription object attribute indicates whether or not the Per-Job or Per-  
 916 Printer Subscription is persistent, i.e., saved across power cycles in an implementation-define manner.

## 917 6 Printer Description Attributes related to Notification

918 This section defines the Printer Description attributes that are related to Notification. Table 3 lists the  
 919 Printer Description attributes and indicates the Printer support required for conformance and whether or not  
 920 the attribute is READ-ONLY: "R" indicates REQUIRED, "O" indicates OPTIONAL, and "CR" indicates  
 921 CONDITIONALLY REQUIRED, i.e., required if Human Consumable notification formats are supported.

922 **Table 3 - Printer Description attributes associated with Notification**

Printer object attributes:	Printer support	READ-ONLY? set by:
notify-schemes-supported (1setOf uriScheme)	<u>REQUIRED</u>	<u>no</u>
notify-events-default (1setOf type2 keyword)	<u>REQUIRED</u>	<u>no</u>
notify-events-supported (1setOf type2 keyword)	<u>REQUIRED</u>	<u>no</u>
max-events-supported (integer(5:MAX))	<u>REQUIRED</u>	<u>no</u>
notify- <del>text</del> format-supported (1setOf mimeMediaType)	<u>REQUIRED</u>	<u>no</u>
max-job-subscriptions-supported (integer( <u>0+</u> :MAX))	<u>REQUIRED</u>	<u>no</u>

Printer object attributes:	Printer support	READ-ONLY?; set-by:
max-printer-subscriptions-supported (integer(0:MAX))	<u>REQUIRED</u>	<u>no</u>
notify-lease-time-supported (rangeOfInteger(0:MAX))	<u>REQUIRED</u>	<u>no</u>
notify-lease-time-default (integer(0:MAX))	<u>REQUIRED</u>	<u>no</u>
persistent-jobs-supported (boolean)	<u>OPTIONAL</u>	<u>no</u> ISSUE 03: ok to allow to be settable?
persistent-subscriptions-supported (boolean)	<u>OPTIONAL</u>	<u>no</u> ISSUE 04: ok to allow to be settable?
printer-state-change-time (integer(1:MAX))	<u>OPTIONAL</u>	<u>yes</u>
printer-state-change-date-time (dateTime)	<u>OPTIONAL</u>	<u>yes</u>

923

### 924 **6.1 notify-schemes-supported (1setOf uriScheme)**

925 This REQUIRED Printer attribute describes the notification delivery methods supported by this Printer  
926 object. Standard values are defined in Section 5.1).

### 927 **6.2 notify-events-default (1setOf type2 keyword)**

928 This REQUIRED Printer attribute identifies the event values if the client does not supply the "notify-  
929 events" operation attribute in ~~either a Job creation request, Create Job Subscription, or the Create Printer~~  
930 ~~Subscription request~~ a Subscription Creation operation. Any value in this attribute MUST also appear in the  
931 "notify-events-supported" attribute, i.e., be a supported event.

### 932 **6.3 notify-events-supported (1setOf type2 keyword)**

933 This REQUIRED Printer attribute identifies the events supported by this Printer object for both Per-Job and  
934 Per-Printer subscriptions which MUST be the same. Standard values are defined in Section 5.2.

### 935 **6.4 max-events-supported (integer(5:MAX))**

936 This REQUIRED Printer attribute specifies the maximum number of events that are supported in a single  
937 Per-Job or Per-Printer subscription which must be the same. A Printer MUST support at least 5 events per  
938 subscription, so that clients can depend on at least 5 events in a single subscription. If the number of events  
939 supplied by a client in a subscription exceed this number, the Printer rejects the request and returns the  
940 ~~'server'~~ client-error-too-many-events (see section 15.4). If notification is not supported, this attribute MUST  
941 NOT be supported.

## 942 6.5 ~~notify-text-format-supported~~ (1setOf mimeType)

943 This ~~CONDITIONALLY~~REQUIRED Printer attribute identifies the MIME media types supported for  
944 Human Consumable and/or Machine Consumable notification content that the subscriber can control, if any  
945 for those notification delivery methods that support Human Consumable format (most do). If the  
946 Notification content is fixed by the implementation, then the value of this attribute is that MIME media  
947 type, if it has been registered, or the 'none' out-of-band value (see section 10.1) otherwise. See the  
948 definition of the "notify-format" attribute in section 5.3 for details and some example values. If an  
949 implementation supports any Human Consumable formats, it MUST support this attribute and MUST  
950 support those Human Consumable formats for all notification delivery methods that permit a Human  
951 Consumable format. If the implementation does not support any Human Consumable MIME media types,  
952 then the 'none' MUST be the only value of this attribute or this attribute MUST NOT be supported at all.

953 ~~A client can determine what formats are supported for a notify scheme as follows. The implementation~~  
954 ~~contains a hard coding of the Machine Consumable format (obtained from the specification). If the hard~~  
955 ~~coding (obtained from the specification) prohibits a Human Consumable format for the notify scheme, or~~  
956 ~~the printer doesn't support the "notify-text-format-supported" attribute, there are no Human Consumable~~  
957 ~~formats for any notify scheme. Otherwise, the attribute "notify-text-formats-supported" specifies the~~  
958 ~~supported mime types for those delivery schemes that are supported and permit a Human Consumable~~  
959 ~~format.~~

960 ~~Note: The rationale for the "notify-text-format-supported" attribute is that the Machine Consumable format~~  
961 ~~seems easy to pick for each notify scheme and thus easy to document. It is easy for a printer to support~~  
962 ~~most Machine Consumable formats. Not all formats listed in the "notify-format-supported" attribute need~~  
963 ~~be available with all delivery methods specified in the "notify-schemes-supported". However, all Human~~  
964 ~~Consumable formats, if any, SHOULD be available with all delivery methods. It is much harder to support~~  
965 ~~a Human Consumable format because of localization issues. Once the code is written to support a~~  
966 ~~particular Human Consumable format, it is easy to transmit it on any of the supported notify-schemes.~~  
967 ~~Thus, if a vendor decides to support a notify-scheme, it has already committed to implement the Machine~~  
968 ~~Consumable format. This may be simple if existing code can be reused, e.g. application/ipp and or more~~  
969 ~~difficult if new code must be written, e.g., it is SNMP.~~

## 970 6.6 max-job-subscriptions-supported (integer(0:MAX))

971 This REQUIRED Printer attribute specifies the maximum number of Per-Job subscriptions that are  
972 supported for a job, i.e., the maximum number of collection values for the "job-notify" operation attribute,  
973 and/or the maximum number of subsequent Create-Job-Subscription operation requests in combination for  
974 a job. A value of 0 indicates no effective maximum. A Printer MUST support at least 1 Per-Job  
975 subscription. If the number of Per-Job subscriptions supplied by a client in a Job Creation request exceeds  
976 the value of this attribute or would exceed some implementation-defined total number of Per-Job  
977 Subscriptions for the Printer, the Printer MUST accept the Job Creation and ignore the excess  
978 subscriptions. If a subsequent Create-Job-Subscription request would exceed this number, the Printer  
979 rejects the request and returns the '~~server~~client-error-too-many-subscriptions' (see section 15.3).

980 If a Printer does not support Per-Job Subscriptions, it MUST NOT support this attribute. The usual way for  
981 a client to determine whether an IPP Printer supports a feature is to query the Printer's "operations-  
982 supported" attribute. However, there is no new REQUIRED operation for Per-Job Subscriptions.  
983 Therefore, the RECOMMENDED way for a client to determine whether or not a Printer supports Per-Job

984 Subscriptions is to query this attribute to see if it is supported (since the Create-Job-Subscriptions is an  
985 OPTIONAL operation).

### 986 **6.7 max-printer-subscriptions-supported (integer(0:MAX))**

987 This REQUIRED Printer attribute specifies the maximum number of Per-Printer subscriptions that are  
988 supported by multiple Create-Printer-Subscription requests, i.e., the maximum number of un-expired Per-  
989 Printer Subscription objects that the Printer supports at a time. A value of 0 indicates no effective  
990 maximum. A Printer MUST support at least 1 Per-Printer subscription. If the number of Per-Printer  
991 subscriptions exceeds the value of this attribute or would exceed some implementation-defined total  
992 number of Per-Printer Subscriptions for the Printer (if any), the Printer rejects the Create-Printer-  
993 Subscription request and returns the 'clientserver-error-too-many-subscriptions' (see section 15.3).

994 If a Printer does not support Per-Printer Subscriptions, then it MUST NOT support this attribute. None the  
995 less, the RECOMMENDED way for a client to determine whether or not a Printer supports Per-Printer  
996 Subscriptions is to query the "operations-supported" to see if the Create-Printer-Subscriptions operation is  
997 supported, rather than querying this attribute.

### 998 **6.8 notify-lease-time-supported (rangeOfInteger(0:MAX))**

999 This REQUIRED Printer attribute specifies the range of values in seconds that are supported for the  
1000 "notify-lease-time-requested" operation attribute in a Create-Printer-Subscription or Renew-Subscription  
1001 request for a Per-Printer subscription. When the lease time expires for a Per-Printer Subscription without  
1002 renewing, the Printer MUST delete the Subscription object. If the client requests a value outside this range,  
1003 the Printer MUST grant a value that is in this range (see section 5.9). A value of 0 indicates an infinite  
1004 lease, i.e., one that does not expire.

### 1005 **6.9 notify-lease-time-default (integer(0:MAX))**

1006 This REQUIRED Printer attribute specifies the value of the lease time that the Printer object has been  
1007 configured to assume if the client does not supply a "notify-lease-time-requested" operation attribute in the  
1008 Create-Printer-Subscription or Renew-Subscription requests.

### 1009 **6.10 persistent-jobs-supported (boolean)**

1010 This OPTIONAL Printer attribute indicates whether or not the Printer supports persistent Jobs, i.e., Jobs  
1011 object that are preserved across power cycles. If Jobs are persistent, then Per-Job Subscriptions MUST also  
1012 be persistent, since they are part of the Job object. It is RECOMMENDED that Jobs (and Per-Job  
1013 Subscriptions) be persistent.

1014 If the Printer supports this attribute as settable, then its value MUST control whether or not the Printer  
1015 keeps Jobs persistently as per the rules in [ipp-set].

1016 ISSUE 03 again: OK to allow the "persistent-jobs-supported" (boolean) Printer Description attribute to be  
1017 settable?

## 6.11 persistent-subscriptions-supported (boolean)

This OPTIONAL Printer attribute indicates whether or not the Printer supports persistent Per-Printer Subscriptions, i.e., Subscription objects that are preserved across power cycles. When this value is 'true' the implementation MAY support some that are persistent and some that are not. If the value is 'false' or the attribute is not supported, Per-Printer Subscriptions MUST NOT be persistent. It is RECOMMENDED that Per-Printer subscriptions be persistent.

If the Printer supports this attribute as settable, then its value MUST control whether or not the Printer keeps Subscription objects persistently as per the rules in [ipp-set]).

ISSUE 04 again: OK to allow the "persistent-subscriptions-supported" (boolean) Printer Description attribute to be settable?

## 6.12 printer-state-change-time (integer(1:MAX))

This OPTIONAL READ-ONLY Printer attribute records the time, i.e., copy of the Printer's "printer-up-time" attribute, that the Printer's "printer-state" attribute was last changed. On power-up, the Printer populates the "printer-state-change-time" from its "printer-up-time" attribute, so that it always has a value.

## 6.13 printer-state-change-date-time (dateTime)

This OPTIONAL READ-ONLY Printer attribute records the date and time, i.e., copy of the Printer's "printer-current-time" (dateTime) attribute (see [ipp-mod] section 4.4.30), that the Printer's "printer-state" attribute was last changed. On power-up, the Printer populates the "printer-state-change-date-time" from its "printer-current-time" attribute, so that it always has a value.

# 7 Notification Content

This section defines the Notification content that is sent to a Notification Recipient when an event occurs. The Notification MAY be sent by the IPP Printer or a third party Notification Service (see section 2.3).

There are two notification content types: Machine Consumable and Human Consumable, i.e., 'text' MIME media type. For most notification delivery methods both content types are defined. Each Notification Content type will either define one specific Machine Consumable form (usual) or indicate that no Machine Consumable form is defined. In addition, each Notification Content type will indicate whether (usual) or not Human Consumable forms are permitted. But the definition will not define the Human Consumable forms. For those Human Consumable forms that a Printer implementation supports as indicated in the Printer's "notify-~~text~~-format-supported" attribute, it MUST support for all Notification Content formats supported that permit Human Consumable form.

## 7.1 Notification content MIME media type formats

This section defines the Notification content that the Notification Source sends asynchronously to each Notification Recipient based on the subscription information stored with the subscription. The Notification is either in a Human Consumable or Machine Consumable form.

### 7.1.1 Human Consumable form

If the notification delivery method is defined to permit Human Consumable forms such as the entire Notification Content or a portion of the Notification Content, such as either an attachment or the "human-readable-report" attribute (see section 7.2) then the following RECOMMENDATIONS apply:

The text message SHOULD include information about the attributes in sections 7.2 and 7.3 for job events or in sections 7.2 and 7.4 for printer events. This information is localized according to the information about natural language and charset in the subscription.

An implementation MAY extend the contents of a Human Consumable notification by adding additional information.

### 7.1.2 Machine Consumable form

If the notification delivery method is defined to have a Machine Consumable form and that form is defined to be the 'application/ipp' MIME media type [ipp-mod], then the following rules apply:

1. The notification content MUST use the 'application/ipp' MIME media type [ipp-mod] using one of: (1) the Get-Job-Attributes response encoding for job events, and (2) Get-Printer-Attributes response for printer events, or (3) a new Sent-Notifications operation for both job and printer events.
2. The attributes listed in sections 7.2 and 7.3 are sent in a Notification for Job events.
3. The attributes listed in sections 7.2 and 7.4 are sent in a Notification for Printer events.
4. For any 'text' or 'name' attribute value in any notification, the charset and natural language rules that apply to all IPP operations apply to these attributes as well, since they are represented as operation responses.
5. The "human-readable-report" attribute can be defined to be REQUIRED, OPTIONAL, or MUST NOT be sent~~The Unsupported-Attributes-Group in the response is not sent.~~
6. If the values of any of the attributes sent in an notification content are not known, the value sent in the report content is the out-of-band 'unknown' value, rather than omitting the attribute (see the beginning of [ipp-mod] section 4.1).

An implementation MAY extend the contents of the Machine Consumable notification by adding additional attributes. Notification Recipients MUST be able to accept Notifications containing attributes they do not recognize. What a Notification Recipient does with an unrecognized attribute is implementation-dependent. Notification Recipients MAY attempt to display unrecognized attributes anyway or MAY ignore them.

**ISSUE 05 - Can an implementation extend the Notification Content to include an attribute that uses the 'collection' attribute syntax? If so, should we REQUIRE that Notification Recipients that can accept Machine Consumable Notifications, be able to accept the 'collection' attribute syntax?**

## 7.2 Notification content attributes common to Job and Printer events

This section lists the parameters and attributes that are included in both Job and Printer event Notifications.

1088 The notification delivery method either models the Notification as a (1) request if the IPP Printer sends the  
 1089 Notification to the Notification Recipient when the event occurs or as a (2) response if the IPP Printer is  
 1090 queried for the Notification by a Notification Recipient:

1091 Request: If the delivery method defines that the IPP Printer sends the Notification, then the delivery  
 1092 method also defines whether or not the Notification Recipient returns a response. If the IPP Printer  
 1093 sends a Notification request, it uses the "operation-id" alternative for item #2 in Table 4:

1094 Response: If the delivery method defines that the IPP Printer supports an operation that returns a  
 1095 Notification as a response to the Notification Recipient, it uses the "status-code" alternative for item  
 1096 #2 in Table 4.

1097 Some events do not include all of these attributes as shown in Table 4. Each notification content contains a  
 1098 single Job or Printer event, whether that event was subscribed using the Job Submission Subscription  
 1099 mechanism or the Per-Printer subscription mechanism. If either kind of Subscription subscribed to both  
 1100 Job and Printer events, then the Printer will send or return them as separate Job Notification content and  
 1101 Printer Notification contents to the same Notification Recipient.

1102 Table 4 lists the attributes that are defined for use in Notifications and indicates the Printer support required  
 1103 for conformance: "~~R" indicates REQUIRED for Printers to support and "O" indicates OPTIONAL for~~  
 1104 ~~Printers to support.~~ References of the form "mod m.n.o" refer to [ipp-mod] sections.

1105 **Table 4 - Common Job and Printer Notification content attributes**

Attributes	Reference	Events	
		'job-progress'	all others
<b>The following attributes MUST occur in this order:</b>			
1. version-number (integer (0:32767))	mod 3.1.1	<b>REQUIRED</b>	<b>REQUIRED</b>
2. operation-id (integer (0:32767)) or status-code (integer (0:32767))	mod 3.1.1	<b>REQUIRED</b>	<b>REQUIRED</b>
3. request-id (integer (0:MAX))	5.7 & mod 3.1.1	<b>REQUIRED</b>	<b>REQUIRED</b>
4. attributes-charset (charset)	5.5 & mod 3.1.4	<b>REQUIRED</b>	<b>REQUIRED</b>
5. attributes-natural-language (naturalLanguage)	5.6 & mod 3.1.4	<b>REQUIRED</b>	<b>REQUIRED</b>
6. printer-uri (uri)	5.10	<b>REQUIRED</b>	<b>REQUIRED</b>
<b>The following attribute MAY occur in any order:</b>			
7. printer-name (name(127))	mod 4.4.4	<u>n/a</u>	<b>REQUIRED</b>
8. job-id (integer(1:MAX))	mod 4.3.2	<b>REQUIRED</b>	<b>REQUIRED**</b>
9. job-name (name(MAX))	mod 4.3.5	<u>n/a</u>	<b>REQUIRED**</b>



Attributes	Reference	Events	
		'job-progress'	all others
10. trigger-event (type2 keyword)	7.2.1	<u>REQUIRED</u>	<u>REQUIRED</u>
11. trigger-time (integer(MIN:MAX))	7.2.2	<u>REQUIRED</u>	<u>REQUIRED</u>
12. trigger-date-time (dateTime)	7.2.3	<u>n/a</u>	<u>OPTIONAL</u>
13. subscription-id (integer(1:MAX))	5.8	<u>REQUIRED</u>	<u>REQUIRED</u>
14. subscriber-user-name (name(MAX))	5.11	<u>REQUIRED</u>	<u>REQUIRED</u>
15. subscriber-user-data (octetString(63))	5.4	<u>REQUIRED</u>	<u>REQUIRED</u>
16. notify-text-format (mimeType)	5.3	<u>OPTIONAL</u>	<u>OPTIONAL</u>
17. human-readable-report (text(MAX))	7.2.4	<u>OPTIONAL</u>	<u>OPTIONAL</u>

1106 Attribute Notes:

1107 "version-number" - the major and minor version number.

1108 "operation-id" - the operation id if the delivery method document models the Notification as the Printer  
 1109 sending the Notification to the Notification Recipient (whether the Notification Recipient returns a  
 1110 response or not).

1111 "status-code" - a value of 0x600 (hexadecimal 600) for a Job event and 0x601 (hexadecimal 601) for a  
 1112 Printer event if the delivery method document models the Notification as the Printer returning the  
 1113 Notification to the Notification Recipient as a response to a request.

1114 "request-id" - the sequence number for this subscription, starting at 1, for each subscription, i.e., the Printer  
 1115 copies the current value of the "subscription-request-id" Subscription object attribute to the  
 1116 Notification request content.

1117 "attributes-charset" - the value comes from the "notify-charset" attribute in the Subscription object.

1118 "attributes-natural-language" - the value comes from the "notify-natural-language" attribute in the  
 1119 Subscription object.

1120 "printer-uri" - the value comes from the "job-printer-uri" Job attribute for Per-Job subscriptions.

1121 **\*\*"job-id" and "job-name"** - included in Printer event Notifications only for Per-Job subscriptions.

1122 "job-name" - SNMP delivery method can truncate to less than 255 octets, since the Notification needs to fit  
 1123 into 484 octets or so on some transports that SNMP is defined for.

1124 "subscription-id" - the unique identifier for the Subscription object on this Printer.

1125 "subscriber-user-name" - the subscriber user name that created the Subscription object. SNMP delivery  
 1126 method can truncate to less than 255 octets, since the Notification needs to fit into 484 octets or so  
 1127 on some transports that SNMP is defined for.

1128 "subscriber-user-data" - opaque user data that may identify either the Subscriber and/or the ultimate  
 1129 Notification Recipient. The client MUST supply this attribute, if the definition of the delivery  
 1130 method specified in the "notify-recipient" attribute REQUIRES the client to supply it.

1131 "notify-text-format (mimeMediaType) - indicates the text MIME media type (see section 5.3) for the  
 1132 "human-readable-report" attribute. This attribute MUST be present if the "human-readable-report"  
 1133 (text(MAX)) attribute is present in order to unambiguously identify the format of its text value to  
 1134 the Notification Recipient.

### 1135 **7.2.1 "trigger-event" (type2 keyword)**

1136 This REQUIRED Notification Content attribute indicates the event that caused this Notification to be  
 1137 delivered.

### 1138 **7.2.2 "trigger-time" (integer(MIN:MAX))**

1139 This REQUIRED Notification Content attribute indicates the time at which the event occurred, i.e.,  
 1140 "trigger-time"—the "printer-up-time" value (see [ipp-mod] section 4.4.29) when the event occurred.

### 1141 **7.2.3 "trigger-date-time" (dateTime)**

1142 This OPTIONAL Notification Content attribute indicates the date and time at which the event occurred,  
 1143 i.e., "trigger-date-time"—the "printer-current-time" value (see [ipp-mod] section 4.4.30) when the event  
 1144 occurred—OPTIONAL to support.

### 1145 **7.2.4 "human-readable-report" (text(MAX))**

1146 ~~"human-readable-report (text(MAX))—the~~ This OPTIONAL Notification Content attribute contains the  
 1147 human consumable text message (see section 7.1.1) that describes the event and is represented in the text  
 1148 format specified by the "notify-text-format" attribute. Whether or not this attribute is defined depends on  
 1149 the delivery method definition document and MUST be defined only for use in the Machine Consumable  
 1150 format. If this attribute is defined for use in the Machine Consumable Notification, then whether this  
 1151 attribute is REQUIRED or OPTIONAL also depends on the delivery method definition document.

## 1152 **7.3 Additional Notification content attributes for Job events only**

1153 Table 5 lists the additional attributes that are included only in Job event Notifications and indicates the  
 1154 Printer support required for conformance: "R" indicates REQUIRED, "O" indicates OPTIONAL, and  
 1155 "CR" indicates CONDITIONALLY REQUIRED, i.e., REQUIRED in a Notification if the corresponding  
 1156 Job attributes are supported. Some events do not include all of these attributes as shown in Table 5.

1157 **Table 5 - Additional Notification content attributes for Job events only**

Attributes	Reference	Events		
		'job-progress'	'job-completed'	all others
18. job-state (type1 enum)	mod 4.3.7	R	R	R
19. job-state-reasons (1setOf type2 keyword)	mod 4.3.8	R	R	R
20. job-k-octets (integer(0:MAX))	mod 4.3.17.1	O	O	

Attributes	Reference	Events		
		'job-progress'	'job-completed'	all others
21. job-k-octets-processed (integer(0:MAX))	mod 4.3.18.1	O	O	
22. job-impressions (integer(0:MAX))	mod 4.2.17.2	O	O	
23. job-impressions-completed (integer(0:MAX))	mod 4.3.18.2	CR	CR	
24. impressions-completed-current-copy (integer(0:MAX))	[ipp-prog]	R		
25. job-media-sheets (integer(0:MAX))	mod 4.3.17.3	O	O	
26. job-media-sheets-completed (integer(0:MAX))	mod 4.3.18.3	CR	CR	
27. job-collation-type (type2 enum)	[ipp-prog]	R		
28. sheet-completed-copy-number (integer(0:MAX))	[ipp-prog]	R		
29. sheet-completed-document-number(integer(0:MAX))	[ipp-prog]	R		

#### 7.4 Additional Notification content attributes for Printer events *only*

Table 6 lists the additional attributes that are included only in Printer event Notifications and indicates the Printer support required for conformance: "**R**" indicates **REQUIRED** and "**O**" indicates **OPTIONAL**.

**Table 6 - Additional Notification content attributes for Printer events *only***

Attributes	Reference	Events
		all printer events
30. printer-state (type1 enum)	mod 4.4.11	<b>REQUIRED</b>
31. printer-state-reasons (1setOf type2 keyword)	mod 4.4.12	<b>REQUIRED</b>
32. printer-is-accepting-jobs (boolean)	mod 4.4.23	<b>REQUIRED</b>

## 8 Operations for notification

This section defines all of the operations for notification which are summarized in Table 1 in section 1.1, including the assignment of the operation-id.

### 8.1 Operations for Per-Job Subscriptions *only*

This section defines the operation requests and responses that are related to Per-Job subscriptions and its Subscription object. Section 8.3 defines the **REQUIRED** operation requests and responses associated with the **REQUIRED** Per-Printer subscription and its Subscription object.

### 8.1.1 Job Creation Operations (Create-Job, Print-Job, Print-URI) and Validate-Job

The usual method for a client to associate one subscription with a Job is to specify the subscription when the job is created. For a Per-Job Subscription, the client supplies the "job-notify (1setOf collection)" operation attribute with the member attributes listed in Table 7 with any of the Job Creation operations (Create-Job, Print-Job, Print-URI), plus Validate-Job (which doesn't create a job or subscription). If the client does not supply the "job-notify" attribute in the create operation, there is no subscription made (either implicitly or explicitly).

If a Printer does not support this notification specification, then it MUST ignore the "job-notify" operation attribute and return it in the response indicated as an attribute that is not supported. See [ipp-mod] section 3.1.7 for details on returning Unsupported Attributes.

**Table 7 - Member attributes of the "job-notify" collection operation attribute**

Member attribute of "job-notify" collection	Reference	<u>client MUST supply</u>	Printer support
notify-recipient (uri)	5.1	yes	REQUIRED
notify-events (1setOf type2 keyword)	5.2	no	REQUIRED
notify- <del>text</del> -format (mimeMediaType)	5.3	no	REQUIRED
subscriber-user-data (octetString(63))	5.4	<u>depends on delivery method **no</u>	REQUIRED
notify-charset (charset)	5.5	no	OPTIONAL
notify-natural-language (naturalLanguage)	5.6	no	OPTIONAL

ISSUE 06: Ok that "notify-charset" and "notify-natural-language" member attributes don't follow the "xxx-supported" rule for collection member attributes, since the "xxx-supported" attributes are "charset-supported" and "generated-natural-language-supported", respectively, instead of "notify-charset-supported" and "notify-natural-language-supported"?

See the referenced sections for a definition of these operation attributes, since they are copied to the Subscription object as the Subscription Description attributes described in section 5.

The following rules apply to Per-Job subscriptions created as part of the Job Creation operations:

- Any subscription can contain job events, printer events, or both.
- The Job Submission Subscription is only valid while the job is "not-completed". The job is "not-completed" while it is in the 'pending', 'pending-held', 'processing', and 'processing-stopped' states. The job 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 "not-completed" again when it is restarted using the Restart-Job operation (see [ipp-mod]).
- 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.
- 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

- 1199 is no mechanism to subscribe to events for all jobs or specifically some job other than this job in a  
1200 create operation. But see the Create-Printer-Subscription operation (section 8.2.1) for an explicit  
1201 operation to subscribe for job and/or printer events independently of any particular job submission, i.e.,  
1202 Per-Printer subscriptions.
- 1203 5. Event reporting only occurs when a notification recipient has specified a subscription to any event(s).
- 1204 6. The notification implementation MAY allow an administrator to configure a policy on what events may  
1205 be dropped.
- 1206 7. **\*\* The client MUST supply the "subscriber-user-data" (octetString(63)) attribute, if the definition of the**  
1207 **delivery method specified in the "notify-recipient" attribute REQUIRES the client to supply it.**
- 1208 8. If the OPTIONAL "notify-charset" attribute is not supported or the supplied value is not supported, the  
1209 IPP Printer MUST return the attribute in the Unsupported Attributes Group but still accept the  
1210 operation, as with all Job create operations. In this case, the Printer MUST use the natural language  
1211 supplied in the "attributes-charset" Job creation operation attribute, if that natural language value is  
1212 supported by the Printer, else the Printer object MUST use the Printer's "charset-configured" value. See  
1213 the Print-Job operation in [ipp-mod].
- 1214 9. If the OPTIONAL "notify-natural-language" attribute is not supported or the supplied value is not  
1215 supported, the IPP Printer MUST return the attribute in the Unsupported Attributes Group but still  
1216 accept the operation, as with all Job create operations. In this case, the Printer MUST use the natural  
1217 language supplied in the "attributes-natural-language" Job creation operation attribute, if that natural  
1218 language value is supported by the Printer, else the Printer object MUST use the Printer's "natural-  
1219 language-configured" value. See the Print-Job operation in [ipp-mod].
- 1220 10. If a collection contains other unrecognized, unsupported member attributes and/or conflicting values,  
1221 the attribute returned in the Unsupported Group is a collection containing the unrecognized,  
1222 unsupported member attributes, and/or conflicting values. The Printer MUST return the unrecognized  
1223 member attributes with the out-of-band value of 'unsupported'. The Printer MUST return the  
1224 unsupported member attributes and conflicting values with their unsupported values. See [ipp-coll].
- 1225 11. If the number of events supplied in the "notify-events" attribute exceeds the Printer's "max-events-  
1226 supported" attribute, the Printer MUST accept the request with the status code 'successful-ok-ignored-  
1227 or-substituted-attributes' and return the "job-notify" collection in the Unsupported Attributes Group  
1228 with only the "job-events" member attribute containing the events that exceed the maximum.
- 1229 12. If the Per-Job subscriptions would exceed the limit of Per-Job subscriptions supported per job as  
1230 specified by the Printer's "max-job-subscriptions-supported" attribute or would exceed some  
1231 implementation-defined limit on the total number of Per-Job subscriptions for the Printer (if any), the  
1232 Printer MUST accept the request with the status code 'successful-ok-ignored-subscriptions', MUST  
1233 return the "job-notify" attribute in the Unsupported Attributes Group with only the collection value(s)  
1234 that represent the excess subscriptions that are being ignored, and MUST perform the Job Creation  
1235 operation (see section 8.1.1), since the job can still be printed.
- 1236 If the job is accepted and one or more subscriptions are ignored, the status code returned is 'successful-  
1237 ok-ignored-subscriptions'. This status code is returned even if other job attributes are unsupported or in  
1238 conflict. That is, if an IPP Printer finds a warning that would allow it to return 'successful-ok-ignored-  
1239 subscriptions' and either 'successful-ok-ignored-or-substituted-attributes' and/or 'successful-ok-  
1240 conflicting-attributes', it must return 'successful-ok-ignored-subscriptions'. In other words, the

1241 precedence for returning success codes is: 'successful-ok-ignored-subscriptions', 'successful-ok-  
1242 conflicting-attributes', and 'successful-ok-ignored-or-substituted-attributes'.

## 1243 8.1.2 Create-Job-Subscription operation

1244 The OPTIONNAL Create-Job-Subscription operation creates a Per-Job Subscription object . The client  
1245 can specify one or more job and/or printer events to be delivered as notifications to one Notification  
1246 Recipient. For the Per-Job subscription objects, the Job events are for this job only. The printer events are  
1247 any events generated by that Printer for any job or when no job is involved at all (same as for Per-Job  
1248 Subscriptions).

1249 The Printer returns a subscription id and the length of time for which it has granted a lease for the  
1250 subscription.

1251 A client can unsubscribe using the Cancel-Subscription operation (section 8.3.4) and the subscription id.

1252 Two Create-Job-Subscription operations with the same events and same Notification Recipient MUST be  
1253 kept as distinct subscriptions and be assigned distinct subscription ids. A Printer MUST allow such  
1254 duplicate subscriptions such that Cancel-Subscription doesn't unsubscribe both subscriptions and MUST  
1255 send the Notifications twice to the Notification Recipient, since the "request-id" is supposed to count  
1256 monotonically for each sSubscription object.

1257 If the Printer has a bounded set of concurrent Per-Job subscriptions and the request would exceed that  
1258 bound, the Printer rejects the operation and returns the 'server/client-error-too-many-subscriptions' status  
1259 code. The client SHOULD try again later.

1260 Access Rights: To create Per-Job subscription objects, the authenticated user (see [IPP-MOD] section 8.3)  
1261 performing this operation MUST either be the job owner or have operator or administrator access rights for  
1262 the Printer object (see [IPP-MOD] sections 1 and 8.5). Otherwise the IPP object MUST reject the  
1263 operation and return: the 'client-error-forbidden', 'client-error-not-authenticated', and-or 'client-error-not-  
1264 authorized' status code as appropriate.

1265 Request :

Group 1: Operation Attributes	Reference <u>[ipp-mod]</u>	<u>client MUST</u> <u>supply</u>	Printer support
"attributes-charset" (charset)	<u>3.1.4.1</u>	<u>yes</u>	REQUIRED
"attributes-natural-language" (naturalLanguage)	<u>3.1.4.1</u>	<u>yes</u>	REQUIRED
"printer-uri" (uri)	<u>3.1.5</u>	<u>yes</u>	REQUIRED
"job-id" (integer(1:MAX))	<u>3.1.5</u>	<u>yes</u>	REQUIRED
<u>"job-uri" (uri)</u>	<u>3.1.5</u>	<u>if not "printer- uri" and "job-id"</u>	<u>REQUIRED</u>
"requesting-user-name" (name(MAX))	<u>8.3</u>	<u>RECOMMEND</u> <u>ED</u>	<u>REQUIRED</u> <u>RECOMME</u> <u>NDED</u>

1266

Group 2: Subscription Attributes		Reference	client MUST supply	Printer support
"notify-recipient" (uri)	5.1	<u>yes</u>	REQUIRED	
"notify-events" (1setOf type2 keyword)	5.2	<u>no</u>	REQUIRED	
"notify-text-format" (mimeType)	5.3	<u>no</u>	REQUIRED	
"subscriber-user-data" (octetString(63))	5.4	<u>depends on delivery method</u>	REQUIRED	
"notify-charset" (charset)	5.5	<u>no</u>	OPTIONAL	
"notify-natural-language" (naturalLanguage)	5.6	<u>no</u>	OPTIONAL	
"notify-persistence-requested" (boolean)		<u>no</u>	OPTIONAL	

1267 Response:

Group 1: Operation Attributes		Reference [ipp-mod]	REQUIRED in response
"status-code" (type2 enum)		<u>3.1.6.1</u>	REQUIRED
"attributes-charset" (charset)		<u>3.1.4.2</u>	REQUIRED
"attributes-natural-language" (naturalLanguage)		<u>3.1.4.2</u>	REQUIRED
"status-message" (text(255))		<u>3.1.6.2</u>	OPTIONAL
"detailed-status-message" (text(MAX))		<u>3.1.6.3</u>	OPTIONAL

1268

Group 2: Unsupported Attributes (see [ipp-mod] section 3.1.7)	REQUIRED if unsupported attributes
---	------------------------------------

1269

Group 3: Subscriptions Attributes		Reference	REQUIRED in response
"subscription-id" (integer(1:MAX))	5.8		REQUIRED
"notify-persistence-granted" (boolean)	5.13		REQUIRED

1270 Attribute Notes:

1271 "job-id" (integer(1:MAX)) - the client MUST either (1) supply this attribute, in combination with the  
 1272 "printer-uri" attribute, in order to create a Per-Job subscription for the Job identified by the "job-id"  
 1273 value or supply the "job-uri" instead, as with any Job operation:-

1274 Note: Unlike all other operations on the Job object, the "job-uri" operation attribute is not defined  
 1275 for use with this operation.

1276 ISSUE 02 - Ok that "job-uri" isn't defined for use with the Create Job Subscription operation?

1277 "job-uri" (uri) - the client MUST supply this attribute, if the "printer-uri" and "job-id" are not supplied, in  
 1278 order to identify the Job to which the Per-Job Subscription is being created.

1279 "notify-recipient" (uri) - the client MUST supply this attribute in order to have a subscription.

1280 "notify-event" (1setOf type2 keyword) - if the client does not supply this attribute, the Printer populates the  
1281 "notify-events" Subscription Description attribute from its "notify-events-default" Printer  
1282 Description attribute.

1283 "notify-~~text~~-format" (mimeMediaType) - if the client supplies this attribute, the value indicates which  
1284 Human Consumable text format is requested for use in the Notification using the delivery method  
1285 that the client supplies in the "notify-recipient" attribute. If the client does not supply this attribute,  
1286 the Machine-Consumable form of the delivery method that the client supplies in the "notify-  
1287 recipient" attribute is used.

1288 "subscriber-user-data" (octetString(63)) - the client MUST supply this attribute, if the definition of the  
1289 delivery method specified in the "notify-recipient" attribute REQUIRES the client to supply it.

1290 "notify-persistence-requested" (boolean) - whether or not the Per-Job Subscription is to be persistent, i.e.,  
1291 saved across power cycles. Note: Persistent trap registrations is a client option in SNMPv3  
1292 [RFC2573].

1293 "notify-persistence-granted" (boolean) - whether or not this Subscription object instance is persistent. This  
1294 attribute MUST be returned whether "notify-persistence-requested" is supported or not, so that the  
1295 client knows which.

1296

## 1297 **8.2 Operations for Per-Printer Subscriptions *only***

1298 This section defines the operation requests and responses associated with the Per-Printer subscription and  
1299 its Subscription object.

### 1300 **8.2.1 Create-Printer-Subscription operation**

1301 The REQUIRED Create-Printer-Subscription operation creates a Per-Printer Subscription object . The  
1302 client can specify one or more job and/or printer events to be delivered as notifications to one Notification  
1303 Recipient. For the Per-Printer subscription objects, the job events are for any job submitted to the Printer.  
1304 The printer events are any events generated by that Printer for any job or when no job is involved at all.

1305 The Printer returns a subscription id and the time at which the subscription lease expires (which may be  
1306 earlier or later than the client requested).

1307 The client ~~must~~**MUST** renew the Per-Printer subscription using the Renew-Subscription operation (see  
1308 section 8.3.3) before the lease runs out in order to maintain the subscription. A client can unsubscribe  
1309 using the Cancel-Subscription operation (section 8.3.4) and the subscription id.

1310 Two Create-Printer-Subscription operations with the same events and same Notification Recipient **MUST**  
1311 be kept as distinct subscriptions and be assigned distinct subscription ids. A Printer **MUST** allow such  
1312 duplicate subscriptions such that Cancel-Subscription doesn't unsubscribe both subscriptions and **MUST**  
1313 send the Notifications twice to the Notification Recipient, since the "request-id" is supposed to count  
1314 monotonically for each subscription.



1315 If the Printer has a bounded set of concurrent Per-Printer subscriptions and the request would exceed that  
 1316 bound, the Printer rejects the operation and returns the '~~server~~client-error-too-many-subscriptions' status  
 1317 code. The client SHOULD try again later.

1318 Access Rights: To create Per-Printer subscription objects, the authenticated user performing this operation  
 1319 MUST have Per-Printer subscription rights for this Printer. Otherwise the IPP object MUST reject the  
 1320 operation and return: the 'client-error-forbidden', 'client-error-not-authenticated', and-or 'client-error-not-  
 1321 authorized' status code as appropriate.

1322 Request :

Group 1: Operation Attributes	<u>Reference</u> <u>[ipp-mod]</u>	<u>client MUST</u> <u>supply</u>	Printer support
"attributes-charset" (charset)	<u>3.1.4.1</u>	<u>yes</u>	REQUIRED
"attributes-natural-language" (naturalLanguage)	<u>3.1.4.1</u>	<u>yes</u>	REQUIRED
"printer-uri" (uri)	<u>3.1.5</u>	<u>yes</u>	REQUIRED
"requesting-user-name" (name(MAX))	<u>8.3</u>	<u>RECOMME</u> <u>NDED</u>	<u>REQUIRED</u> <u>RECOMME</u> <u>NDED</u>

1323

Group 2: Subscription Attributes	<u>Reference</u>	<u>client MUST</u> <u>supply</u>	Printer support
"notify-recipient" (uri)	5.1	<u>yes</u>	REQUIRED
"notify-events" (1setOf type2 keyword)	5.2	<u>no</u>	REQUIRED
"notify- <del>text</del> -format" (mimeType)	5.3	<u>no</u>	REQUIRED
"subscriber-user-data" (octetString(63))	5.4	<u>depends on</u> <u>the delivery</u> <u>method</u>	REQUIRED
"notify-charset" (charset)	5.5	<u>no</u>	OPTIONAL
"notify-natural-language" (naturalLanguage)	5.6	<u>no</u>	OPTIONAL
"notify-lease-time-requested" (integer(0:MAX))		<u>no</u>	REQUIRED
"notify-persistence-requested" (boolean)		<u>no</u>	OPTIONAL

1324 Response :

Group 1: Operation Attributes	<u>Reference</u>	<u>REQUIRED</u> <u>in response</u>
"status-code" (type2 enum)	<u>3.1.6.1</u>	REQUIRED
"attributes-charset" (charset)	<u>3.1.4.2</u>	REQUIRED
"attributes-natural-language" (naturalLanguage)	<u>3.1.4.2</u>	REQUIRED
"status-message" (text(255))	<u>3.1.6.2</u>	OPTIONAL
"detailed-status-message" (text(MAX))	<u>3.1.6.3</u>	OPTIONAL

1325

Group 2: Unsupported Attributes (see [ipp-mod] section 3.1.7)	<u>REQUIRED</u> <u>if unsupported</u> <u>attributes</u>
---	---

1326

Group 3: Subscription Attributes	Reference	REQUIRED in response
"subscription-id" (integer(1:MAX))	5.8	REQUIRED
"notify-lease-expiration-time" (integer(0:MAX))	5.9	REQUIRED
"notify- <del>server</del> printer-up-time" (integer(1:MAX))	5.12	REQUIRED
"notify-persistence-granted" (boolean)	5.13	REQUIRED

1327 Attribute Notes:

1328 "notify-recipient" (uri) - the client MUST supply this attribute in order to have a subscription.

1329 "notify-lease-time-requested" (integer(0:MAX)) - the number of seconds requested for the subscription  
 1330 lease. A value of 0 indicates a request that the Per-Printer Subscription lease never expire.  
 1331 Supplying a 0 value MAY require authentication in order to be used, if 0 is supported at all.  
 1332 If the client does not supply this attribute, the Printer uses its "notify-lease-time-default" Printer  
 1333 Description attribute value (see section 6.9).

1334 "notify-event" (1setOf type2 keyword) - if the client does not supply this attribute, the Printer populates the  
 1335 "notify-events" Subscription Description attribute from its "notify-events-default" Printer  
 1336 Description attribute.

1337 "notify-~~text~~format" (mimeMediaType) - if the client supplies this attribute, the value indicates which  
 1338 Human Consumable text format is requested for use in the Notification using the delivery method  
 1339 that the client supplies in the "notify-recipient" attribute. If the client does not supply this attribute,  
 1340 the Machine-Consumable form of the delivery method that the client supplies in the "notify-  
 1341 recipient" attribute is used.

1342 "subscriber-user-data" (octetString(63)) - the client MUST supply this attribute, if the definition of the  
 1343 delivery method specified in the "notify-recipient" attribute REQUIRES the client to supply it.

1344 "notify-persistence-requested" (boolean) - whether or not the Per-Printer Subscription is to be persistent,  
 1345 i.e., saved across power cycles. Note: Persistent trap registrations is a client option in SNMPv3  
 1346 [RFC2573].

1347 "notify-lease-expiration-time" (integer(0:MAX)) - The Printer object MUST return this attribute which is  
 1348 the time in the future at which the subscription lease will expire, i.e., the "printer-up-time" value (in  
 1349 time ticks - see [ipp-mod] section 4.4.29) at which the Printer will delete the Subscription. A value  
 1350 of 0 indicates that the lease subscription will never expire.

1351 "notify-~~server~~printer-up-time" (integer(1:MAX)) - The Printer object MUST return this attribute which is  
 1352 an alias for the Printer's "printer-up-time" Printer Description attribute. The client subtracts this  
 1353 value from the "notify-lease-expiration-time" value returned in order to determine the number of  
 1354 second in the future that the subscription will expire. This computed value may be less than the  
 1355 requester requested in the "notify-lease-time-requested" if it was greater than the MAX supported or  
 1356 more than the requester requested if it was less than the MIN supported, as indicated in the Printer's  
 1357 "notify-lease-time-supported" (rangeOfInteger(0:MAX)) attribute (see section 6.8).

1358 "notify-persistence-granted" - whether or not this Subscription object instance is persistent. This attribute  
 1359 MUST be returned whether "notify-persistence-requested" is supported or not, so that the client  
 1360 knows which.

1361

### 1362 8.3 Common Operations for Per-Job and Per-Printer Subscriptions

1363 This section defines the operations that are common to both Per-Job and Per-Printer subscriptions.

#### 1364 8.3.1 Get-Subscription-Attributes operation

1365 The REQUIRED Get-Subscription-Attributes returns the requested attributes of the identified Subscription  
 1366 object. See section 5.

1367 Request:

Group 1: Operation Attributes	<a href="#">Reference [ipp-mod]</a>	<a href="#">client MUST supply</a>	Printer support
-------------------------------	-------------------------------------	------------------------------------	-----------------

1368

"attributes-charset" (charset)	<a href="#">3.1.4.1</a>	<a href="#">yes</a>	REQUIRED
"attributes-natural-language" (naturalLanguage)	<a href="#">3.1.4.1</a>	<a href="#">yes</a>	REQUIRED
"printer-uri" (uri)	<a href="#">3.1.5</a>	<a href="#">yes</a>	REQUIRED
"requesting-user-name" (name(MAX))	<a href="#">8.3</a>	<a href="#">RECOMMENDED</a>	RECOMMENDED

1369

<a href="#">Group 2: Subscription Attributes</a>	<a href="#">Reference</a>	<a href="#">client MUST supply</a>	<a href="#">Printer support</a>
"subscription-id" (integer(1:MAX))	5.8	<a href="#">yes</a>	REQUIRED
"requested-attributes" (1setOf type2 keyword)		<a href="#">no</a>	REQUIRED

1370 Response:

Group 1: Operation Attributes	<a href="#">Reference [ipp-mod]</a>	<a href="#">REQUIRED in response</a>
"status-code" (type2 enum)	<a href="#">3.1.6.1</a>	REQUIRED
"attributes-charset" (charset)	<a href="#">3.1.4.2</a>	REQUIRED
"attributes-natural-language" (naturalLanguage)	<a href="#">3.1.4.2</a>	REQUIRED
"status-message" (text(255))	<a href="#">3.1.6.2</a>	OPTIONAL
"detailed-status-message" (text(MAX))	<a href="#">3.1.6.3</a>	OPTIONAL

1371

Group 2: Unsupported Attributes <a href="#">(see [ipp-mod] section 3.1.7)</a>	<a href="#">REQUIRED if unsupported attributes</a>
---	--

1372

Group 3: <the requested Subscription object attributes>	REQUIRED
---	----------

This operation is similar to the Get-Printer-Attributes operation. If the client omits the "requested-attributes" operation attribute, the Printer MUST respond as if the client had supplied the 'all' value, i.e., return all of the attributes supported for the Subscription object.

### 8.3.2 Get-Subscriptions operation

The REQUIRED Get-Subscriptions operation returns the requested attributes of the Subscription objects (see section 5).

Request :

Group 1: Operation Attributes	Reference [ipp-mod]	client MUST supply	Printer support
"attributes-charset" (charset)	<a href="#">3.1.4.1</a>	yes	REQUIRED
"attributes-natural-language" (naturalLanguage)	<a href="#">3.1.4.1</a>	yes	REQUIRED
"printer-uri" (uri)	<a href="#">3.1.5</a>	yes	REQUIRED
"job-id" (integer(1:MAX))	<a href="#">3.1.5</a>	yes, if Per- Job Subscription	REQUIRED
"requesting-user-name" (name(MAX))	<a href="#">8.3</a>	RECOMME NTED	RECOMME NDED
"limit" (integer(1:MAX))		OPTIONAL	REQUIRED
"requested-attributes" (1setOf type2 keyword)		OPTIONAL	REQUIRED
"my-subscriptions" (boolean)		OPTIONAL	REQUIRED

Response :

Group 1: Operation Attributes	Reference [ipp-mod]	REQUIRED in response
"status-code" (type2 enum)	<a href="#">3.1.6.1</a>	REQUIRED
"attributes-charset" (charset)	<a href="#">3.1.4.2</a>	REQUIRED
"attributes-natural-language" (naturalLanguage)	<a href="#">3.1.4.2</a>	REQUIRED
"status-message" (text)	<a href="#">3.1.6.2</a>	OPTIONAL
"detailed-status-message" (text(MAX))	<a href="#">3.1.6.3</a>	OPTIONAL

Group 2: Unsupported Attributes <a href="#">(see [ipp-mod] section 3.1.7)</a>	REQUIRED if unsupported attributes
---	--

Group 3 to N:<the requested Subscription Attributes for each Subscription object in a separate group>		REQUIRED
---	--	----------

Attribute Notes:

This operation is similar to the Get-Jobs operation (see [ipp-mod]). If the client wants any attributes returned, including the "subscription-id", it must include the attribute keyword name in the "requested-attributes" operation attribute. If the "requested-attributes" operation attribute is omitted, the Printer MUST respond as if the client supplied the value: 'subscription-id'.

1389 "job-id" (integer(1:MAX)) - If the client supplies this attribute, all of the Per-Job Subscription objects for  
1390 the identified job are candidates for return. If this attribute is omitted, all of the Per-Printer  
1391 Subscription objects are candidates for return.

1392 "limit" (integer(1:MAX)): The client OPTIONALLY supplies this attribute. The Printer object MUST  
1393 support this attribute. It is an integer value that determines the maximum number of Subscription  
1394 objects that a client will receive from the Printer even if "my-subscriptions" constrain which  
1395 subscriptions are returned. The limit is a "stateless limit" in that if the value supplied by the client is  
1396 'N', then only the first 'N' Subscriptions are returned in the Get-Subscriptions Response. There is no  
1397 mechanism to allow for the next 'M' Subscriptions after the first 'N' Subscriptions. If the client does  
1398 not supply this attribute, the Printer object responds with all applicable Subscriptions.

1399 "requested-attributes" (1setOf keyword): The client OPTIONALLY supplies this attribute. The Printer  
1400 object MUST support this attribute. It is a set of Subscription attribute names and/or the 'all'  
1401 attribute group name in whose values the requester is interested. This set of attributes is returned  
1402 for each Job object that is returned. If the client does not supply this attribute, the Printer MUST  
1403 respond as if the client had supplied this attribute with the value: 'all'.

1404 "my-subscriptions" (boolean): The client OPTIONALLY supplies this attribute. The Printer object MUST  
1405 support this attribute. It indicates whether Subscriptions from all users or just the Subscriptions  
1406 submitted by the requesting user of this request MUST be returned by the Printer object. If the  
1407 client does not supply this attribute, the Printer object MUST respond as if the client had supplied  
1408 the attribute with a value of 'false', i.e., Subscriptions from all users. The means for authenticating  
1409 the requesting user and matching the Subscription objects is the same as for jobs as described in  
1410 [ipp-mod] section 8.

1411 ~~"my-subscriptions" (boolean) - If the client supplies the "my-subscriptions" with a 'false' value or omits it,~~  
1412 ~~the Printer returns all subscriptions, subject to the security policy in force.~~

1413 Groups 3 to N: Subscription Object Attributes: The Printer object responds with one set of Subscription  
1414 Object Attributes for each returned Subscription object. The Printer object ignores (does not  
1415 respond with) any requested attribute or value which is not supported or which is restricted by the  
1416 security policy in force, including whether the requesting user is the user that created the  
1417 Subscription object (subscribing user) or not (see [ipp-mod] section 8).

### 1418 8.3.3 Renew-Subscription operation

1419 The REQUIRED Renew-Subscription operation permits a client to request the IPP Printer to extend the  
1420 lease on a Subscription object instance. There is no way to renew a Per-Job subscription, since they are  
1421 automatically canceled after the job completes and no longer has any documents, i.e., the job is no longer  
1422 retained (see [ipp-mod] section 4.3.7.2). If the requested subscription object is a Per-Job subscription, the  
1423 Printer MUST grant an infinite lease by returning a 0 value for the "notify-lease-expiration-time".

1424 *Access Rights:* The authenticated user (see [IPP-MOD] section 8.3) performing this operation MUST either  
1425 be the owner of the Subscription object or have operator or administrator access rights for the Printer object  
1426 (see [IPP-MOD] sections 1 and 8.5). Otherwise the IPP object MUST reject the operation and return: the  
1427 'client-error-forbidden', 'client-error-not-authenticated', and-or 'client-error-not-authorized' status code as  
1428 appropriate.

1429 Request:

Group 1: Operation Attributes		Reference [ipp-mod]	client MUST supply	Printer support
"attributes-charset" (charset)		<a href="#">3.1.4.1</a>	yes	REQUIRED
"attributes-natural-language" (naturalLanguage)		<a href="#">3.1.4.1</a>	yes	REQUIRED
"printer-uri" (uri)		<a href="#">3.1.5</a>	yes	REQUIRED
"requesting-user-name" (name(MAX))		<a href="#">8.3</a>	RECOMME NDED	RECOMME NDED

1430

<u>Group 2: Subscription Attributes</u>		Reference	client MUST supply	Printer support
"subscription-id" (integer(1:MAX))		5.8	yes	REQUIRED
"notify-lease-time-requested" (integer(0:MAX))			no	REQUIRED

1431 Response:

Group 1: Operation Attributes		Reference [ipp-mod]	REQUIRED in response
"status-code" (type2 enum)		<a href="#">3.1.6.1</a>	REQUIRED
"attributes-charset" (charset)		<a href="#">3.1.4.2</a>	REQUIRED
"attributes-natural-language" (naturalLanguage)		<a href="#">3.1.4.2</a>	REQUIRED
"status-message" (text(255))		<a href="#">3.1.6.2</a>	OPTIONAL
"detailed-status-message" (text(MAX))		<a href="#">3.1.6.3</a>	OPTIONAL

1432

Group 2: Unsupported Attributes (see [ipp-mod] section 3.1.7)	REQUIRED if unsupported attributes
---	--

1433

<u>Group 3: Subscriptions Attributes</u>		Reference	REQUIRED in response
"notify-lease-expiration-time" (integer(0:MAX))		5.9	REQUIRED
"notify- <del>server</del> printer-up-time" (integer(1:MAX))		5.12	REQUIRED

1434

1435 ~~ISSUE 03—Should Renew Subscription Request have a Group 2 for its two Subscription attributes?~~1436 ~~ISSUE 04—Should Renew Subscription Response have a Group 3 for its two Subscription attributes?~~

1437 Attribute Notes:

1438 "notify-lease-time-requested" (integer(0:MAX)) - the number of seconds requested for the Per-Printer  
1439 subscription lease. Same as Create-Printer-Subscriptions (see section 8.2.1).1440 "notify-lease-expiration-time" - the time in the future when the subscription will expire. Same as for the  
1441 Create-Printer-Subscription operation (see section 8.2.1).

1442 "notify-~~server~~printer-up-time" - the Printer object MUST return this attribute which is an alias for the  
 1443 Printer's "printer-up-time" Printer Description attribute. The client subtracts this value from the  
 1444 "notify-lease-expiration-time" value returned in order to determine the number of second in the  
 1445 future that the subscription will expire (see further explanation in section 8.2.1).

1446 Note: There is no way to change any of the Subscription object attributes, except the "notify-lease-  
 1447 expiration-time" attribute (using the Renew-Subscription operation). In order to change other attributes, a  
 1448 client can create a new Subscription object and then use the Cancel-Subscription operation to cancel the old  
 1449 one (or do this in the other order, in case there is a limit on the number of Subscription object instances, as  
 1450 long as a short window with no Notifications is ok).

1451 Note: There is no need to renew a Per-Job Subscription, since it is effectively the time that the Job is active  
 1452 (see section 8.1).

### 1453 8.3.4 Cancel-Subscription operation

1454 The REQUIRED Cancel- Subscription operation allows a client to remove a Subscription object. No more  
 1455 Notifications are delivered for that Subscription. Once performed, there is no way to use that Subscription  
 1456 in the future. Subscription-ids should not be reused immediately, so that a stale reference situation is not  
 1457 created. Same as for Cancel-Job and job-ids.

1458 *Access Rights:* The authenticated user (see [IPP-MOD] section 8.3) performing this operation MUST either  
 1459 be the owner of the Subscription object or have operator or administrator access rights for the Printer object  
 1460 (see [IPP-MOD] sections 1 and 8.5). Otherwise the IPP object MUST reject the operation and return: the  
 1461 'client-error-forbidden', 'client-error-not-authenticated', and-or 'client-error-not-authorized' status code as  
 1462 appropriate.

1463 Request :

Group 1: Operation Attributes	Reference	client MUST supply	Printer support
"attributes-charset" (charset)	<a href="#">3.1.4.1</a>	yes	REQUIRED
"attributes-natural-language" (naturalLanguage)	<a href="#">3.1.4.1</a>	yes	REQUIRED
"printer-uri" (uri)	<a href="#">3.1.5</a>	yes	REQUIRED
"requesting-user-name" (name(MAX))	<a href="#">8.3</a>	RECOMME NDED	RECOMME NDED

1464

<u>Group 2: Subscription Attributes</u>	Reference	client MUST supply	Printer support
"subscription-id" (integer(1:MAX))	5.8	yes	REQUIRED

1465 Response :

Group 1: Operation Attributes	Reference	REQUIRED in response
"status-code" (type2 enum)	<a href="#">3.1.6.1</a>	REQUIRED
"attributes-charset" (charset)	<a href="#">3.1.4.2</a>	REQUIRED
"attributes-natural-language" (naturalLanguage)	<a href="#">3.1.4.2</a>	REQUIRED
"status-message" (text(255))	<a href="#">3.1.6.2</a>	OPTIONAL
"detailed-status-message" (text(MAX))	<a href="#">3.1.6.3</a>	OPTIONAL

1466

Group 2: Unsupported Attributes <a href="#">(see [ipp-mod] section 3.1.7)</a>	REQUIRED <a href="#">if unsupported attributes</a>
---	---

1467

## 1468 9 Comparison of Per-Job versus Per-Printer Subscriptions

1469 Per-Job and Per-Printer subscriptions are quite similar. Either type of subscription can subscribe to Job  
 1470 events, Printer events, or both. Both types of subscriptions can be queried using the Get-Subscriptions and  
 1471 Get-Subscription-Attributes operations and canceled using the Cancel-Subscription operation. Both types  
 1472 of subscriptions create Subscription objects which have the same attributes defined. However, there are  
 1473 some semantic differences between Per-Job subscriptions and Per-Printer subscriptions. A Per-Job  
 1474 Submission Subscription is established by the client when submitting a job and after creating the job using  
 1475 the Create-Job-Subscription operation by specifying the "job-id" of the job. A Per-Printer Subscription is  
 1476 established between a client and a Printer using the Create-Printer-Subscription operation. Some specific  
 1477 differences are:

- 1478 1. A client usually creates a Per-Job subscription as part of the Job Creation operations (Create-Job, Print-  
 1479 Job, and Print-URI), rather than using the OPTIONAL Create-Job-Subscription operation, especially  
 1480 since ~~some~~ Printer implementations ~~MAY not~~ **NEED NOT** support the Create-Job-Subscription  
 1481 operation, since it is OPTIONAL.
- 1482 2. For Per-Job subscriptions, the subscription is only valid while the job is "not-complete" (see sections  
 1483 7.2 and 7.3) while for the Per-Printer subscriptions, the subscription is valid until the time (in seconds)  
 1484 that the Printer returned in the "notify-lease-expiration-time" operation attribute expires.
- 1485 3. Job Events in a Per-Job subscription apply only to "one job" (the Job created by the job creation  
 1486 operation or references by the Create-Job-Subscription operation) while Job Events in a Per-Printer  
 1487 subscription apply to ALL jobs contained in the IPP Printer object.

## 1488 10 Out of Band Values

1489 This section defines out-of-band values (see [ipp-mod] section 4.1) for use with attributes defined in this  
 1490 and other documents.

### 1491 10.1 'none'

1492 The specified attribute in the request MUST NOT be applied to the job. Specifically, this value overrides  
 1493 the Printer's "xxx-default" attribute value for the attribute, if one exists. This "out-of-band" value allows a  
 1494 client, in a request, to specify that the value of an attribute MUST be semantically equivalent to 'none.'  
 1495 This out-of-band value is needed since attributes that are of the 'collection', 'uri', and 'mimeType' need  
 1496 a way for '-name', or 'text' syntax can be problematic when a client wishes to specify that the Printer MUST  
 1497 NOT apply the value of an "xxx-default" attribute MUST NOT be applied to the job. See [ipp-coll] for a  
 1498 complete specification, including encoding. Unlike the 'keyword' or 'enum' attribute syntax, where the  
 1499 value of 'none' (or its equivalent) can be a standard value, other attribute syntaxes have no such mechanism.



~~A Printer MUST support the use of the "out-of-band" value for any attribute that calls for its use, such as any Job Template attribute that has the 'collection' attribute syntax, if the Printer supports the use of the 'collection' attribute syntax for that attribute.~~

~~When a client sends a request to the printer object, the "out-of-band" value 'none' MUST only be used for attributes whose definitions explicitly indicate that the use of "out-of-band" value 'none' is allowed. A client MUST NOT use the "out-of-band" 'none' value for attributes whose definition does not explicitly call out its use.~~

~~'none' The specified attribute in the request MUST NOT be applied to the job. Specifically, this value overrides the Printer's "xxx default" attribute value for the attribute, if one exists.~~

~~ISSUE-05—The out of band 'none' value is also defined in the PWG Production Printing document. Should we keep the definition here in the Notification document? And/or should we move the definition to the 'collection' specification (ipp-coll) which is also defining the tag for the 'collection' attribute syntax that is the province of the IPP Transport and Encoding document?~~

## 11 Conformance Requirements

~~This section further enhances the Conformance Requirements detailed in [IPP-MOD] section 5. Extensions made to the events herein must be made such that new events or event attributes are backward compatible to clients who implemented early versions of this notification specification.~~

It is OPTIONAL to implement this Event Notification specification. An implementation conforming to this specification MUST also meet the Conformance Requirements detailed in [IPP-MOD] section 5. If this Event Notification specification is implemented, IPP objects MUST support all of the REQUIRED object attributes as defined in this document in the indicated sections:

1. REQUIRED Subscription object attributes in section 5.
2. REQUIRED Printer Description object attributes in section 6.
3. REQUIRED attributes in Notification content in section 7.

In addition, the Printer MUST support the 'collection' attribute syntax (see [ipp-coll]).

Extensions made to the events herein must be made such that new events or event attributes are backward compatible to clients who implemented early versions of this notification specification.

If this Event Notification specification is implemented, the operations described in section 8 MUST be supported as described in Table 8:

**Table 8 - Conformance Requirements for Operations**

Attribute	Conformance requirements
"job-notify" ( <u>1setOf collection</u> ) in Job Creation operations (section 8.1.1)	REQUIRED
Create-Printer-Subscription (section 8.2.1)	REQUIRED
Create-Job-Subscription (section 8.1.2)	OPTIONAL
Get-Subscription-Attributes (section 8.3.1)	REQUIRED
Get-Subscriptions (section 8.3.2)	REQUIRED

Attribute	Conformance requirements
Renew-Subscription (section 8.3.3)	REQUIRED
Cancel-Subscription (section 8.3.4)	REQUIRED

1528

## 1529 12 IANA Considerations

1530 IANA will be called on to register URL schemes for notification delivery for use in the "notification-  
1531 recipient" attribute, using the same procedures outlined in [ipp-mod].

## 1532 13 Internationalization Considerations

1533 This IPP notification specification continues the internationalization of [ipp-mod] for attributes containing  
1534 text strings and names. A subscribing client can specify a different natural language and charset for each  
1535 Notification content delivered to a Notification Recipient.

1536 The Human Consumable Notification content is a 'text/plain; charset=utf-8' by default where the  
1537 Notification Sender has localized the text message as requested by the subscriber for the intended  
1538 Notification Recipient.

## 1539 14 Security Considerations

1540 By far the biggest security concern is the abuse of notification: sending unwanted notifications to third  
1541 parties (i.e., spam). The problem is made worse by notification addresses that may be redistributed to  
1542 multiple parties (e.g. mailing lists). There exist scenarios where third party notification is required (see  
1543 Scenario #2 and #3 in [ipp-not-req]). The fully secure solution would require active agreement of all  
1544 recipients before sending out anything. However, requirement #9 in [ipp-req] (“There is no requirement for  
1545 IPP Printer receiving the print request to validate the identity of an event recipient”) argues against this.  
1546 Certain systems may decide to disallow third party notifications (a traditional fax model).

1547 Clients submitting notification requests to the IPP Printer has the same security issues as submitting an  
1548 IPP/1.1 print job request. The same mechanisms used by IPP/1.1 can therefore be used by the client  
1549 notification submission. Operations that require authentication can use the HTTP authentication.  
1550 Operations that require privacy can use the HTTP/TLS privacy.

1551 The notification access control model should be similar to the IPP access control model for Jobs. Creating  
1552 a Per-Printer Notification Subscription object is associated with a user. Only the creator or an operator can  
1553 cancel the subscription. The system may limit the listing of items to only those items owned by the user.  
1554 Some subscriptions (e.g. those that have a lifetime longer than a job) can be done only by privileged users  
1555 (users having operator and/or administrator access rights), if that is the authorization policy.

1556 The standard security concerns (delivery to the right user, privacy of content, tamper proof content) apply  
1557 to the notification delivery. IPP should use the security mechanism of the delivery method used. Some  
1558 delivery mechanisms are more secure than others. Therefore, sensitive notifications should use the delivery  
1559 method that has the strongest security.

## 15 Status Codes

The following status codes are defined as extensions for notification:

### 15.1 'successful-ok-ignored-subscriptions' (0x0003)

The number of subscriptions supplied in a Job Creation operation (Create-Job, Print-Job, Print-URI) exceeds either the limit of Per-Job subscriptions supported per job as specified by the Printer's "max-job-subscriptions-supported" attribute or some implementation-defined limit on the total number of Per-Job subscriptions for the Printer (if any). The Printer MUST accept the request with this status code, MUST return the "job-notify" attribute in the Unsupported Attributes Group with only the collection value(s) that represent the excess subscriptions that are being ignored, and MUST perform the Job Creation operation (see section 8.1.1), since the job can still be printed.

This status code is returned even if other job attributes are unsupported or in conflict. That is, if an IPP Printer finds a warning that would allow it to return 'successful-ok-ignored-subscriptions' and either 'successful-ok-ignored-or-substituted-attributes' and/or 'successful-ok-conflicting-attributes', it must return 'successful-ok-ignored-subscriptions'. In other words, the precedence for returning success codes is: 'successful-ok-ignored-subscriptions', 'successful-ok-conflicting-attributes', and 'successful-ok-ignored-or-substituted-attributes'.

### 15.2 client-error-uri-notification-scheme-not-supported (0x0414??)

The scheme of the client-supplied URI in a "notify-recipient" operation attribute in a Create-Printer-Subscription or Create-Printer-Subscription operation is not supported. See [ipp-mod] section 3.1.7.

There is no corresponding Per-Job subscription error for a Job Creation operation, since the Printer object MUST ignore any errors in the "job-notify" operation attribute, MUST return the "notify-recipient" attribute in the Unsupported Attributes Group, and perform the Job Creation operation (see section 8.1.1), since the job can still be printed.

### 15.3 client-error-too-many-subscriptions (0x0415??)

The bounded set of concurrent Per-Printer subscriptions supported by the Printer object would be exceeded if this Create-Printer-Subscription request were accepted or the bounded set of concurrent Per-Job subscriptions supported by the Printer object would be exceeded if this Create-Job-Subscriptions request were accepted.

Note: There is no corresponding Per-Job subscription error on a Job Creation operation, since the Printer object MUST ignore any errors in the "job-notify" operation attribute and perform the Job Creation operation (see section 8.1.1), since the job can still be printed.

### 15.4 client-error-too-many-events (0x0416??)

The client supplied more events in the "notify-events" operation attribute in a Create-Job-Subscription or Create-Printer-Subscription operation than the Printer supports, as indicated in its "max-events-supported" attribute (see section 6.4).

1595 There is no corresponding Per-Job subscription error for a Job Creation operation, since the Printer object  
 1596 MUST ignore any errors in the "job-notify" operation attribute, MUST return the "notify-events" attribute  
 1597 in the Unsupported Attributes Group with only the excess events that are being ignored, and perform the  
 1598 Job Creation operation (see section 8.1.1), since the job can still be printed.

## 1599 **16 Addition attribute tag encodings** ~~Additions to the IPP Encoding and~~ 1600 ~~Transport Document~~

1601 The Subscription ~~object-attributes~~ tag ~~and the Notification attributes tag needs to be assigned in section~~  
 1602 ~~3.7.1 Delimiter Tags~~ are assigned the following delimiter tag values as extensions to the encoding defined in  
 1603 [ipp-prol] for use in requests and responses to delimit Subscription object attribute Groups and Notification  
 1604 Content attribute Groups:

### 1605 **3.7.1 Delimiter Tags**

1606 ~~The following table specifies the values for the delimiter tags:~~

Tag Value (Hex)	Delimiter
0x00	reserved
0x01	<del>operation-attributes-tag</del>
0x02	<del>job-attributes-tag</del>
0x03	<del>end-of-attributes-tag</del>
0x04	<del>printer-attributes-tag</del>
0x05	<del>unsupported-attributes-tag</del>
0x06	<del>subscription-attributes-tag</del>
<u>0x07</u>	<u>notification-attributes-tag</u>
<del>0x07-0x0e</del>	<del>reserved for future delimiters</del>
0x0F	<del>reserved for future chunking end-of-attributes-tag</del>

1607 ~~When an xxx-attributes-tag occurs in the protocol, it MUST mean that zero or more following attributes up~~  
 1608 ~~to the next delimiter tag are attributes belonging to group xxx as defined in the model document, where xxx~~  
 1609 ~~is operation, job, printer, unsupported, subscription.~~

1610 ~~Doing substitution for xxx in the above paragraph, this means the following. When an operation-attributes-~~  
 1611 ~~tag occurs in the protocol, it MUST mean that the zero or more following attributes up to the next delimiter~~  
 1612 ~~tag are operation-attributes as defined in the model document. When an job-attributes-tag occurs in the~~  
 1613 ~~protocol, it MUST mean that the zero or more following attributes up to the next delimiter tag are job~~  
 1614 ~~attributes or job template attributes as defined in the model document. When a printer-attributes-tag occurs~~  
 1615 ~~in the protocol, it MUST mean that the zero or more following attributes up to the next delimiter tag are~~  
 1616 ~~printer attributes as defined in the model document. When an unsupported-attributes-tag occurs in the~~  
 1617 ~~protocol, it MUST mean that the zero or more following attributes up to the next delimiter tag are~~  
 1618 ~~unsupported attributes as defined in the model document. When a subscription-attributes-tag occurs in the~~  
 1619 ~~protocol, it MUST mean that the zero or more following attributes up to the next delimiter tag are~~  
 1620 ~~subscription attributes as defined in the [ipp-not] document.~~

1621 ~~Add a reference to [ipp-not].~~

## 17 References

### [ipp-coll]

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## A. Appendix - Summary of Notification Attribute Usage

This appendix summarizes the usage of Notification attributes in the Job operation attribute collection, Job object, Subscription object, Notification content, Job operations, and Subscriptions operations. The legend for the notation used in the tables is given following each table.



Attributes	Objects		Notification content		Job operations		Subscription operations		
	Job	Subscription	Job Notification Content	Printer Notification Content	Job Creation Validate -Job	Create-Job-Subscription	Create-Printer-Subscription	Renew - Subscription	Cancel - Subscription
1. notify-recipient (uri)		R			R	R	R		
2. notify-events (1setOf type2 keyword)		R			[R]	[R]	[R]		
3. notify-text-format (mimeMediaType)		R	[O]	[O]	[R]	[R]	[R]		
4. human-readable-report (text(MAX))			[O]	[O]					
5. subscriber-user-data (octetString(63))		R	R	R	[R]*	[R]*	[R]*		
6. attributes-charset (charset)	R		R (7)	R (7)	R	R	R	R	R
7. notify-charset (charset)		O			[O]	[O]	[O]		
8. attributes-natural-language (naturalLanguage)	R		R (9)	R (9)	R	R	R	R	R
9. notify-natural-language (naturalLanguage)		O			[O]	[O]	[O]		
10. notify-lease-time-requested (integer(0:MAX))							[R]	[R]	
11. notify-lease-expiration-time (integer(0:MAX))		R**					Return	Return	
12. notify-persistence-requested (boolean)						[O]	[O]		
13. notify-persistence-granted (boolean)		R				Return	Return		
14. trigger-event (type2 keyword)			R (2)	R (2)					
15. trigger-time (integer(MIN:MAX))			R	R					
16. trigger-date-time (dateTime)			[O]	[O]					
17. <u>subscription</u> -request-id (integer (0:MAX))		R	R	R					
18. subscription-id (integer(1:MAX))		R	R	R			Return	R	R

1740 Legend: "R" - REQUIRED for Printer to support; "O" - OPTIONAL for Printer to support; "[ ]" - OPTIONAL for sender to send;  
 1741 Return - Printer MUST return; \* the client MUST supply for some delivery methods; \*\* - MUST be 0 for Per-Job Subscription  
 1742 objects; (n) means the value comes from the indicated Subscription Attribute

Attributes	Objects		Notification		Job operations		Subscription operations		
	Job	Subscription	Job Notification	Printer Notification	Job Creation-Validate-Job	Create-Job-Subscription	Create-Printer-Subscription	Renew-Subscription	Cancel-Subscription
19. version-number (integer (0:32767))			R	R					
20. operation-id (integer (0:32767)) or status-code (integer (0:32767))			0x600	0x601					
21. job-printer-uri (uri)	R								
22. printer-uri (uri)		R	R	R	R	R	R	R	R
23. printer-name (name(127))			R	R					
24. job-id (integer(1:MAX))	R		R	Per-Jb		R			
25. job-name (name(MAX)) [SNMP can truncate]	R		R	Per-Jb					
26. requesting-user-name (name(MAX))	R								
27. subscriber-user-name (name(MAX))		R	<del>R</del>	<del>R</del>					
28. job-state (type1 enum)	R		R						
29. job-state-reasons (1setOf type2 keyword)	R		R						
30. notify- <del>server</del> printer-up-time (integer(1:MAX))		R				Return	Return		
31. job-k-octets (integer(0:MAX))									
32. job-k-octets-processed (integer(0:MAX))	O		[pg/cp]						
33. job-impressions (integer(0:MAX))									
34. job-impressions-completed (integer(0:MAX))	O		[pg/cp]						
35. impressions-completed-current-copy (integer(0:MAX))	O		[pg/cp]						
36. job-media-sheets (integer(0:MAX))									
37. job-media-sheets-completed (integer(0:MAX))	O		[pg/cp]						
38. job-collation-type (type2 enum)	O		[pg/cp]						
39. sheet-completed-copy-number (integer(0:MAX))	O		[pg/cp]						
40. sheet-completed-document-number(integer(0:MAX))	O		[pg/cp]						

1744 Legend: "R" - REQUIRED for Printer to support; "O" - OPTIONAL for Printer to support; "[ ]" - OPTIONAL for sender to send;  
1745 "[pg/cp]" - REQUIRED in a 'job-progress' or 'job-completed' notification if the corresponding Job attributes are supported ; (nn) - an  
1746 alternate source of the data in a Notification.

1747

Attributes	Objects		Notification		Job operations		Subscription operations		
		Printer object	Job Notification	Printer Notification	Job Creation, Validate -Job	Create -Job-Subscription	Create-Printer-Subscription	Renew - Subscription	Cancel - Subscription
41. printer-state (type1 enum)		R		R					
42. printer-state-reasons (1setOf type2 keyword)		R		R					
43. printer-is-accepting-jobs (boolean)		R		R					
44. notify-schemes-supported (1setOf uriScheme)		R							
45. notify-events-default (1setOf type2 keyword)		R							
46. notify-events-supported (1setOf type2 keyword)		R							
47. max-events-supported (integer(5:MAX))		R							
48. notify- <del>text</del> -format-supported (1setOf mimeType)		CR							
49. max-job-subscriptions-supported (integer(1:MAX))		R							
50. max-printer-subscriptions-supported (integer(0:MAX))		R							
51. notify-lease-time-supported (rangeOfInteger(0:MAX))		R							
52. notify-lease-time-default (integer(0:MAX))		R							
53. persistent-jobs-supported (boolean)		O							
54. persistent-subscriptions-supported (boolean)		O							
55. printer-state-change-time (integer(1:MAX))		O							
56. printer-state-change-date-time (dateTime)		O							

1748 Legend: "R" - REQUIRED for Printer to support; "O" - OPTIONAL for Printer to support; "[ ]" - OPTIONAL for sender to send;

1749 "CR" - CONDITIONALLY REQUIRED, i.e., REQUIRED if Human Consumable format supported;

1750

## 1751 **B. Appendix: Change History**

1752 This section summarizes the changes to the document. Each sub-section is in reverse chronological order.  
1753 Adding or removing ISSUES that don't change the document are not listed here.

### 1754 **18.1 Changes to the February 2, 2000 version to create the March 6, 2000 version**

1755 The following changes were made to the February 2, 2000 version to create the March 6, 2000 version  
1756 based on the agreements reached on the mailing list, at the February IPP WG meetings, and reflected in the  
1757 minutes:

- 1758 1. Clarified that this extension is intended as an extension to IPP/1.0, IPP/1.1, and future versions.
- 1759 2. Allocated the operation-id 0x0016 to 0x001B values for the Notification operations defined in the  
1760 document.
- 1761 3. Pre-pended the word "subscription-" on the front of the "request-id" Subscription object attribute to  
1762 distinguish it from the "request-id" parameter that is sent in every request and response.
- 1763 4. Added the term "settable" for describing attributes that are not READ-ONLY.
- 1764 5. Added the term "Subscription Creation operation" to stand for any operation that can create a  
1765 Subscription object: Job Creation operations (Create-Job, Print-Job, and Print-URI), Create-Job-  
1766 Subscription, and Create-Printer-Subscription.
- 1767 6. Changed the "subscriber-user-name" (name(MAX)) Subscription object attribute from OPTIONAL to  
1768 REQUIRED.
- 1769 7. Changed the name and semantics of "notify-printer-up-time(integer(1:MAX)) to notify-server-up-time  
1770 so that it can be either the Printer's uptime or a Notification Delivery Service uptime.
- 1771 8. Added the 'ipp:', 'indp:', 'mailto:', and 'snmp:' notification delivery schemes to the definition of the  
1772 "notify-recipients" to indicate possible schemes.
- 1773 9. Changed the name and semantics of "notify-text-format" (mimeMediaType) to "notify-format" so that it  
1774 can be used to specify either Human Consumable or Machine Consumable formats where the  
1775 implementation supports both. Clarified that this attribute controls whatever variable Notification  
1776 Content that the implementation supports, which may be an attachment to the fixed content format or  
1777 the contents of the "human-readable-report" (text(MAX)) attribute. Clarified that an implementation  
1778 NEED NOT support all of its supported Notification Content formats with all of its supported delivery  
1779 methods.
- 1780 10. Added 'text/xml', 'application/ipp', 'application/postscript', and 'image/tiff' and additional example  
1781 MIME media types for "notify-format" (mimeMediaType).
- 1782 11. Clarified that the recommend way for a client to determine whether or not a Printer supports Per-Job  
1783 Subscriptions is to query the Printer's "max-job-subscriptions-supported" attribute, since Create-Job-  
1784 Subscriptions is an OPTIONAL operation.

- 1785 12. Clarified that the recommend way for a client to determine whether or not a Printer supports Per-Printer  
1786 Subscriptions is to query the Printer's "operations-supported" attribute to see if the Create-Printer-  
1787 Subscriptions operations is supported, since this is the usual way to determine a Printer's capabilities.
- 1788 13. Clarified that if "persistent-jobs-supported" (boolean) and "persistent-subscriptions-supported"  
1789 (boolean) are settable, then setting them must affect whether or not jobs and subscriptions are  
1790 persistent.
- 1791 14. Allowed delivery methods to send operations with or without a response, depending on the definition of  
1792 the delivery method.
- 1793 15. Indicated that a deliver method definition is free to REQUIRE that the client supply the "subscriber-  
1794 user-data" attribute.
- 1795 16. Required that the Printer support the "job-uri" operation attribute as a target, in addition to "printer-  
1796 uri"&"job-id", i.e., keep consistent with all Job operations.
- 1797 17. Changed the 'none' out-of-band value to be a reference to the collection document [ipp-coll], since the  
1798 use for it in this document is with the 'collection' attribute syntax.
- 1799 18. Clarified that a conforming implementation MUST support the 'collection' attribute syntax, since that is  
1800 required in Job Creation operations.
- 1801 19. Allocated the values to the new status codes defined in this document.
- 1802 20. Allocated the [ipp-pro] subscription-attributes-tag and notification-attributes-tag delimiter tags to  
1803 delimit Subscription attributes and Notification Content attributes in requests and responses.
- 1804 21. Changed the 'server-error-too-many-subscriptions' and 'server-error-too-many-events' to be client  
1805 errors, i.e., 'client-error-too-many-subscriptions' and 'client-error-too-many-events', since other errors of  
1806 this type are client errors.

## 18.2 Changes to the October 14, 1999 version to create the February 2, 2000 version

The following changes were made to the October 14, 1999 version to create the February 2, 2000 version based on the agreements reached at the October and December IPP WG meetings and reflected in the minutes:

1. Added a Java Listener as an example of a Notification Recipient.
2. Clarified the object relationships in section 4.1.
3. Clarified how job events differ for Per-Job versus Per-Printer Subscriptions.
4. Added the ability for the Machine Consumable form to contain a Human Readable "human-readable-report" (text) attribute so that both forms could be sent in the same Notification.
5. Clarified that the 'none' value for notify-text-format (mimeMediaType) has to be out-of-band, not the text string 'none' as a mimeMediaType.
6. Clarified that 'none' means send the Machine Consumable form without the "human-readable-report" (text) attribute, if it is defined.
7. Clarified that Notification Recipients MUST be able to accept unrecognized attributes.

- 1822 8. Allowed the notification delivery method definition to be modeled as (1) a request with an operation  
1823 code without a response, (2) a request with a operation code with a response or (3) a response with a  
1824 status code.
- 1825 9. Added "notify-text-format" (mimeType) and "human-readable-report" (text(MAX)) to be able to  
1826 be sent in a Notification content, if the notification delivery method document permits it.
- 1827 10. Added "job-k-octets" (integer(0:MAX)), "job-impressions" (integer(0:MAX)), and "job-media-sheets"  
1828 (integer(0:MAX)) as OPTIONAL for Notification content for use in job-progress events to show the  
1829 target values so that the Notification Recipient can show a thermometer.
- 1830 11. Added a Subscription Attributes group (and subscription-attributes tag) the Create-Job-Subscription and  
1831 Create-Printer-Subscription requests and responses.
- 1832 12. Added the 'none' out-of-band value for use with "notify-text-format" (mimeType) attribute.
- 1833 13. Changed the job progress attributes from using -2 to mean 'unknown' as in the PWG Job Monitoring  
1834 MIB, to use the 'unknown' out-of-band value.

1835

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