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17 Internet Printing Protocol (IPP):  
18 **IPP Event Notification Specification**

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32 **Abstract**

33 This document describes an extension to the IPP/1.0, IPP/1.1, and future versions that allows a client to  
34 subscribe to printing related events. Subscriptions are either associated with a particular Job include (called  
35 "Per-Job subscriptions") or with the Printer and (called "Per-Printer subscriptions"). ~~One or~~ A client can  
36 create a more Per-Job ~~Submission~~ subscriptions ~~are specified by the client~~ when submitting a job. A client  
37 can also create Additional Per-Job and Per-Printer subscriptions ~~are created~~ by performing separate explicit  
38 Create-Job-Subscription Create-Printer-Subscription operations, respectively. Subscriptions are modeled as

39 Subscription objects. Four other operations are defined for Subscription objects: Get-Attributes, Get-  
40 Subscriptions, Renew-Subscription, and Cancel-Subscription.

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

46 The full set of IPP documents includes:

47 Design Goals for an Internet Printing Protocol [RFC2567]

48 Rationale for the Structure and Model and Protocol for the Internet Printing Protocol [RFC2568]

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

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

51 Internet Printing Protocol/1.1: Implementer's Guide [IPP-IIG]

52 Mapping between LPD and IPP Protocols [RFC2569]

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

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

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

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

72 The "Internet Printing Protocol/1.1: Implementer's Guide" document gives insight and advice to  
73 implementers of IPP clients and IPP objects. It is intended to help them understand IPP/1.0 and some of the  
74 considerations that may assist them in the design of their client and/or IPP object implementations. For  
75 example, a typical order of processing requests is given, including error checking. Motivation for some of  
76 the specification decisions is also included.

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

79

80

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207

## 208 1 Introduction

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

212 ~~Internet Printing Protocol/1.0 & 1.1: "Collection Attribute Syntax" [ipp-coll]~~  
213 ~~Internet Printing Protocol/1.0 & 1.1: "Job Progress Attributes" [ipp-prog]~~  
214 ~~Internet Printing Protocol/1.0 & 1.1: "Notification Change History" [ipp-not-hist]~~

215

216 ~~In addition, each notification delivery method, whether REQUIRED or OPTIONAL, is described in~~  
217 ~~separate documents:~~

218

219 ~~Internet Printing Protocol/1.0 & 1.1: "Notification Delivery Method xxx [TBD]~~  
220 ~~Internet Printing Protocol/1.0 & 1.1: "Notification Delivery Method yyy [TBD]~~

221

222 Refer to the Table of Contents for the layout of this document.

223 ~~The rest of this document is laid out as follows:~~

224 ~~–The rest of Section 1.1 is an overview of IPP Notification.~~

225 ~~–Section 2 is the model for network entities that use IPP notification, including clients (desktop and~~  
226 ~~servers), IPP Printers (servers and devices), and Notification Recipients.~~

227 ~~–Section 3 is the terminology used throughout the document.~~

228 ~~–Section 4 is the object model for notification, including Job, Printer, and Subscription objects.~~

229 ~~–Section 5 defines the Subscription object and its attributes.~~

230 ~~–Section 6 defines the Printer Description attributes~~

231 ~~–Section 7 defines the Notification content of Human Consumable and Machine Consumable Event~~  
232 ~~formats.~~

233 ~~–Sections 8 and 10 define the Per Job and Per Printer Subscription operations.~~

234 ~~–Section 1 defines the out-of-band values.~~

235 ~~–Section 11 and 12 define the conformance requirements and IANA requirements, respectively.~~

236 ~~–Section 13–15 cover Internationalization, Security, and Status codes.~~

237 ~~–Appendix A is a summary of the Notification Attribute usage~~



238 ~~–Appendix B is a Change History~~

## 239 **1.1 Notification Overview**

240 A client can establish an Event Notification subscription so that when one of the specified events occurs, an  
241 asynchronous Event Notification is sent to a specified Notification Recipient.

242 A client MAY create a subscription associated with a particular job (called a Per-Job Subscription) when  
243 submitting a job or performing the Create-Job-Subscription operation. A client MAY create a subscription  
244 associated with the Printer as a whole (called Per-Printer Subscription) by performing the Create-Printer-  
245 Subscriptions operation.

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

249 A Per-Job or Per-Printer subscription request includes, for example:

- 250 1. the names of Job and/or Printer events that are of interest to the Notification Recipient
- 251 2. the delivery method and address (URL) to use to deliver the Event Notification to one Notification  
252 Recipient
- 253 3. ~~if Human-Consumable notification content is to be sent, which text~~ the format of the Human  
254 Consumable text portion of the Event Notification
- 255 4. some opaque data that the subscriber wants to be sent to the Notification Recipient in the Event  
256 Notification, perhaps to identify either the subscriber or the ultimate recipient
- 257 5. the charset to use in the Event Notification, ~~if it is to be different than the one used in the request~~  
258 ~~that created the subscription~~
- 259 6. the natural language to use in the Human Consumable Event Notification and in name or text  
260 attributes in the Machine Consumable Event Notification, ~~if it is to be different than the one used in~~  
261 ~~the request that created the subscription~~
- 262 7. the requested lease time in seconds for the subscription
- 263 8. whether or not the subscription is requested to be persistent across power cycles.

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

272 When a client performs a Job Creation operation (Print-Job, Print-URI, and Create-Job), a client can create  
273 a single Subscription object for receiving Event Notifications by using the "notify-xxx" operation attributes.  
274 The "notify-xxx" operation attributes may be submitted to the Validate-Job in order to be validated. The  
275 "notify-xxx" attributes are copied to a newly created Subscription to populate the corresponding  
276 Subscription Description attributes. If a client wants more than one Per-Job subscription, it MUST use the  
277 Create-Job-Subscription operation if the Printer supports it. To avoid race conditions, a client SHOULD  
278 perform the Create-Job-Subscription between a Create-Job operation and the first Send-Document or Send-  
279 URI operation.

280 When a client performs the Create-Job-Subscription operation, the operation creates a Subscription object  
281 and associates it with a job that already exists. When a client performs the Create-Printer-Subscription  
282 operation, the operation creates a Subscription object and associates with the Printer as a whole instead of a  
283 particular job. For Per-Printer subscriptions and Per-Job subscriptions created after the Job has been  
284 created, a client requests job and printer event notification using new operations independent of any job.  
285 The Printer keeps each subscription in a separate Subscription object. The Create-Job-Subscription and  
286 Create-Printer-Subscription operations create an instance of the Subscription object supplying these new  
287 operation attributes and ~~Both of these operations~~ returns a ~~subscription id~~notify-subscription-id (analogous  
288 to a job-id for a Job object). ~~The Printer copies the These~~operation attributes ~~of these two operations are~~  
289 ~~copied~~to the Subscription object as Subscription Description attributes. ~~and so may~~The Subscription object  
290 attributes may be queried using the Get-Subscription-Attributes and Get-Subscriptions operations. The  
291 subscriber requests a lease time for each Per-Printer subscription which MAY be infinite. The Printer  
292 grants a lease time according to its configured policy. A client MUST renew the Subscription before the  
293 granted lease time expires using the Renew-Subscription operation.

294 Table 1 summarizes the Per-Job Subscription operations. Table 2 summarizes the Per-Job Subscription  
295 operations. Table 3 summarizes the operations that work with both Per-Job and Per-Printer Subscriptions.  
296 Each table contains the following columns:

- 297 a) Operation: the name of the operation
- 298 b) ID: the assigned ~~assigns their~~operation-id (see [ipp-mod] section 4.4.15) ~~and their salient input~~  
299 ~~operation attributes~~. The value of 'mod' means that the operation-id is assigned in [ipp-mod].
- 300 c) Brief Description: information about the operation

301

302

**Table 1 - Summary of Operations that Create Per-Job Subscriptions**

Operation:	ID	Brief Description
Print-Job, Print-URI, Create-Job	mod	Create at most one Per-Job Subscriptions as part of the Job Creation operation
Validate-Job	mod	Check that the Job Creation operation would be accepted including the Subscription
Create-Job-Subscription	0x0017	Create a Per-Job Subscription

303

304

**Table 2 - Summary of Operations that Create Per-Printer Subscriptions**

Operation:	ID	Brief Description
Create-Printer-Subscription	0x0016	Create a Per-Printer Subscription

305

**Table 3 - Summary of Operations that act on Per-Job and Per-Printer Subscriptions**

Operation:	ID	Brief Description
Get-Subscription-Attributes	0x0018	Get specified Subscription attributes of the specified Subscription object
Get-Subscriptions	0x0019	Get the specified Subscription attributes from all specified Subscription objects
Renew-Subscription	0x001A	Renew the Subscription lease
Cancel-Subscription	0x001B	Cancel the Subscription

306

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

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

312 ~~2) As an events occurs, the Printer searches the set of subscriptions for any interest in that event. As the~~  
 313 ~~Printer finds that some notification recipient is interested in that event (the notification recipient is~~  
 314 ~~subscribed to the event), the Printer increments the Subscription object's "subscription-request-id" (integer~~

315 ~~(0:MAX)) attribute and a notification is generated and delivered using the methods and target addresses~~  
316 ~~identified in the subscription, passing the incremented "request-id".~~

317 The following is an example of how a Printer could implement Event Notifications. When an event occurs,  
318 the Printer searches the all of its Subscription objects for any interest in the event. For each Subscription  
319 object found, the Printer

- 320 a) increments the Subscription object's "notify-sequence-id" (integer (0:MAX)) attribute, and
- 321 b) generates an Event Notification, and
- 322 c) either
  - 323 i) delivers the Event Notification using the delivery method and target address identified in the
  - 324 Subscription object's "notify-recipient-uri" attribute if the delivery method is a "push"
  - 325 delivery method, or
  - 326 ii) saves Event Notification for an event-lease time if the delivery method is a "pull", i.e. the
  - 327 client is expected to fetch the Event Notifications.

328 The "~~subscription-request-id~~notify-sequence-id" sequence number permits a Notification Recipient to  
329 detect duplicate Event Notifications due either to duplicate subscriptions or retries and to detect dropped  
330 Event Notifications.

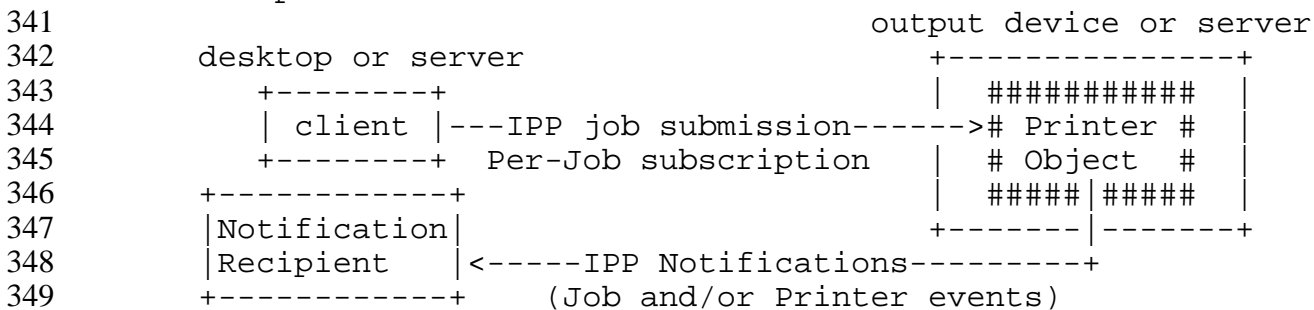
## 331 2 Model for Per-Job and Per-Printer Subscription and Event Notification

### 332 2.1 Model for Per-Job Subscription and Event Notification

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

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

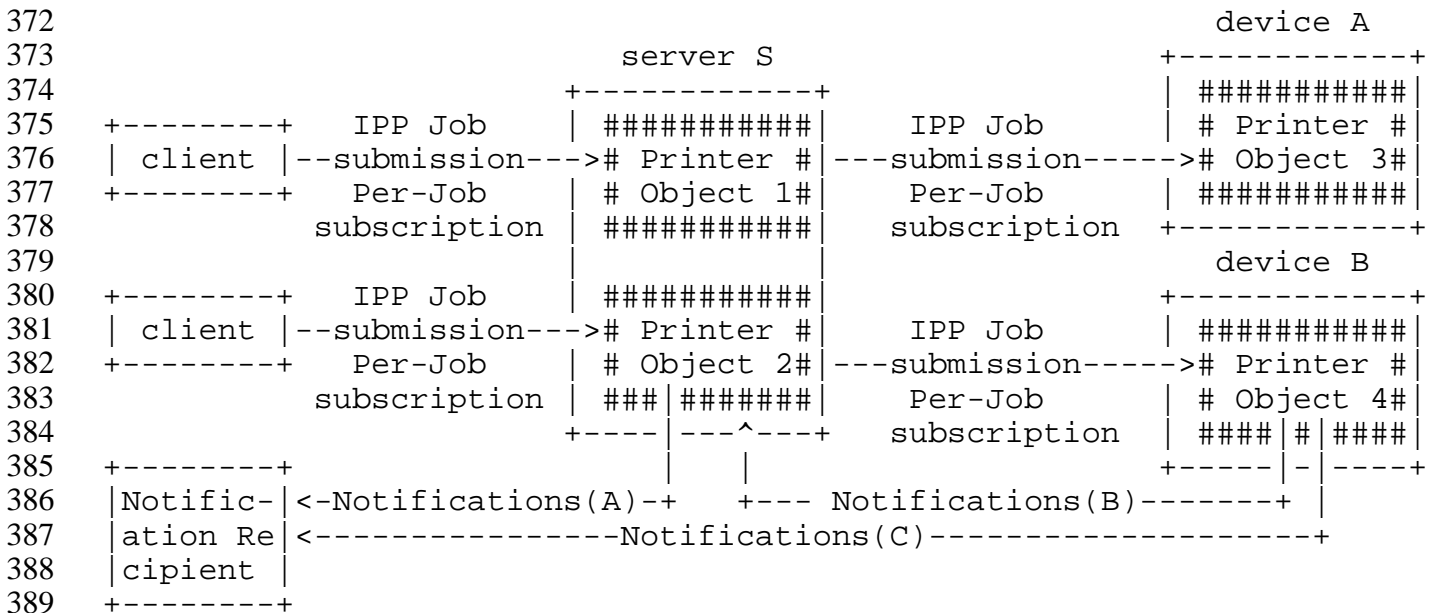
339 embedded printer:



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

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

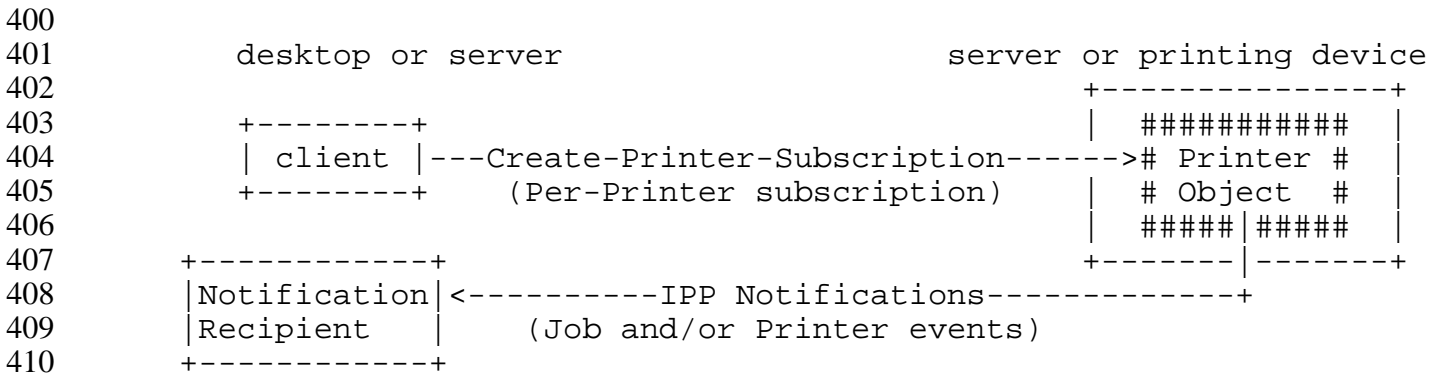
- 355 1. forward the Per-Job subscriptions to the down stream IPP Printer and let it perform the Event
356 Notification directly to the Notification Recipients supplied by the Client (Notifications(C)) and
357 use Per-Printer Subscriptions for the Server's own purposes.
- 358 2. save the client-supplied Per-Job subscription on the Job object in the server and substitute its
359 own Per-Job subscription with the Server as the Notification Recipient (Notifications(B)). Then
360 the Server relays Event Notifications to the client-supplied Notification Recipients
361 (Notifications(A)).
- 362 3. A combination of 1 and 2 in which the Server adds its own Per-Job subscriptions to those
363 supplied by the client. Thus the IPP Job that goes to Printer object 4 has a combination of
364 subscription information from both the Client and the Server. This latter approach is sometimes
365 called "piggy-backing" because the Server is adding its Per-Job subscription information to that
366 supplied by the client. Piggy-backing is especially useful, if device B also accepts (IPP or non-
367 IPP) requests from other servers. Then when all the jobs from Server S have been completed by
368 device B, there will be no more Job events sent to Server S. (Server S could still maintain a
369 long term Per-Printer subscription with Printer D to that Server S can have Printer B's state track
370 (shadow) that of Printer D or Server S could poll Printer D when queried about Printer B).



390 **Figure 2 - Client-Server-Printer Per-Job Subscription and Notification Model**

391 **2.2 Model for Per-Printer Subscription and Event Notification**

392 Per-Printer subscriptions are created by a client (an end user, an operator, or a server acting as a client)  
 393 using a Create-Printer-Subscription operation that is independent of Job Submission. The Printer object  
 394 (printing device or server) creates a Subscription object to hold the attributes supplied by the subscriber.  
 395 The client creates separate Per-Printer subscriptions if more than one Notification Recipient is desired. The  
 396 Printer delivers Event Notifications to the Notification Recipient specified by each Per-Printer subscription.  
 397 A Notification Recipient may be the subscriber or a third party. Figure 3 shows the Per-Printer subscription  
 398 notification model for the Client - Printer relationship where the client may be an end user, an operator, or a  
 399 server acting as a client.



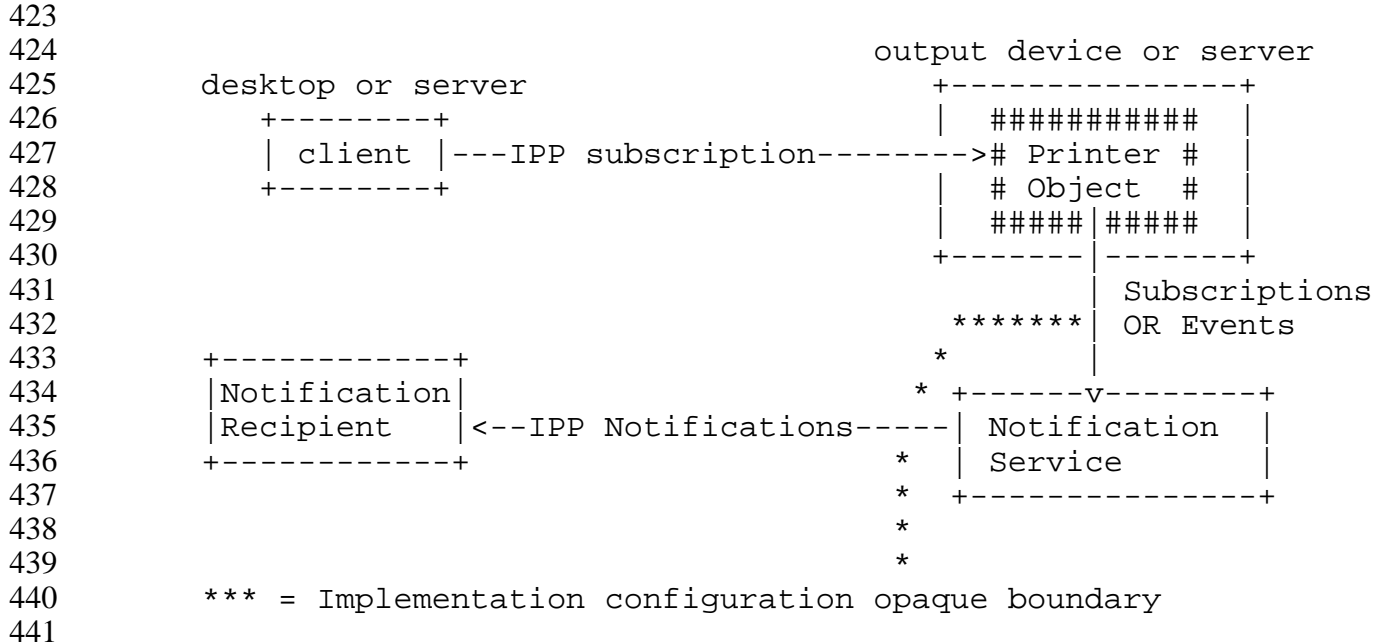
411 **Figure 3 - Client-Printer Per-Printer Subscription and Notification Model**

412 **2.3 Relationship between the Printer object and the Notification Delivery Service**

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

417 **2.3.1 Use of a Notification Service transparently to clients**

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



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

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

**2.3.2 Use of Notification Service transparently to the IPP Printer**

Another way that a Notification Service can be used is if the Notification Recipient indicated in the IPP Subscription is a notification service (transparent to the IPP Printer), which in turn forwards the Event Notification to the Ultimate Notification Recipient using additional parameters in the IPP Subscription (URI parameters or subscriber user data). In such cases, the Ultimate Notification Recipient has also subscribed directly with the other notification service (by means outside this document). As far as the IPP Printer is concerned, the IPP Subscription indicated that the IPP Printer is to delivery Event Notifications to the Notification Recipient (Notification Service) using the specified notification delivery method. The method that the Notification Recipient uses for delivering the Event Notification to the Ultimate Notification Recipient is beyond the scope of this document and is transparent to the IPP Printer. However, the client does have to know how to pass additional information to the Notification Recipient in the IPP Subscription using either extra parameters in the URI or subscriber user data. Examples of this latter approach are paging, immediate messaging services, and NOS vendors infrastructure. Figure 5 shows this approach.

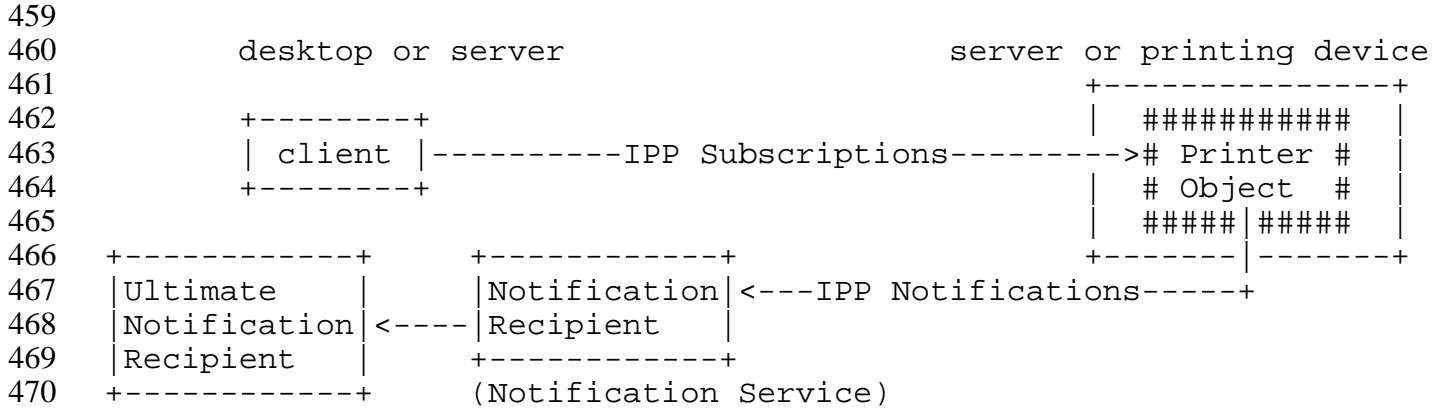


Figure 5 - Use of a Notification Service transparent to the IPP Printer

### 3 Terminology

This section defines terminology used throughout this document.

#### 3.1 Conformance Terminology

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

**REQUIRED** - an adjective used to indicate that a conforming IPP Printer implementation **MUST** support the indicated operation, object, attribute, attribute value, status code, or out-of-band value in requests and responses. See [ipp-mod] "Appendix A - Terminology for a definition of "support". *Since support of this entire notification specification is **OPTIONAL** for conformance to IPP/1.0 or IPP/1.1, the use of the term **REQUIRED** in this document means "REQUIRED if this **OPTIONAL** notification specification is implemented".*

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

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

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



496 **READ-ONLY** - an adjective used in an attribute definition to indicate that an IPP Printer MUST NOT  
497 ~~support the~~allow the attribute's value to be modified ~~as being settable using~~with the Set-Job-  
498 Attributes or Set-Printer-Attributes operations (see [ipp-set]).

499

## 500 3.2 Other terminology

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

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

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

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

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

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

517 **Job Recipient** - A human who is the ultimate consumer of the print job. In many cases this will be the  
518 same person as the Job Submitting End User, but need not be.  
519 Example: If I use IPP to print a document on a printer in a business partner's office, I am the Job  
520 Submitting End User, while the person I intend the document for in my business partner's office is  
521 the Job Recipient. Since one of the goals of IPP is to be able to print near the Job Recipient of the  
522 printed output, we would normally expect that person to be in the same security domain as, and  
523 geographically near, the Printer. However, this may not always be the case. For example, I submit a  
524 print job across the Internet to a Kinko's print shop. I am both the Submitting End User and the Job  
525 Recipient, but I am neither near nor in the same security domain as the Printer.

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

530 Example: I submit a print job from home to be printed on a printer at work. I'd like my secretary to

531 pick up the print job and put it on my desk. In this case, I am acting as both Job Submitting End  
532 User and Job Recipient. My secretary is acting as a Job Recipient Proxy

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

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

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

543 **Per-Job Subscription** - A Subscription object that is associated with a single Job. ~~that a~~ A client  
544 specifies ~~creates such a Subscription object~~ -as part of a ~~create~~ create-job operation (Print-Job, Print-  
545 URI, Create-Job), a Validate-Job operation, or an explicit Create-Job-Subscription operation with a  
546 Job object as the target.

547 **Per-Printer Subscription** - A Subscription object that is associated with the Printer as a whole. ~~A~~ that  
548 a client creates such a Subscription object ~~specifies~~ -using an explicit Create-Printer-Subscription  
549 operation with a Printer object as the target.

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

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

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

561 **Event** - An event is some occurrence (either expected or unexpected) within the printing system of a  
562 change of state, condition, or configuration of a Job or Printer object. A property of an event is that  
563 it only occurs at one instant in time and does not span the time the physical event takes place. For  
564 instance, jam-occurred and jam-cleared are two distinct events. The jam-occurred event is reported  
565 only when the jam initially occurs and only if there is one or more event subscriptions outstanding  
566 for that event.

567 Events can be classified along two dimensions:

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

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

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

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

578 **Event Notification** - When an event occurs, an Event Notification is generated that fully describes the  
579 event (what the event was, where it occurred, when it occurred, etc.). Event Notifications are  
580 delivered to each Notification Recipient that has a subscription that includes the event, if any. The  
581 Event Notification is delivered to the address of the Notification Recipient using the notification  
582 delivery method defined in the subscription. However, an Event Notification is sent **ONLY** if there  
583 is a corresponding subscription. Note: sometimes "Event Notification" is shortened to  
584 "Notification".

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

587 **Immediate Event Notification** - Event Notifications that are delivered using a delivery method which  
588 is not store-and-forward (e.g. TCP connection, UDP datagram). This can be on the order of several  
589 minutes subject to network latency.

590 **Store and Forward Event Notification** - An Event Notification which are not necessarily delivered to  
591 Notification Recipients immediately, but is queued for delivery by some intermediate network  
592 application, for later retrieval. Email and Instant Messaging services are examples of a store and  
593 forward notification delivery method.

594 **Human Consumable Event Notification** - Event Notifications that are intended to be consumed by  
595 human End Users only. They are simple text that has been localized for the Notification Recipient  
596 as specified in the subscription. Programs are not intended to parse Human Consumable Event  
597 Notification, since it is localized and the content depends on implementation. There is no  
598 standardized format.

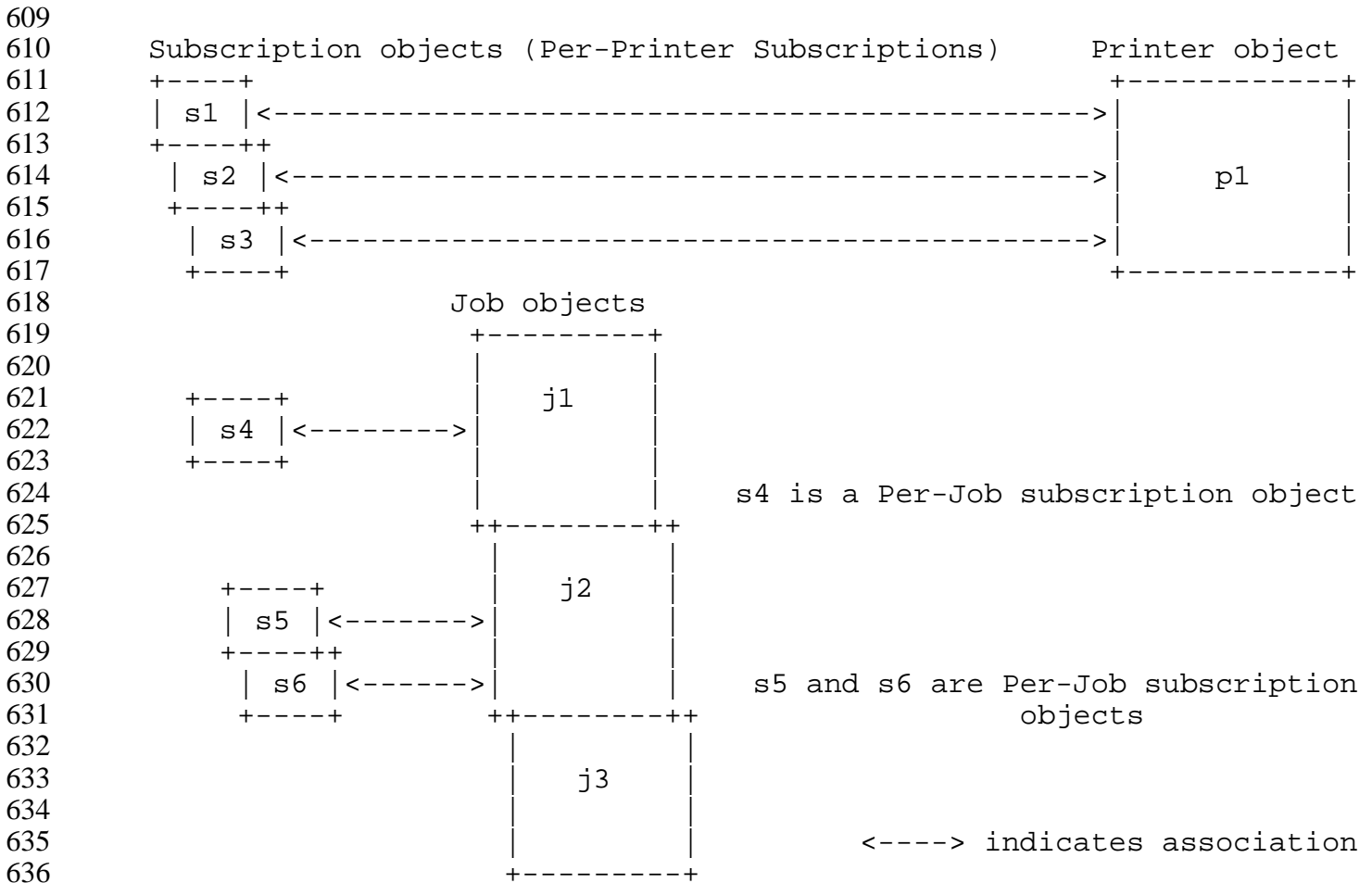
599 **Machine Consumable Event Notification** - Event Notifications that are intended for consumption by a  
600 program only. They use the encoding of an IPP response. The Notification Recipient must localize  
601 the contents, if displaying it to a human.

602 **Subscription Creation operation** - One of the operations that creates a Subscription object: Job  
 603 Creation operations (Create-Job, Print-Job, and Print-URI), Create-Job-Subscription, and Create-  
 604 Printer-Subscription.

605 **4 Object Model for Notification**

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

608 The object relationships can be seen pictorially as:



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

638 s1, s2, and s3 are Per-Printer Subscription objects and can identify Printer and/or Job events.  
 639 s4, s5, and s6 are Per-Job subscription objects and can identify Printer and/or Job events.

640 **4.1 Object relationships**

641 This sub-section defines the object relationships between the Printer, Job, and Subscription objects.  
 642 Whether Per-Printer Subscription objects are actually contained in a Printer object or are just bi-

643 directionally associated with them in some way is IMPLEMENTATION DEPENDENT and is transparent  
644 to the client. Similarly, whether Per-Job Subscription objects are actually contained in a Job object or are  
645 just bi-directionally associated with them in some way is IMPLEMENTATION DEPENDENT and is  
646 transparent to the client. The object relationships are defined as follows:

#### 647 **4.1.1 Printer object and Per-Printer Subscription objects**

- 648 1. The Printer object contains (is associated with) zero or more Per-Printer Subscription objects (p1  
649 contains s1-s3 Per-Printer Subscription objects).
- 650 2. A Per-Printer Subscription object (s1-s3) cannot be contained in (or associated with) more than one  
651 Printer object (p1).
- 652 3. Each Per-Printer Subscription object (s1, s2, and s3) is contained in (or is associated with) one  
653 Printer object (p1) and each represents one Per-Printer subscription.
- 654 4. Each Per-Printer Subscription object identifies one or more Job and/or Printer events. Such Job  
655 events are for *all* jobs on the Printer. Such Printer events are for *any* Printer event, no matter which  
656 job is processing and when no jobs are processing.

#### 657 **4.1.2 Job object and Per-Job Subscription objects**

- 658 1. A Job object (j1, j2, j3) contains (is associated with) zero or more Per-Job subscription objects (s4-  
659 s6). Job j1 is associated with Per-Job subscription object s4, Job j2 is associated with Per-Job  
660 subscription objects s5 and s6, and Job j3 is not associated with any Per-Job subscription object.
- 661 2. A Per-Job Subscription object cannot be contained in (or associated with) more than one Job object.
- 662 3. Each Per-Job Subscription object is contained in (or associated with) one Job object and each  
663 represents one Per-Job Subscription.
- 664 4. Each Per-Job Subscription object identifies one or more Job and/or Printer events. Such Job events  
665 are only for *this* job (different than "per-Printer" Subscriptions). Such Printer events are for *any*  
666 Printer event, no matter which job and when no jobs are processing (same as for "per-Printer"  
667 Subscriptions).

## 668 **5 Subscription Object attributes**

669 ISSUE Should we consolidate this section and several others into a single Subscription Template section  
670 (like the Job Template section in the IPP/1.1 model document [ipp-mod]. Much information is replicated  
671 four times, here and in each of the three operations.

672 ISSUE: To further simplify, the document should we have the Job Creation operations use a Subscription  
673 group like the Create-Job-Subscription and Create-Printer-Subscription operations. This would reduce text  
674 and reduce code because of the added commonality.

675 Table 4 lists the Subscription object attributes defined in this section and the related Printer Description  
676 attributes defined in section 6, if any. The definitions of the object attributes are specified in this section so  
677 that they can be referred to from the subsequent definitions of the operations that set them. ~~None~~ ~~All~~ of the  
678 Subscription object attributes can be modified after a Subscription object is created because this  
679 specification does not define a Set-Subscription-Attributes operation. The attributes, that are inherently un-  
680 modifiable even if there were a Set-Subscription-Attributes operation are marked as READ-ONLY. They  
681 can be set only by specific operations that create or perform operations on Subscription objects (see section  
682 8).

683 If a Printer supports an attribute, the Printer MUST

- 684 a) accept the attribute in a Subscription creation operation (Job-Creation, Create-Job-Subscription  
685 and Create-Printer-Subscription), and
- 686 b) store the attribute on the created Subscription object, and
- 687 c) return the attribute in the Get-Subscription-Attributes operations.

688 Table 4 below contains the following columns:

- 689 a) Subscription object attributes: the name of a Subscription object attribute.
- 690 b) Client MUST supply: the value is 'yes' if the client MUST supply the Subscription attribute in an  
691 operation that creates a Subscription object. The value is 'no' if the client MAY supply the  
692 Subscription attribute in an operation that creates a Subscription object. If a client MAY supply  
693 the Subscription attribute, the default value is specified in the section describing the attribute.
- 694 c) Printer MUST support: the value is 'yes' if the Printer MUST support the Subscription attribute  
695 (as defined above) and 'no' if the Printer MAY support the Subscription.
- 696 d) Related Printer Description attribute(s): this columns lists the related attributes, such as the  
697 "xxx-supported" and "xxx-default" attributes. The value 'n/a' means that the attribute has no  
698 related attributes.

699

700

**Table 4 - Subscription object attributes supplied directly by the client**

Subscription object attributes: <u>Set by client input to a Subscription Creation operation</u>	<u>Client MUST supply</u>	Printer <u>MUST</u> support	Related Printer Description attribute(s)
notify-recipient- <u>uri</u> (uri)	<u>yes</u>	yes	notify-schemes-supported (1setOf uriScheme)
notify-events (1setOf type2 keyword)	<u>no</u>	yes	notify-events-default (1setOf type2 keyword)  notify-events-supported (1setOf type2 keyword)  <del>max-</del> notify-max-events-supported (integer(5:MAX))
notify- <del>text</del> -format (mimeMediaType)	<u>no</u>	yes	notify- <del>text</del> -format-supported (1setOf mimeMediaType)
<u>notify-additional-formats</u> (1setOf mimeMediaType)	<u>no</u>	no	<u>notify-additional-formats-supported</u> (1setOf mimeMediaType)
<u>notify-requested-attributes</u>	<u>no</u>	no	<u>notify-requested-attributes-supported</u> (1 setOf type2 keyword)
<u>notify-user-data</u> (octetString(63))	<u>no</u>	yes	n/a
notify-charset (charset)	<u>no</u>	<u>yes</u> <del>no</del>	charset-supported (1setOf charset)
notify-natural-languages ( <del>1setOf</del> naturalLanguage)	<u>no</u>	<u>yes</u> <del>no</del>	generated-natural-language-supported (1setOf naturalLanguage)

701

702 Table 5 contains the same columns as table two except for the second column ('Client MUST supply')  
703 which is omitted because a client MUST NOT supply any of the attributes in the table. The Printer supplies  
704 them all from a source defined for the attribute.

705

**Table 5 - Subscription object attributes supplied the Printer**

706

Subscription object attributes:	Printer <b><u>MUST</u></b> support	Related Printer Description attribute(s)
<del>Printer initializes to 0, increments at beginning of each event</del>		
<del>subscription-request-id-notify-sequence-id(integer(0:MAX))</del>	<u>yes</u>	n/a
<u>notify-subscription-id (integer(1:MAX))</u>	<u>yes</u>	<u>n/a</u>
<u>notify-lease-expiration-time (integer(0:MAX))</u>	<u>yes</u>	<u>notify-lease-time-default (integer(0:MAX))</u> <u>notify-lease-time-supported (rangeOfInteger(0:MAX))</u>
<u>printer-uri (uri)</u>	<u>yes</u>	<u>printer-uri-supported</u>
<u>subscriber-user-name (name(MAX))</u>	<u>yes</u>	<u>n/a</u>
<u>notify-server-up-time (integer(1:MAX))</u>	<u>yes</u>	<u>printer-up-time (integer(1:MAX))</u>
<u>notify-persistence-granted (boolean)</u>	<u>yes</u>	<u>persistent-subscriptions-supported (boolean)</u>

707

708

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

### 715 **5.1 notify-recipient-uri (uri)**

716 This ~~REQUIRED READ ONLY~~ Subscription object attribute describes both where (the address of the  
 717 Notification Recipient) and how (the delivery method) notifications are to be delivered to the Notification  
 718 Recipient when any of the events specified in the "notify-events" attribute occur. A Printer MUST support  
 719 this attribute and a client MUST supply this attribute as an operation attribute when it creates a Subscription  
 720 object with the Create Job, Create-Job-Subscription or Create-Printer-Subscription operation.



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

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

725 1) The URI scheme used.

726 2) The default delivery format, and additional delivery formats if any. If the delivery method supports  
 727 additional delivery formats, the Printer MUST support the "notify-additional-formats" for them to  
 728 be accessible to clients

729 ~~2) The supported and default delivery format, and if not one of the specified types in Section 5.3,~~  
 730 ~~description of the notification content.~~

731 3) Whether the Event Notification Content is intended to Machine Consumable or Human  
 732 Consumable.

733 4) If the attribute "notify-text" is supported for the Machine Consumable content.

734 5) Any content length restrictions imposed by the delivery protocol.

735 6) The latency of the delivery protocol used.

736 7) The reliability of the transport and delivery protocol used.

737 8) The security aspects of the transport and delivery protocol used, e.g. how it is handled in firewalls.

738 9) How the delivery protocol is initiated, e.g. does it have to be initiated by the receiving user (pull), or  
 739 is it initiated by the notification service (push).

740 Although this specification does not define any notification delivery schemes, the following sorts of  
 741 notification delivery schemes are expected~~The following notification delivery schemes are defined in other~~  
 742 ~~documents for use as part of the URI value of this attribute:~~

743 ~~'ipp:'—The Notification Recipient uses server directed polling to pull Event Notifications~~ ~~[ipp-method-~~  
 744 ~~poll]~~

745 ~~'indp:'—The Notification Source sends~~ ~~Send Notifications operations~~ Event Notifications to the  
 746 Notification Recipient ~~[ipp-method-indp]~~ using http as the transport.

747 ~~'mailto:'—The Notification Source sends an email message,~~ ~~using SMTP with possible attachments~~  
 748 ~~containing Machine Consumable Notification Content~~ ~~[ipp-method-mailto]~~

749 ~~'snmpnotify:'—The Notification Source sends SNMP traps and/or informs to the Notification Recipient~~  
 750 ~~[ipp-method-smp]~~

751 This list of notification delivery schemes will be added to as needed using the registration procedures  
752 defined in [ipp-mod]. [See the section on IANA Considerations in this specification for more details.](#)

753 ~~ISSUE-01—Once a number of delivery solutions have been developed and evaluated, we may want to~~  
754 ~~make one or several of them REQUIRED for implementation to ensure a minimum set of interoperability.~~  
755 ~~Which one or ones should be REQUIRED?~~

## 756 5.2 notify-events (1setOf type2 keyword)

757 This ~~REQUIRED READ-ONLY~~ Subscription object attribute identifies the job and/or printer events that  
758 are to be delivered to the Notification Recipient as Event Notifications as defined in section 7. [A Printer](#)  
759 [MUST support this attribute and a client MAY supply this attribute as an operation attribute when it creates](#)  
760 [a Subscription object with the Create Job, Create-Job-Subscription or Create-Printer-Subscription](#)  
761 [operation.](#) If the client ~~did~~ [does](#) not supply this attribute ~~when supplying the subscription in one of the~~  
762 [aforementioned operations](#), the Printer object [MUST](#) populate this attribute with its "notify-events-default"  
763 attribute value (see section 6.2).

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

767 Job events: The semantics for job events depends on whether the subscription is a Per-Job  
768 Subscription or a Per-Printer Subscription. For Per-Job Subscriptions, the Printer [MUST](#)  
769 generate Event Notifications only for the job events of the job with which the Subscription is  
770 associated. For Per-Printer Subscriptions, the Printer [MUST](#) generate Event Notifications  
771 for the job events for any job submitted to the Printer.

772 For example, consider the event when there are 10 'pending' jobs, one 'processing' job, and  
773 30 'completed' jobs and the 'processing' job completes. The Printer [MUST](#) generate a 'job-  
774 completed' job Event Notification if the job [has-is associated with](#) a Per-Job Subscription  
775 that contained the 'job-completed' event in this attribute [of it the Printer is associated with a](#)  
776 [Per-Printer Subscription that contained the 'job-completed' event in this attribute.](#) The  
777 Printer [MUST NOT](#) generate Event Notifications for any other jobs whose Per-Job  
778 Subscriptions contain the 'job-completed' event in this attribute.

779 Printer events: The semantics for printer events does not depend on whether the subscription is a  
780 Per-Job or a Per-Printer Subscription. For both Per-Job Subscriptions and Per-Printer  
781 Subscriptions, the Printer [MUST](#) generate Event Notifications for printer events, no matter  
782 what job is processing, including when no jobs are processing.

783 For example, consider the event when there are 10 'pending' jobs, one 'processing' job, and  
784 30 'completed' jobs and the Printer enters the 'stopped' state. The Printer [MUST](#) generate a  
785 'printer-state-changed' printer Event Notification for each of the 11 'pending' and 'processing'  
786 jobs whose Per-Job Subscriptions contain the 'printer-state-changed' event in this attribute.

787           The Printer MUST NOT generate Event Notifications for any of the 'completed' jobs' whose  
788           Per-Job Subscriptions contain the 'printer-state-changed' event in this attribute.

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

792           A Printer MUST support the events indicated as "REQUIRED" and MAY support of the events indicated as  
793           "OPTIONAL".

794           The standard event keyword value for the "notify-events-default" and "notify-events-default" attributes  
795           only:

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

798           The standard job event keyword values are:

799           '**job-created**': REQUIRED - the Printer object has accepted a Job Creation operation (Print-Job, Print-  
800           URI, or Create-Job) and the job's "time-at-creation" attribute value is set (see [ipp-mod] section  
801           4.3.14.1). The Printer puts the job in the 'pending', 'pending-held' or 'processing' states.  
802           Note: This event is separate from the 'job-state-changed' event so that it can be subscribed to  
803           without having to get every job state change event for a Notification Recipient that is only interested  
804           in when the job is first created.

805           '**job-completed**': REQUIRED - the job has reached one of the completed states, i.e., the value of the  
806           job's "job-state" attribute has changed to: 'completed', 'aborted', or 'canceled'. The Job's "time-at-  
807           completed" and "date-time-at-completed" (if supported) attributes are set (see [ipp-mod] section  
808           4.3.14).  
809           Note: This event is separate from 'job-state-changed' so that it can be subscribed to without having  
810           to get every job state change event for a Notification Recipient that is only interested in when the  
811           job is completed.

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

816           This event also indicates that one or more values have been added to or removed from the Job's  
817           "job-state-reasons" attribute, such as 'job-queued' or 'job-printing', whether or not the job's state has  
818           changed. If job state reasons are added when the job is created, only the 'job-created' event is  
819           generated, in order to keep the events disjoint. If job state reasons are added or removed when the  
820           job is completed, only the 'job-completed' event is generated, in order to keep the events disjoint.  
821           822

823           A client that wants to subscribe to all job state changes, including creation and completion, includes  
824           the 'job-created', 'job-state-changed', and 'job-completed' in the notification subscription. When a

825 job is finally removed from the Job History (see [ipp-mod] 4.3.7.1) no event is generated, i.e.,  
826 neither a 'job-state-changed' event nor a 'job-purged' event is generated.

827 **'job-config-changed'**: OPTIONAL - when the configuration of a job has changed, i.e., the value of the  
828 "job-message-from-operator" or any of the ~~non-READ-ONLY~~ "configuration" Job attributes have  
829 changed. A "configuration" Job attribute is an attribute that 1) can change value because of some  
830 human interaction either direct or indirect, and that 2) is not covered by one of the other events in  
831 this section. Examples of "configuration" Job attributes are such as any of the job template attributes  
832 ~~or~~ and the "job-name" attribute. ~~Often, such a change is the result of the user or the operator~~  
833 performing a Set-Job-Attributes operation (see [ipp-set]) on the Job object. The client performs a  
834 Get-Job-Attributes to find out the new values of the changed attributes. This event is useful for GUI  
835 clients and drivers to update the job information to the user.

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

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

841 The standard Printer event keywords values are:

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

844 **'printer-restarted'**: OPTIONAL - when the printer is powered up or the Restart-Printer operation is  
845 performed (see [ipp-mod]).  
846 Note: This event is separate from the 'printer-state-changed' event so that it can be subscribed to  
847 without having to get every printer state change event, for a Notification Recipient that is only  
848 interested in when the Printer first comes up.

849 **'printer-shutdown'**: OPTIONAL - when the device is being powered down or the Shutdown-Printer  
850 operation has been performed (see [ipp-set2]).  
851 Note: This event is separate from 'printer-state-changed' so that it can be subscribed to without  
852 having to get every Printer state change event, for a Notification Recipient that is only interested in  
853 when the Printer is powered down or shutdown.

854 **'printer-state-changed'**: REQUIRED - the Printer changed state, i.e., the value of the Printer's  
855 "printer-state", "printer-state-reasons" (whether "printer-state" changed or not), and/or "printer-is-  
856 accepting-jobs" attributes changed, except when the Printer starts up or is shutdown. If printer state  
857 reasons are added when the Printer is started up, only the 'printer-restarted' event is generated, in  
858 order to keep the events disjoint. If printer state reasons are added or removed when the printer is  
859 powered-down or shutdown, only the 'printer-shutdown' event is generated, in order to keep the  
860 events disjoint.

861  
862 A client that wants to subscribe to all printer state changes, including restart and power-

863 down/shutdown, includes the 'printer-restarted', 'printer-state-changed', and 'printer-shutdown' in the  
864 notification subscription. If a Printer does not support 'printer-restarted' or 'printer-shutdown', these  
865 attributes do not become accessible via this attribute.

866 **ISSUE:** is above fix correct?

867 '**printer-media-changed**': OPTIONAL - when the media loaded on a printer has been changed, i.e.,  
868 the "media-ready" attribute has changed. This event includes both an actual media change and  
869 filling an empty input tray with the same or different media. The client must check the "media-  
870 ready" Printer attribute (see [ipp-mod] section 4.2.11) separately to find out what new media was  
871 loaded or filled.

872 '**printer-config-changed**': OPTIONAL - when the configuration of a Printer has changed, i.e., the  
873 value of the "printer-message-from-operator" or any "configuration" ~~non-READ-ONLY~~ Printer  
874 attribute has changed, A "configuration" Printer attribute is an attribute which can change value  
875 because of some human interaction either direct or indirect, and which is not covered by one of the  
876 other events in this section. Examples of "configuration" Printer attributes are any of the job  
877 template attributes, such as "xxx-supported" and "xxx-default",.. ~~except for~~ The "media-ready"  
878 attribute is an example of an attribute covered by another event: 'printer-media-changed'. (which  
879 has its own event), ~~whether~~ Often, such a change is the result of the user or the operator performing  
880 a Set-Printer-Attributes operation (see [ipp-set]) on the Printer object through the Set-Printer-  
881 Attributes operation or by other means and whether initiated by a human or not. For example, any  
882 "xxx-supported", "xxx-default", "printer-message-from-operator", etc. values have changed. The  
883 client has to perform a Get-Printer-Attributes to find out the new values of these changed attributes.  
884 This event is useful for GUI clients and drivers to update the available printer capabilities to the  
885 user.

886 **ISSUE:** if printer-media-changed is not supported, does printer-config-changed support it? Same  
887 question for attributes below.

888 '**printer-queue-changed**': OPTIONAL - the order of jobs in the Printer's queue has changed, so that an  
889 application that is monitoring the queue can perform a Get-Jobs operation to determine the new  
890 order. This event does not include when a job enters the queue (the 'job-created' event covers that)  
891 and does not include when a job leaves the queue (the 'job-completed' event covers that).

892 '**printer-no-longer-full**': OPTIONAL - when the Printer can now accept a Print-Job, Print-URI,  
893 Create-Job, Send-Document, or Send-URI request. This event is used when there is more than one  
894 client feeding a printer/server (fan-in), and the Printer may still be printing but has acquired more  
895 buffer space to accept jobs. This event only occurs when the Printer did not have room to accept  
896 jobs previously and rejected a Print-Job, Print-URI, Create-Job, Send-Document, or Send-URI  
897 operation.

898 '**printer-almost-idle**': OPTIONAL - when the Printer needs another Job in order to stay busy. This  
899 event is used when a spooler is feeding more than one printer/server (fan-out), and the spooler holds  
900 jobs until a Printer requests them, rather than committing jobs to IPP Printers before it is necessary.

901 This event MAY be used by a Printer implementation to request a new job from any subscribers  
902 sufficiently ahead of time so that the device does not run out of work between jobs.

### 903 **5.3 notify-text-format (mimeMediaType)**

904 This Subscription object attribute indicates the MIME Media type of the value of the "notify-text" attribute  
905 (see section 8.2) to be sent in the Event Notifications. Support of the "notify-text" attribute is REQUIRED  
906 for some delivery methods and not for others. See the documents for each delivery methods for details.

907 ~~This REQUIRED READ ONLY Subscription object attribute indicates the MIME Media type of Human~~  
908 ~~Consumable and/or Machine Consumable format content that is to be sent in the Notifications for the~~  
909 ~~Notification Content that is under control of the Subscriber. Depending on the delivery method definition~~  
910 ~~document, this attribute MAY specify the MIME Media type for the entire Notification Content, or just a~~  
911 ~~portion that is controllable by the subscriber, if there is a fixed part as well. For example, if the entire~~  
912 ~~Notification Content is always a fixed Machine Consumable MIME Media type, such as the 'ipp:' delivery~~  
913 ~~method which uses the 'application/ipp' MIME Media type (see [indp-method]), then this attribute controls~~  
914 ~~the format of the "human-readable-report" (text(MAX)) Notification Content attribute (see section 7.2) in~~  
915 ~~the Machine Consumable form. As another example, if the Notification Content is always a Human~~  
916 ~~Consumable format content with a MIME Media attachment, such as with the 'mailto:' delivery method~~  
917 ~~[ipp-method-mailto], this attribute controls the format of the attachment.~~

918 ~~If the 'text' MIME media type registration permits a charset parameter, then such a specification MUST be~~  
919 ~~used (instead of the "notify-charset" attribute see section 5.6) in order to indicate the charset to be used in~~  
920 ~~the notification content.~~

921 A Printer MUST support this attribute and a client MAY supply this attribute as an operation attribute when  
922 it creates a Subscription object with the Create Job, Create-Job-Subscription or Create-Printer-Subscription  
923 operation.

924 ~~If the Subscriber did does not supply this attribute when requesting the subscription, the Printer object~~  
925 ~~populates this Subscription object attribute with 'text/plain', either the 'none' out-of-band value (see section~~  
926 ~~1.1) or one of the values of the Printer's "notify-format-supported" attribute (see section 6.5), depending on~~  
927 ~~the delivery method and implementation, since there is no "notify-format-default" defined in this document.~~

928 The value of this attribute MUST be a subtype of 'text', and it MUST be a value in the MIME registry. The  
929 charset for these formats is specified by the "notify-charset" attribute. If the value of this attribute contains a  
930 'charset' parameter, it is ignored. The attribute "notify-charset" specifies the charset

931 Examples Standard mimeMediaType values are:

932 ~~'none': This out-of-band value (see section 1.1) indicates that the Subscriber controllable part of the~~  
933 ~~Notification content is not to be sent.~~

934 ~~'text/plain; charset=utf-8': Human Consumable plain text containing characters from ISO-10646~~  
935 ~~represented as UTF-8 [RFC2279] as defined in section 7.1.1.~~

936 ~~'text/html': Human Consumable HTML data [RFC1866] as defined in section 7.2.~~

937 ~~'text/xml': Machine Consumable XML data [RFC2376] as defined in section 7.1.~~



938 'text/vnd.wap.wml': wml data. See IANA registry [IANA]  
939 'text/richtext': rich text data [RFC2046]  
940 ~~'application/ipp': Machine Consumable IPP request as defined in section 7.1 data encoded as in [ipp-~~  
941 ~~pro]~~  
942 ~~'application/postscript': Human Consumable PostScript [RFC2046]~~  
943 ~~'image/tiff': Human Consumable image data [RFC2302]~~

#### 944 **5.4 notify-additional-formats (1setOf mimeType)**

945 This Subscription object attribute indicates the MIME Media types of additional Machine Consumable  
946 contents to be sent in the Event Notifications for those delivery methods that make use of this attribute.  
947 This attribute is intended for delivery methods that can send multiple formats.

948 For example, an email delivery method might support "notify-text-formats" of 'text/plain' only. If the user  
949 specifies the "notify-text-format" attribute and not this attribute, the Event Notification content consists of  
950 an email message that is just plain text. If a Subscriber specifies values of 'text/html' and 'image/tiff' for this  
951 attribute, the Event Notification content consists of a multipart/mixed value with 3 parts, one that is  
952 'text/plain' (the one specified by the "notify-text-format" attribute), another that is 'text/html' and a third  
953 that is 'image/tiff'.

954 A Printer MAY support this attribute and a client MAY supply this attribute as an operation attribute when  
955 it creates a Subscription object with the Create Job, Create-Job-Subscription or Create-Printer-Subscription  
956 operation.

957 If a Printer is generating an Event Notification for a delivery method whose definition

958 a) does not mention this attribute, the Printer MUST use the single format specified in the delivery  
959 method's definition whether this attribute is present or not in the Subscription object.

960 b) does mention this attribute and this attribute is

961 i) supported by the Printer and present on the Subscription object, the Printer MUST generate  
962 an Event Notification in the single default format (specified by the delivery method's  
963 definition) plus the formats requested in this attribute

964 ii) not supported by the Printer or not present on the Subscription object, the Printer MUST  
965 generate an Event Notification in the single default format that is specified in the delivery  
966 method's definition.

967 If the Subscriber does not supply this attribute when creating the subscription, the Printer does not put this  
968 attribute on the Subscription object, and the Printer behaves as described in items a) or b)ii) above.

969 If a particular value appears more than once in the union of this attributes and the "notify-text-format"  
970 attribute, the Printer MUST send the requested format at least once, but it MAY send the requested format  
971 more than once. For example, if the value of "notify-text-format" is 'text/html' and the values of this  
972 attribute are 'text/html' and 'image/tiff', a client could get two 'text/html' values or one.

973 The value of this attributes MAY be any value in the MIME registry that the Printer supports except  
974 'text/plain' (because it is the default value of "notify-text-format"). If the value of this attribute contains a  
975 'charset' parameter, it is ignored. The attribute "notify-charset" specifies the charset.

976 Examples are:

977 'text/html': Human Consumable HTML data [RFC1866].

978 'text/xml': Human Consumable XML data [RFC2376].

979 'text/vnd.wap.wml': wml data. See IANA registry [IANA]

980 'text/richtext': Human Consumable rich text data [RFC2046]

981 'application/ipp': Machine Consumable IPP request as in [ipp-pro].

982 'application/postscript': Human Consumable PostScript [RFC2046]

983 'image/tiff': Human Consumable image data [RFC2302]

984 'multipart/mixed': Machine Consumable data [RFC2046]. In this context, this value acts as a wild card  
985 and requests all formats supported by Printer for the delivery method.

986

#### 987 **5.45.5 notify-requested-attributes (1setOf type2 keyword)**

988 This Subscription object attributes holds the set of additional attributes for the Printer to include in each  
989 Machine Consumable Event Notification.

990 A Printer MAY support this attribute and a client MAY supply this attribute as an operation attribute when  
991 it creates a Subscription object with the Create Job, Create-Job-Subscription or Create-Printer-Subscription  
992 operation.

993 A Printer MUST include the attributes specified in section 7.1 in each Event Notification whether it  
994 supports this attribute or not.

995 If a Printer supports this attribute and a Subscription object contains this attribute and the delivery method  
996 generates a Machine Consumable Event Notification, the Printer MUST include in each Event Notification:

997 a) the attributes specified in section 7.1 and

998 b) each attribute contained in this attribute and contained in the "notify-requested-attributes-  
999 supported" attribute. That is, if an attribute is contained in this attribute but not in the "notify-  
1000 requested-attributes-supported" attribute, it is an unsupported value.

1001 If the delivery method generates a Human Consumable Event Notification, this attribute is ignored and the  
1002 Printer generates the information specified in section 7.2.

1003 If a Printer does not support this attribute or a client does not supply this attribute, then a Printer MUST  
1004 include in each Event Notification the attributes specified in section section 7.1 and the Printer NEED  
1005 NOT supply any additional attributes.



#### 1.45.6 ~~notify-user-data~~subscriber-user-data (octetString(63))

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

A Printer MAY support this attribute and a client MAY supply this attribute as an operation attribute when it creates a Subscription object with the Create Job, Create-Job-Subscription or Create-Printer-Subscription operation. If the client does not supply this attribute, the Printer does not add it to the Subscription object. If a delivery method requires this attribute and the Subscription object does not have it, the delivery method uses an octet-string of length 0.

#### 1.55.7 ~~notify-charset~~ notify-charset (charset)

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

A Printer MUST support this attribute and a client MAY supply this attribute as an operation attribute when it creates a Subscription object with the Create Job, Create-Job-Subscription or Create-Printer-Subscription operation. If the client does not supply this attribute, the Printer MUST copy the value of the "attributes-charset" operation attribute to this attribute on the Subscription object.

#### 1.65.8 ~~notify-natural-language~~ notify-natural-language (naturalLanguage)

This ~~OPTIONAL READ ONLY~~ Subscription object attribute specifies the natural language for the IPP object to use in any human readable text in the Event Notification content that is sent to the Notification Recipient, whether the Event Notification content is Machine Consumable or Human Consumable.

A Printer MUST support this attribute and a client MAY supply this attribute as an operation attribute when it creates a Subscription object with the Create Job, Create-Job-Subscription or Create-Printer-Subscription operation. If the client does not supply this attribute, the Printer MUST copy the value of the "attributes-natural-language" operation attribute to this attribute on the Subscription object.

### 1.75.9 ~~notify-sequence-id~~ ~~subscription-request-id~~

This ~~REQUIRED~~ READ-ONLY Subscription object attribute holds the most recent "~~request-id~~~~notify-sequence-id~~" sequence number delivered in an Event Notification content to the Notification Recipient.

A Printer MUST support this attribute and a client MUST NOT supply this attribute as an operation attribute when it creates a Subscription object with the Create Job, Create-Job-Subscription or Create-Printer-Subscription operation.

A value of 0 indicates that no Event Notifications have been sent for this subscription. The first "~~request-id~~~~notify-sequence-id~~" sent for a subscription MUST be 1. Each Notification Recipient receives its own monotonically increasing series of "~~request-id~~~~notify-sequence-id~~"s, ~~operation parameters (see [ipp-mod] section 3.1.2)~~, i.e., no gaps, in order to be able to detect a missing Event Notification.

### 1.85.10 ~~notify-subscription-id~~ ~~subscription-~~ (integer (1:MAX))

This ~~REQUIRED~~ READ-ONLY Subscription object attribute uniquely identifies this Subscription object instance on this Printer object or this Job object.

A Printer MUST support this attribute and a client MUST NOT supply this attribute as an operation attribute when it creates a Subscription object with the Create Job, Create-Job-Subscription or Create-Printer-Subscription operation.

The Printer object, on acceptance of a Create-Job-Subscription or Create-Printer-Subscription request, generates an ID ~~which~~ ~~that~~ identifies the new Subscription object on that Printer or Job. The Printer returns the value of the "~~subscription-id~~~~notify-subscription-id~~" attribute as part of the response to a Create-Job-Subscription or Create-Printer-Subscription request. The 0 value is not included to allow for compatibility with "job-id" and with SNMP index values, which also cannot be 0.

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

### 1.95.11 ~~notify-lease-expiration-time~~ (integer(0:MAX))

This ~~REQUIRED~~ READ-ONLY Subscription object attribute specifies the time in the future when the subscription lease will expire, i.e., the "printer-up-time" value at which the lease will expire.

1071 A Printer MUST support this attribute and a client MUST NOT supply this attribute as an operation  
1072 attribute when it creates a Subscription object with the Create Job, Create-Job-Subscription or Create-  
1073 Printer-Subscription operation.

1074 When the Printer object creates a Per-Printer Subscription object, it populates this attribute with the  
1075 appropriate value. When the indicated time arrives, the Printer MUST delete the Per-Printer Subscription  
1076 object. Per-Job Subscription objects always return a value of 0 since Per-Job Subscriptions don't have a  
1077 lease, but exist for the life-time of the Job instead.

1078 A client is able to extend a lease of a Per-Printer subscription using the Renew-Subscription operation (see  
1079 section 9.3.3). A value of 0 indicates an infinite time, if such a policy is supported as indicated in the  
1080 "notify-lease-time-supported" (integer(0:MAX)) Printer Description attribute (see section 6.7) and the  
1081 subscriber is authorized to request an infinite lease. A Per-Job subscription cannot be renewed.

1082 Note: In order to compute the number of seconds remaining in a Per-Printer Subscription lease, a client can  
1083 subtract the "notify-server-up-time" Subscription object attribute (see section 5.14) from the "notify-lease-  
1084 expiration-time" Subscription object attribute.

#### 1085 ~~1.10~~5.12 printer-uri (uri)

1086 This ~~REQUIRED~~ READ-ONLY Subscription object attribute identifies the Printer object that created this  
1087 Subscription object.

1088 A Printer MUST support this attribute and a client MUST NOT supply this attribute as an operation  
1089 attribute when it creates a Subscription object with the Create Job, Create-Job-Subscription or Create-  
1090 Printer-Subscription operation.

1091 When a Printer object creates a Subscription object, it populates this attribute with the Printer object URI  
1092 that was used in the create request. This attribute permits a client to identify the Printer object URI that was  
1093 used to create this Subscription object, i.e., what security scheme was used.

1094

#### 1095 ~~1.11~~5.13 subscriber-user-name (name(MAX))

1096 This ~~REQUIRED~~ READ-ONLY Subscription object attribute contains the name of the user that created the  
1097 Subscription object.

1098 A Printer MUST support this attribute and a client MUST NOT supply this attribute as an operation  
1099 attribute when it creates a Subscription object with the Create Job, Create-Job-Subscription or Create-  
1100 Printer-Subscription operation.

1101 The Printer object sets this attribute to the most authenticated printable name that it can obtain from the  
1102 authentication service over which the IPP operation was received. This attribute is intended to help a  
1103 human user determine for which Per-Printer Subscriptions they are the Subscriber. Only if such is not

1104 available, does the Printer object use the value supplied by the client in the "requesting-user-name"  
1105 operation attribute of the create operation (see [IPP-MOD] Sections 4.4.2, 4.4.3, and 8). For Per-Job  
1106 subscriptions created as part of the Job creation operation, the value of the "subscriber-user-name" is the  
1107 same as the "job-originating-user-name" Job attribute (see [ipp-mod] section 4.3.6).

1108 The value of the "subscriber-user-name" is implementation dependent when a server accepts a request and  
1109 forwards it to a downstream IPP Printer (see Figure 2 and the [ipp-iig]).

1110 Note: The Printer object needs to keep an internal originating user id of some form, typically as a credential  
1111 of a principal, with the Subscription object. Since such an internal attribute is implementation-dependent  
1112 and not of interest to clients, it is not specified as a Subscription Description attribute. This originating user  
1113 id is used for authorization checks (if any) on all subsequent operations.

#### 1114 ~~1.12~~5.14 **notify-server-up-time (integer(1:MAX))**

1115 This ~~REQUIRED~~ READ-ONLY Subscription object attribute indicates the amount of time (in seconds) that  
1116 the Printer or Notification Delivery Service implementation has been up and running.

1117 A Printer MUST support this attribute and a client MUST NOT supply this attribute as an operation  
1118 attribute when it creates a Subscription object with the Create Job, Create-Job-Subscription or Create-  
1119 Printer-Subscription operation.

1120 This attribute is an alias for the Printer's "printer-up-time" attribute" (see [ipp-mod] section 4.4.29) if the  
1121 Printer is keeping the Subscription objects or is the up time for the Notification Delivery Service if the  
1122 Printer has delegated the responsibility for keeping Subscription objects to a notification delivery service, in  
1123 an analogous way that the Job's "job-printer-up-time" is an alias for "printer-up-time" Printer attribute (see  
1124 [ipp-mod] section 4.3.13.4).

1125 Note: The purpose of this attribute is so that a client can request this attribute in a Get-Subscription-  
1126 Attributes or Get-Subscriptions request and use the value returned in combination with the "notify-lease-  
1127 expiration-time" (see section 5.11) in order to display the wall clock time equivalent to the user. The  
1128 difference between this attribute and the 'integer' value of the "notify-lease-expiration-time" attribute is the  
1129 number of seconds in the future that the subscription will expire. A client can compute the wall-clock time  
1130 at which the subscription will expire by adding this difference to the client's wall-clock time.

#### 1131 ~~1.13~~5.15 **notify-persistence-granted (boolean)**

1132 This ~~REQUIRED~~ READ-ONLY Subscription object attribute indicates whether or not the Per-Job or Per-  
1133 Printer Subscription is persistent, i.e., saved across power cycles in an implementation-define manner.

1134 A Printer MUST support this attribute and a client MUST NOT supply this attribute as an operation  
1135 attribute when it creates a Subscription object with the Create Job, Create-Job-Subscription or Create-  
1136 Printer-Subscription operation.

## 6 Printer Description Attributes related to Notification

This section defines the Printer Description attributes that are related to Notification. **Table 6 – REQUIRED non-READ-ONLY Printer Description attributes associated with Notification**

<u>Printer object attributes:</u>
<u>notify-schemes-supported (1setOf uriScheme)</u>
<u>notify-events-default (1setOf type2 keyword)</u>
<u>notify-events-supported (1setOf type2 keyword)</u>
<u>notify-max-events-supported (integer(5:MAX))</u>
<u>notify-text-format-supported (1setOf mimeType)</u>
<u>notify-max-printer-subscriptions-supported (integer(0:MAX))</u>
<u>notify-lease-time-supported (rangeOfInteger(0:MAX))</u>
<u>notify-lease-time-default (integer(0:MAX))</u>

Table 6 lists the Printer Description attributes that a Printer MUST conditionally support and that are not READ-ONLY. A Printer MUST support the listed attribute if it supports the Create-Job-Subscriptions operation.

**Table 7 – Conditionally REQUIRED non-READ-ONLY Printer Description attributes associated with Notification**

<u>Printer object attributes:</u>
<u>notify-max-job-subscriptions-supported (integer(0:MAX))</u>

Table 8 lists the Printer Description attributes that a Printer MAY support and that are not READ-ONLY.

**Table 8 - OPTIONAL non-READ-ONLY Printer Description attributes associated with Notification**

<u>Printer object attributes:</u>
<u>notify-additional-formats-supported (1setOf mimeType)</u>
<u>notify-requested-attributes-supported (1setOf type2 keyword)</u>

<u>Printer object attributes:</u>
<u>persistent-jobs-supported (boolean)</u>
<u>persistent-subscriptions-supported (boolean)</u>

1148 Table 8 lists the Printer Description attributes that a Printer MAY support and that are READ-ONLY.

1149 Table 9 lists the Printer Description attributes and indicates the Printer support required for conformance  
1150 and whether or not the attribute is READ-ONLY: -

1151 Table 6 lists the Printer Description attributes that a Printer MUST support and that are not READ-ONLY.

1152 **Table 6 – REQUIRED non-READ-ONLY Printer Description attributes associated with Notification**

<u>Printer object attributes:</u>
<u>notify-schemes-supported (1setOf uriScheme)</u>
<u>notify-events-default (1setOf type2 keyword)</u>
<u>notify-events-supported (1setOf type2 keyword)</u>
<u>notify-max-events-supported (integer(5:MAX))</u>
<u>notify-text-format-supported (1setOf mimeType)</u>
<u>notify-max-printer-subscriptions-supported (integer(0:MAX))</u>
<u>notify-lease-time-supported (rangeOfInteger(0:MAX))</u>
<u>notify-lease-time-default (integer(0:MAX))</u>

1153 Table 6 lists the Printer Description attributes that a Printer MUST conditionally support and that are not  
1154 READ-ONLY. A Printer MUST support the listed attribute if it supports the Create-Job-Subscriptions  
1155 operation.

1156 **Table 7 – Conditionally REQUIRED non-READ-ONLY Printer Description attributes associated**  
1157 **with Notification**

<u>Printer object attributes:</u>
<u>notify-max-job-subscriptions-supported (integer(0:MAX))</u>

1158

1159 Table 8 lists the Printer Description attributes that a Printer MAY support and that are not READ-ONLY.

1160 **Table 8 - OPTIONAL non-READ-ONLY Printer Description attributes associated with Notification**

<u>Printer object attributes:</u>
<u>notify-additional-formats-supported (1setOf mimeType)</u>
<u>notify-requested-attributes-supported (1setOf type2 keyword)</u>
<u>persistent-jobs-supported (boolean)</u>
<u>persistent-subscriptions-supported (boolean)</u>

1161 Table 8 lists the Printer Description attributes that a Printer MAY support and that are READ-ONLY.

1162 **Table 9 - OPTIONAL READ-ONLY Printer Description attributes associated with Notification**

<u>Printer object attributes:</u>
<u>printer-state-change-time (integer(1:MAX))</u>
<u>printer-state-change-date-time (dateTime)</u>

1163

1164 **6.1 notify-schemes-supported (1setOf uriScheme)**

1165 This REQUIRED Printer attribute describes the notification delivery methods supported by this Printer  
1166 object. Standard values are defined in Section 5.1.

1167 The usual way for a client to determine whether an IPP Printer supports a feature is to query the Printer's  
1168 "operations-supported" attribute. If a client wants to determine if a Printer supports the "notify-xxx"  
1169 operation attributes, it could check for the value of Create-Printer-Subscription in the "operations-  
1170 supported" attribute, but the RECOMMENDED way is for the client to check for the existence of this  
1171 attribute.

1172 **6.2 notify-events-default (1setOf type2 keyword)**

1173 This REQUIRED Printer attribute identifies the event values if the client does not supply the "notify-  
1174 events" operation attribute in a Subscription Creation operation. Any value in this attribute MUST also  
1175 appear in the "notify-events-supported" attribute, i.e., be a supported event.

1176 **6.3 notify-events-supported (1setOf type2 keyword)**

1177 This REQUIRED Printer attribute identifies the events supported by this Printer object for both Per-Job and  
1178 Per-Printer subscriptions, which MUST be the same. Standard values are defined in Section 5.2.



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

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

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

This REQUIRED Printer attribute identifies the MIME media types supported for the value of the "notify-text-format" attribute. See section 5.3 for details and some example values.

If a delivery method supports the "notify-text" attribute or a Human Consumable form, then it must support all values of this attribute.

~~This REQUIRED Printer attribute identifies the MIME media types supported for Human Consumable and/or Machine Consumable notification content that the subscriber can control, if any. If the Notification content is fixed by the implementation, then the value of this attribute is that MIME media type, if it has been registered, or the 'none' out of band value (see section 1.1) otherwise. See the definition of the "notify-format" attribute in section 5.3 for details and some example values.~~

~~Not all formats listed in the "notify-format-supported" attribute need be available with all delivery methods specified in the "notify-schemes-supported". However, all Human Consumable formats, if any, SHOULD be available with all delivery methods. It is much harder to support a Human Consumable format because of localization issues. Once the code is written to support a particular Human Consumable format, it is easy to transmit it on any of the supported notify-schemes. Thus, if a vendor decides to support a notify-scheme, it has already committed to implement the Machine Consumable format. This may be simple if existing code can be reused, e.g. application/ipp and or more difficult if new code must be written, e.g., it is SNMP.~~

## 6.76.6 notify-max-printer-subscriptions-supported (integer(0:MAX))

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

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



1215 **6.86.7 notify-lease-time-supported (rangeOfInteger(0:MAX))**

1216 This REQUIRED Printer attribute specifies the range of values in seconds that are supported for the  
1217 "notify-lease-time-requested" operation attribute in a Create-Printer-Subscription or Renew-Subscription  
1218 request for a Per-Printer subscription. When the lease time expires for a Per-Printer Subscription without  
1219 renewing, the Printer MUST delete the Subscription object. If the client requests a value outside this range,  
1220 the Printer MUST grant a value that is in this range (see section 5.11). A value of 0 indicates an infinite  
1221 lease, i.e., one that does not expire.

1222 **6.96.8 notify-lease-time-default (integer(0:MAX))**

1223 This REQUIRED Printer attribute specifies the value of the lease time that the Printer object has been  
1224 configured to assume if the client does not supply a "notify-lease-time-requested" operation attribute in the  
1225 Create-Printer-Subscription or Renew-Subscription requests.

1226 **6.9 notify-max-job-subscriptions-supported (integer(0:MAX))**

1227 If a Printer supports the OPTIONAL Create-Job-Subscriptions operation, it MUST support this attribute,  
1228 and a Printer does not support the Create-Job-Subscriptions operation, it MUST NOT support this attribute.

1229 This Printer attribute specifies the maximum number of Per-Job subscriptions that are supported for a job,  
1230 i.e., the maximum number of subsequent Create-Job-Subscription operation requests in combination for a  
1231 job. A value of 0 indicates no effective maximum. A Printer MUST support at least 1 Per-Job  
1232 subscription. If a Create-Job-Subscription request would exceed this number, the Printer rejects the request  
1233 and returns the 'client-error-too-many-subscriptions' (see section 15.3).

1234 **6.10 notify-additional-formats-supported (1setOf mimeType)**

1235 This OPTIONAL Printer attribute identifies the MIME media types supported for the value of the "notify-  
1236 additional-formats" attribute. See section 5.4 for details and some example values. If a Printer supports the  
1237 "notify-additional-formats" attribute, it MUST support this attribute.

1238 If a Printer does not support this attribute, then it also does not support the "notify-additional-formats"  
1239 attribute and the Printer it MUST behave as described in section 5.4.

1240 **6.11 notify-requested-attributes-supported (1setOf type2 keyword)**

1241 This OPTIONAL Printer attribute specifies the attribute names that can be values of the "notify-requested-  
1242 attributes" in the Create-Job, Print-Job, Validate-Job, Create-Job-Subscription and Create-Printer-  
1243 Subscription operations. This attribute MAY contain any Printer attribute, Job attribute or Subscription  
1244 attribute that the Printer supports in an Event Notification. It MUST NOT contain any of the attributes in  
1245 Section 7.1 that a Printer automatically puts in an Event Notification; it would be redundant.

## 1246 ~~6.10~~**6.12 persistent-jobs-supported (boolean)**

1247 This OPTIONAL Printer attribute indicates whether or not the Printer supports persistent Jobs, i.e., Jobs  
1248 object that are preserved across power cycles. If Jobs are persistent, then Per-Job Subscriptions MUST also  
1249 be persistent, since they are part of the Job object. It is RECOMMENDED that Jobs (and Per-Job  
1250 Subscriptions) be persistent.

1251 ~~As with any settable attribute, if the Printer supports setting this attribute to more than one value, then the~~  
1252 ~~value being set MUST control whether or not the Printer keeps Jobs persistently as per the rules in [ipp-~~  
1253 ~~set]). As with any settable attribute, if the Printer only supports one value, it MAY support this attribute~~  
1254 ~~either (1) as settable to that one value, or as not settable, depending on implementation (see [ipp-set]).~~

## 1255 ~~6.11~~**6.13 persistent-subscriptions-supported (boolean)**

1256 This OPTIONAL Printer attribute indicates whether or not the Printer supports persistent Per-Printer  
1257 Subscriptions, i.e., Subscription objects that are preserved across power cycles. When this value is 'true' the  
1258 implementation MAY support some that are persistent and some that are not. If the value is 'false' or the  
1259 attribute is not supported, Per-Printer Subscriptions MUST NOT be persistent. It is RECOMMENDED  
1260 that Per-Printer subscriptions be persistent.

1261 ~~As with any settable attribute, if the Printer supports setting this attribute to more than one value, then the~~  
1262 ~~value being set MUST control whether or not the Printer keeps Jobs persistently as per the rules in [ipp-~~  
1263 ~~set]). As with any settable attribute, if the Printer only supports one value, it MAY support this attribute~~  
1264 ~~either (1) as settable to that one value, or as not settable, depending on implementation (see [ipp-set]).~~

## 1265 ~~6.12~~**6.14 printer-state-change-time (integer(1:MAX))**

1266 This OPTIONAL READ-ONLY Printer attribute records the time, i.e., copy of the Printer's "printer-up-  
1267 time" attribute, that the Printer's "printer-state" attribute was last changed. On power-up, the Printer  
1268 populates the "printer-state-change-time" from its "printer-up-time" attribute, so that it always has a value.

## 1269 ~~6.13~~**6.15 printer-state-change-date-time (dateTime)**

1270 This OPTIONAL READ-ONLY Printer attribute records the date and time, i.e., copy of the Printer's  
1271 "printer-current-time" (dateTime) attribute (see [ipp-mod] section 4.4.30), that the Printer's "printer-state"  
1272 attribute was last changed. On power-up, the Printer populates the "printer-state-change-date-time" from its  
1273 "printer-current-time" attribute, so that it always has a value.

## 1274 **7 Event Notification Content**

1275 This section defines the Event Notification content that the Notification Source sends asynchronously when  
1276 an event occurs to each Notification Recipient based on the subscription information stored with the

- 1277 subscription. The Event Notification MAY be sent by the IPP Printer or a third party Notification Service  
1278 (see section 2.3).
- 1279 When an event occurs, the Printer MUST create an Event Notification with the content that the delivery  
1280 method specifies. The content contains the value of attributes specified by the delivery method. The Printer  
1281 obtains the values immediately after the event occurs. For example, if the "printer-state" attribute changes  
1282 from 'pending' to 'processing', the event 'printer-state-changed' occurs and the Printer puts various attributes  
1283 into the Event Notification, including "printer-up-time" and "printer-state" with the values that they have  
1284 immediately after the event occurs, i.e. the value of "printer-state" is 'processing'.
- 1285 If two events occur simultaneously, or nearly so (e.g. "printer-up-time" has the same value for both), the  
1286 Printer MUST create a separate Event Notification for each event. Depending on the delivery method, the  
1287 Printer MAY combine several Event Notifications into a single compound Event Notification. In this case,  
1288 each Event Notification MAY have the same value of "printer-up-time", but if these two nearly-  
1289 simultaneously events represent two successive 'printer-state-changed' events one from 'idle' to 'processing'  
1290 and another from 'processing' to 'stopped', the Printer SHOULD accurately report the "printer-state" of the  
1291 first event as 'processing' and the second event as 'stopped'.
- 1292 In either case, even if a Subscription object is listening for more than one event, and several of those events  
1293 occur in quick succession, each event MUST generate a separate Event Notification.
- 1294 ~~The notification-delivery method either models the Notification as a (1) request if the IPP Printer sends the~~  
1295 ~~Notification to the Notification Recipient when the event occurs or as a (2) response if the IPP Printer is~~  
1296 ~~queried for the Notification by a Notification Recipient:~~
- 1297 After the Printer has created the Event Notification, the Printer delivers it. Depending on the delivery  
1298 method, the Printer delivers the Event Notification via either a
- 1299 Push: The the IPP Printer sends the Event Notification shortly after an event occurs. For some  
1300 delivery methods, the Notification Recipient either MUST send a response; for others it MUST  
1301 NOT send a response.
- 1302 Pull: The IPP Printer saves Event Notifications for some event-lease time and expects the  
1303 Notification Recipient to request events. The IPP Printer returns the events in a response to such a  
1304 request.
- 1305 ~~Request: If the delivery method defines that the IPP Printer sends the Notification, then the delivery~~  
1306 ~~method also defines whether or not the Notification Recipient returns a response. If the IPP Printer~~  
1307 ~~sends a Notification request, it uses the "operation-id alternative for item #~~**Error! Reference source**  
1308 ~~not found.~~ in Table 9:
- 1309 ~~Response: If the delivery method defines that the IPP Printer supports an operation that returns a~~  
1310 ~~Notification as a response to the Notification Recipient, it uses the "status-code" alternative for item~~  
1311 ~~#~~**Error! Reference source not found.** in Table 9.
- 1312 The next two sections describe the attributes to be included in the content of Event Notifications.

1313 Each delivery method is defined in a separate document (i.e. not in this document). Such a document  
1314 specifies

1315 a) the form of the Event Notification content: namely Human Consumable or Machine  
1316 Consumable (see sections 7.1 and 7.2).

1317 b) whether an several Event Notifications can be combined into a compound Event Notification.

1318 c) the attributes to include (for Machine Consumable see sections 7.1.1, 7.1.2 and 7.1.3. for Human  
1319 Consumable see sections 7.2.1, 7.2.2, and 7.2.3).

1320 d) the encoding of the attributes (see the document for a particular delivery method).

1321 ~~The Notification is either in a Human Consumable or Machine Consumable form.~~

1322 ~~This section defines the Notification content that is sent to a Notification Recipient when an event occurs.~~  
1323 ~~The Notification MAY be sent by the IPP Printer or a third party Notification Service (see section 2.3).~~

1324 ~~There are two notification content types: Machine Consumable and Human Consumable, i.e., 'text' MIME~~  
1325 ~~media type. For most notification delivery methods both content types are defined. Each Notification~~  
1326 ~~Content type will either define one specific Machine Consumable form (usual) or indicate that no Machine~~  
1327 ~~Consumable form is defined. In addition, each Notification Content type will indicates whether (usual) or~~  
1328 ~~not Human Consumable forms are permitted. But the definition will not define the Human Consumable~~  
1329 ~~forms. For those Human Consumable forms that a Printer implementation supports as indicated in the~~  
1330 ~~Printer's "notify-format-supported" attribute, it MUST support for all Notification Content formats~~  
1331 ~~supported that permit Human Consumable form.~~

## 1332 ~~7.1 Notification content MIME media type formats~~

### 1333 ~~7.1.27.1 Content of Machine Consumable Event Notifications form~~

1334 ~~If the notification delivery method is defined to have a Machine Consumable form and that form is defined~~  
1335 ~~to be the 'application/ipp' MIME media type [ipp-mod], then the following rules apply:~~

1336 ~~1. The notification content MUST use the 'application/ipp' MIME media type [ipp-mod] using one~~  
1337 ~~of: (1) the Get Job Attributes response encoding for job events, (2) Get Printer Attributes~~  
1338 ~~response for printer events, or (3) a new Sent Notifications operation for both job and printer~~  
1339 ~~events.~~

1340 ~~2. The attributes listed in sections 7.2 and 7.3 are sent in a Notification for Job events.~~

1341 ~~3. The attributes listed in sections 7.2 and 7.4 are sent in a Notification for Printer events.~~

1342 ~~4. For any 'text' or 'name' attribute value in any notification, the charset and natural language rules~~  
1343 ~~that apply to all IPP operations apply to these attributes as well, since they are represented as~~  
1344 ~~operation responses.~~

1345 ~~5.The "human-readable-report" attribute can be defined to be REQUIRED, OPTIONAL, or MUST~~  
1346 ~~NOT be sent.~~

1347 ~~6.If the values of any of the attributes sent in a notification content are not known, the value sent in~~  
1348 ~~the report content is the out-of-band 'unknown' value, rather than omitting the attribute (see the~~  
1349 ~~beginning of [ipp-mod] section 4.1).~~

1350 This section defines the REQUIRED and RECOMMENDED attributes of all delivery methods that are  
1351 intended to send a Machine Consumable Event Notification. A Printer NEED NOT include the  
1352 RECOMMENDED attributes if they are incompatible with a particular delivery method. The definition of  
1353 the delivery method can exclude it from Event Notifications.

1354 A client MAY request additional attributes via the "notify-requested-attributes" attribute with values in the  
1355 "notify-requested-attributes-supported" attribute if a Printer supports both of these attributes.

1356 An implementation MAY extend the contents of the Machine Consumable Event Notification by adding  
1357 additional attributes. Notification Recipients MUST be able to accept Event Notifications containing  
1358 attributes they do not recognize. What a Notification Recipient does with an unrecognized attribute is  
1359 implementation-dependent. Notification Recipients MAY attempt to display unrecognized attributes  
1360 anyway or MAY ignore them.

1361 The next three sections define the attributes that are in:

1362 a) all Job and Printer Events Notifications

1363 b) Job Events Notifications only

1364 c) Printer Events Notifications only

### 1365 **7.27.1.1 Attributes in Event Notification content common to Job and Printer events**

1366 This section lists the ~~parameters and~~ attributes that a Print MUST and SHOULD are included in both Job  
1367 and Printer Event Notifications.

1368 ~~Some events do not include all of these attributes as shown in Table 4. Each notification content contains a~~  
1369 ~~single Job or Printer event, whether that event was subscribed using the Job Submission Subscription~~  
1370 ~~mechanism or the Per Printer subscription mechanism. If either kind of Subscription subscribed to both~~  
1371 ~~Job and Printer events, then the Printer will send or return them as separate Job Notification content and~~  
1372 ~~Printer Notification contents to the same Notification Recipient.~~

1373 The tables in this section and following sections contain the following columns:

1374 a) Source of Value: the name of the attribute that supplies the value for the Event Notification

1375 b) Object: the object from which the source value comes. If the object is "Event Notification", the  
1376 Printer fabricates the value when it sends the Event Notification. See section 8 for a description  
1377 of such events.

1378 c) Reference: the section of this specification or the [ipp-mod] which explains the attribute. The  
 1379 latter section numbers are preceded by "mod"

1380 Table 10 lists the IPP attributes that a Printer SHOULD include in each Event Notification.

1381 **Table 10 - Recommended Attributes in Event Notification Content**

<u>Source Value</u>	<u>Object</u>	<u>Reference</u>
<u>notify-sequence-id(integer (0:MAX))</u>	<u>Subscription</u>	5.9
<u>notify-charset (charset)</u>	<u>Subscription</u>	5.7
<u>notify-natural-language</u>	<u>Subscription</u>	5.8
<u>notify-text (text)</u>	<u>Event Notification</u>	8.2
<u>notify-text-format (mimeMediaType)</u>	<u>Subscription</u>	5.3

1382

1383 Table 11 lists the IPP attributes that a Printer MUST include in each Event Notification.

1384 ~~Table 4 lists the attributes that are defined for use in Notifications and indicates the Printer support required~~  
 1385 ~~for conformance: References of the form "mod m.n.o" refer to [ipp-mod] sections.~~

1386 **Table 11 - Common Job and Printer Required Attributes in Event Notification Content attributes**

<u>Source Value</u>	<u>Object</u>	<u>Reference</u>
<u>printer-uri (uri)</u>	<u>Subscription</u>	5.12
<u>trigger-event (type2 keyword)</u>	<u>Event Notification</u>	8.1
<u>printer-up-time (integer(MIN:MAX))</u>	<u>Printer</u>	1.1

1387 Attribute Notes:

1388 ~~"version-number"—the major and minor version number.~~

1389 ~~"operation-id"—the operation id if the delivery method document models the Notification as the Printer~~  
 1390 ~~sending the Notification to the Notification Recipient (whether the Notification Recipient returns a~~  
 1391 ~~response or not).~~

1392 ~~"status-code"—a value of 0x600 (hexadecimal 600) for a Job event and 0x601 (hexadecimal 601) for a~~  
 1393 ~~Printer event if the delivery method document models the Notification as the Printer returning the~~  
 1394 ~~Notification to the Notification Recipient as a response to a request.~~

- 1395 ~~"request-id" the sequence number for this subscription, starting at 1, for each subscription, i.e., the Printer~~  
 1396 ~~copies the current value of the "subscription-request-id" Subscription object attribute to the~~  
 1397 ~~Notification request content.~~
- 1398 ~~"attributes-charset" the value comes from the "notify-charset" attribute in the Subscription object.~~
- 1399 ~~"attributes-natural-language" the value comes from the "notify-natural-language" attribute in the~~  
 1400 ~~Subscription object.~~
- 1401 ~~"printer-uri" the value comes from the "job-printer-uri" Job attribute for Per-Job subscriptions.~~
- 1402 ~~\*\*"job-id" and "job-name" included in Printer event Notifications only for Per-Job subscriptions.~~
- 1403 ~~"job-name" SNMP delivery method can truncate to less than 255 octets, since the Notification needs to fit~~  
 1404 ~~into 484 octets or so on some transports that SNMP is defined for. See [ipp-method-snmip]~~
- 1405 ~~"subscription-id" notify-subscription-id the unique identifier for the Subscription object on this Printer.~~
- 1406 ~~"subscriber-user-name" the subscriber user name that created the Subscription object. SNMP delivery~~  
 1407 ~~method can truncate to less than 255 octets, since the Notification needs to fit into 484 octets or so~~  
 1408 ~~on some transports that SNMP is defined for. See [ipp-method-snmip]~~
- 1409 ~~"subscriber-user-data" opaque user data that may identify either the Subscriber and/or the ultimate~~  
 1410 ~~Notification Recipient. The client MUST supply this attribute, if the definition of the delivery~~  
 1411 ~~method specified in the "notify-recipient" attribute REQUIRES the client to supply it.~~
- 1412 ~~"notify-format (mimeMediaType) indicates the text MIME media type (see section 5.3) for the "human-~~  
 1413 ~~readable-report" attribute. This attribute MUST be present if the "human-readable-report"~~  
 1414 ~~(text(MAX)) attribute is present in order to unambiguously identify the format of its text value to~~  
 1415 ~~the Notification Recipient.~~
- 1416 Table 12 lists the IPP attributes that a Printer MUST include in each Event Notification if it supports the  
 1417 attribute named in the "Source Value" column.

1418 **Table 12 – Conditionally Required Attributes in Event Notification Content**

<u>Source Value</u>	<u>Object</u>	<u>Reference</u>
<u>printer-current-time (dateTime)</u>	<u>Printer</u>	1.1

- 1419
- 1420 **7.37.1.2 Additional Attributes in Notification Content attributes for Job events *only***
- 1421 This section lists the additional attributes that a Print MUST include in Job Event Notifications.



1422 ~~lists the additional attributes that are included only in Job event Notifications and indicates the Printer~~  
 1423 ~~support required for conformance: "R" indicates REQUIRED, "O" indicates OPTIONAL, and "CR"~~  
 1424 ~~indicates CONDITIONALLY REQUIRED, i.e., REQUIRED in a Notification if the corresponding Job~~  
 1425 ~~attributes are supported. Some events do not include all of these attributes as shown in .~~

1426 Table 13 lists the additional attributes that a Printer MUST include in all Job Event Notification.

1427 **Table 13 – Additional Required Attributes in Job Event Notification Content**

<u>Source Value</u>	<u>Object</u>	<u>Reference</u>
<u>job-id (integer(1:MAX))</u>	<u>Job</u>	<u>mod 4.3.2</u>
<u>job-state (type1 enum)</u>	<u>Job</u>	<u>mod 4.3.7</u>
<u>job-state-reasons (1setOf type2 keyword)</u>	<u>Job</u>	<u>mod 4.3.8</u>

1428

1429 Table 13 lists the additional attributes that a Printer MUST include in each Job Event Notification when the  
 1430 job event is a 'job-progress' or 'job-completed'. It MUST not include these attributes for other events.

1431 **Table 14 – Additional Required Attributes in Job Event Notification Content for 'job-progress' or**  
 1432 **'job-completed' events**

<u>Source Value</u>	<u>Object</u>	<u>Reference</u>
<u>job-impressions-completed (integer(0:MAX))</u>	<u>Job</u>	<u>mod 4.3.18.2</u>

1433

1434 ~~**Table 8 – Additional Notification content attributes for Job events only**~~

1435 **7.47.1.3 Additional Attributes in Notification content** ~~attributes~~ **for Printer events**  
 1436 ***only***

1437 ~~Error! Reference source not found.~~ This section lists the additional attributes that a Print MUST include  
 1438 in Printer Event Notifications.

1439 ~~lists the additional attributes that are included only in Printer event Notifications and indicates the Printer~~  
 1440 ~~support required for conformance:~~

1441 Table 16 lists the additional attributes that a Printer MUST include in each Printer Event Notification.



1442 **Table 16 – Additional Required Attributes in Printer Event Notification Content**

<u>Source Value</u>	<u>Object</u>	<u>Reference</u>
<u>printer-state (type1 enum)</u>	<u>Printer</u>	<u>mod 4.4.11</u>
<u>printer-state-reasons (1setOf type2 keyword)</u>	<u>Printer</u>	<u>mod 4.4.12</u>
<u>printer-is-accepting-jobs (boolean)</u>	<u>Printer</u>	<u>mod 4.4.23</u>

1443 **7.4.17.2 Content of Human Consumable Event Notification form**

1444 This section defines the RECOMMENDED and OPTIONAL attributes of all delivery methods that are  
 1445 intended to send a Human Consumable Event Notification or the "notify-text" attribute in a Machine  
 1446 Consumable Event Notification. If a RECOMMENDED attribute is incompatible with a particular delivery  
 1447 method, the definition of the delivery method NEED NOT include it in Event Notifications.

1448 A client MUST NOT request additional attributes via the "notify-requested-attributes" attribute because this  
 1449 attribute works only for Machine Consumable Event Notifications.Event Notification.

1450 If the notification delivery method is defined to permit Human Consumable forms such as the "human-  
 1451 readable-report" attribute (see section 7.2) then the following RECOMMENDATIONS apply:

1452 The text message SHOULD include information about the attributes in sections 7.2 and 7.3 for job events  
 1453 or in sections 7.2 and 7.4 for printer events. This information is localized according to the information  
 1454 about natural language and charset in the subscription. The text message SHOULD contain the attributes  
 1455 specified by the "notify-attributes" attribute.

1456 An implementation MAY extend the contents of a Human Consumable Event Notification by adding  
 1457 additional information. Notification Recipients MUST NOT expect to be able to parse the Human  
 1458 Consumable contents.

1459 The next three sections define the attributes that are in:

- 1460 a) all Job and Printer Events Notifications
- 1461 b) Job Events Notifications only
- 1462 c) Printer Events Notifications only

1463 **7.2.1 Information in Notification Content Common to Job and Printer Events**

1464 This section lists the information that a Printer SHOULD include in both Job and Printer Event  
 1465 Notifications.

1466 There is a separate table for each piece of information. Each row in the table represents a source value for  
1467 the information and the values are listed in order of preference, with the first one being the preferred one.  
1468 An implementation SHOULD use the source value from the earliest row in the table.. The tables in this  
1469 section and following contain the following columns for each piece of information:

- 1470 a) Source of Value: the name of the attribute that supplies the value for the Event Notification
- 1471 b) Object: the object from the which the source value comes.
- 1472 c) Reference: the section of this specification or the [ipp-mod] which explains the attribute. The  
1473 latter section numbers are preceded by "mod"

1474 An Event Notification SHOULD contain the following information:

- 1475 a) the Printer name
- 1476 b) the event and/or state information
- 1477 c) the job identity for a Job event

1478 Table 17 lists the source of the information for the Printer Name. The "printer-name" is more user friendly  
1479 unless the Notification Receiver is in a place where the Printer name is not meaningful.

1480 **Table 17 – Printer Name in Event Notification Content**

<u>Source Value</u>	<u>Object</u>	<u>Reference</u>
<u>printer-name (name(127))</u>	<u>Printer</u>	<u>Mod 4.4.4</u>
<u>printer-uri (uri)</u>	<u>Subscription</u>	5.12

1481

1482 Table 18 lists the source of the information for the event name. A Printer MAY combine this information  
1483 with state information described in sections 7.2.2 and 7.2.3.

1484 **Table 18 – Event Name in Event Notification Content**

<u>Source Value</u>	<u>Object</u>	<u>Reference</u>
<u>trigger-event (type2 keyword)</u>	<u>Subscription</u>	8.1

1485

1486 Table 19 lists the source of the information for the time that the event occurred. If a Printer supports  
1487 the "printer-current-time" attribute, a Printer MAY include this attribute. If a Printer does not support

1488 the "printer-current-time" attribute, it MUST NOT support this attribute because the "printer-up-time" is not  
 1489 an allowed option.

1490 **Table 19 – OPTIONAL Event Time in Event Notification Content**

<u>Source Value</u>	<u>Object</u>	<u>Reference</u>
<u>printer-current-time (dateTime)</u>	<u>Printer</u>	1.1

1491  
 1492 **7.2.2 Additional Information in Event Notification Content for Job events only**

1493 This section lists the additional information that a Print SHOULD include in Job Event Notifications. The  
 1494 "job-name" is likely more meaningful to a user than "job-id".

1495 Table 20 lists the source of the information for the job name.

1496 **Table 20 – Job Name in Job Event Notification Content**

<u>Source Value</u>	<u>Reference</u>
<u>job-name (name(MAX))</u>	<u>mod 4.3.5</u>
<u>job-id (integer(1:MAX))</u>	<u>mod 4.3.2</u>

1497  
 1498 Table 21 lists the source of the information for the job state. If a Printer supports the "job-state-message"  
 1499 and "job-detailed-state-message" attributes, it SHOULD use those attributes for the job state information,  
 1500 otherwise it should fabricate such information from the "job-state" and "job-state-reasons". For some  
 1501 events, a Printer MAY combine this information with event information.

1502 **Table 21 – Job State in Job Event Notification Content**

<u>Source Value</u>	<u>Object</u>	<u>Reference</u>
<u>job-state-message (text(MAX))</u>	<u>Job</u>	<u>mod 4.3.9</u>
<u>job-detailed-status-messages (1setOf text(MAX))</u>	<u>Job</u>	<u>mod 4.3.8</u>
<u>job-state (type1 enum)</u>	<u>Job</u>	<u>mod 4.3.7</u>
<u>job-state-reasons (1setOf type2 keyword)</u>	<u>Job</u>	<u>mod 4.3.8</u>

### 7.2.3 Additional Information in Event Notification Content for Printer events only

Table 22 lists the source of the information for the printer state. If a Printer supports the "printer-state-message", it SHOULD use that attribute for the job state information, otherwise it should fabricate such information from the "printer-state" and "printer-state-reasons". For some events, a Printer MAY combine this information with event information.

**Table 22 – Printer State in Printer Event Notification Content**

<u>Source Value</u>	<u>Reference</u>
<u>printer-state-message (text(MAX))</u>	<u>mod 4.4.13</u>
<u>printer-state (type1 enum)</u>	<u>mod 4.4.11</u>
<u>printer-state-reasons (1setOf type2 keyword)</u>	<u>mod 4.4.12</u>
<u>printer-is-accepting-jobs (boolean)</u>	<u>mod 4.4.23</u>

## 8 Attributes only in Event Notifications

This section contains those attributes that exist only in Event Notifications.

### 8.1 trigger-event (type2 keyword)

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

This attribute exists only in Event Notifications and its value is generated by the Notification Source.

### ~~8.2 trigger-time (integer(MIN:MAX))~~

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

~~This attribute exists only in Event Notifications and its value is generated by the Notification Source as a snapshot of the "printer-up-time" attribute when the event occurs.~~

### ~~8.3 trigger-date-time (dateTime)~~

~~This CONDITIONALLY REQUIRED Event Notification Content attribute indicates the date and time at which the event occurred, i.e., the "printer-current-time" value (see [ipp-mod] section 4.4.30) when the~~

1525 ~~event occurred. If a Printer supports the "printer-current-time" attribute, it MUST include this attribute in~~  
1526 ~~each Event Notification. If a Printer does not support the "printer-current-time" attribute, it MUST NOT~~  
1527 ~~include this attribute in each Event Notification.~~

1528 ~~This attribute exists only in Event Notifications and its value is generated by the Notification Source as a~~  
1529 ~~snapshot of the "printer-current-time" attribute when the event occurs.~~

## 1530 **8.48.2 notify-text (text(MAX))**

1531 This OPTIONAL Event Notification Content attribute contains the Human Consumable text message (see  
1532 section 7.2) that describes the event and is represented in the text format specified by the "notify-text-  
1533 format" attribute. Whether or not this attribute is defined depends on the delivery method definition  
1534 document. If this attribute is defined for use in delivery method that a Printer supports, then a Printer  
1535 MUST support this attribute.

## 1536 **9 Operations for Notification**

1537 This section defines all of the operations for notification which are summarized in Table 3 in section 1.1,  
1538 including the assignment of the operation-id.

### 1539 **9.1 Operations for Per-Job Subscriptions *only***

1540 This section defines the operation requests and responses that are related to Per-Job subscriptions and its  
1541 Subscription object. Section 9.3 defines the REQUIRED operation requests and responses associated with  
1542 the REQUIRED Per-Printer subscription and its Subscription object.

#### 1543 **1.1.19.1.1 Job Creation Operations (Create-Job, Print-Job, Print-URI) and** 1544 **Validate-Job**

1545 The usual method for a client to associate one subscription with a Job is to specify the subscription when  
1546 the job is created. ~~For a Per Job Subscription, the~~ The client supplies ~~the several~~ "job-notify-xxx (1setOf  
1547 ~~collection)~~" operation attributes ~~s with the member attributes listed as specified~~ in Table 23 with any of the  
1548 Job Creation operations (Create-Job, Print-Job, Print-URI), plus Validate-Job (which doesn't create a job or  
1549 subscription). If the client does not supply the "job-notify-xxx" attributes ~~s~~ in the create operation, there is no  
1550 subscription made (either implicitly or explicitly).

1551 If a Printer does not support this notification specification, then it MUST ignore the "job-notify-xxx"  
1552 operation attributes ~~s~~ and return ~~it-them~~ in the response indicated as ~~an-attributes~~ that ~~is-are~~ not supported.  
1553 See [ipp-mod] section 3.1.7 for details on returning Unsupported Attributes.

1554 The mechanism described in this section can create at most one Per-Job subscription. If a client wants to  
1555 create more than one Per-Job subscription (e.g. 3 of them), it MUST perform one or more Create-Job-  
1556 Subscription operations between a Create-Job operation and the first Send-Document or Send-URI  
1557 operation for the job created by the Create-Job operation. The Create-Job MAY have "notify-xxx" attributes

1558 to create one Per-Job subscription. The Create-Job-Subscription operations create all Per-Job subscriptions  
 1559 except the optional one in the Create-Job operation. If a client uses Print-Job, it is not possible to use  
 1560 Create-Job-Subscription operations without either running into race conditions or using Job-Hold/Job-  
 1561 Release, which the Printer MAY NOT support.

1562 Table 23 below contains the following columns:

- 1563 a) notify-xxx attributes: the name of a Subscription object attribute.
- 1564 b) Reference: the section where the attribute is defined
- 1565 c) Client MUST supply: the value is 'yes' if the client MUST supply the operation attribute in an  
 1566 operation. The value is 'no' if the client MAY supply the Subscription attribute in an operation.  
 1567 If a client MAY supply the Subscription attribute, the default value is specified in the section  
 1568 describing the attribute.
- 1569 d) Printer MUST support: the value is 'yes' if the Printer MUST support the operation attribute and  
 1570 'no' if the Printer MAY support the operation attribute.

1571

1572 **Table 23 - ~~Member attributes of the~~ The "job-notifynotify-xxx" collection operation attributes**

<u>notify-xxx attributes</u>	Reference	client MUST supply	Printer <u>MUST</u> support
<u>notify-recipient-uri</u> (uri)	5.1	yes	yes
notify-events (1setOf type2 keyword)	5.2	no	yes
notify- <u>text</u> -format (mimeMediaType)	5.3	no	yes
<u>notify-user-data</u> (octetString(63))	5.4	no	yes
notify-charset (charset)	5.7	no	yes
notify-natural-language (naturalLanguage)	5.8	no	yes
<u>notify-additional-formats</u> (1setOf mimeMediaType)	5.4	<u>no</u>	no
<u>notify-requested-attributes</u> (1setOf type2 keyword)	5.4	<u>no</u>	no

1573

1574 Table 24 shows the "job-notifynotify-xxx" (~~collection~~) ~~member~~ attributes with their corresponding "xxx-  
 1575 default" and "xxx-supported" attributes. The Printer uses the "xxx-default" values if the client omits the

1576 ~~member~~-attribute in the request. The "xxx-supported" attributes are used by the Printer to validate the  
 1577 request. The client can query to determine supported values.

1578 **Table 24 – The "~~job-notify~~notify-xxx" supported and default attributes**

" <u>notify-xxx</u> " member attribute	"xxx-default", if any	"xxx-supported"
<u>notify-recipient-uri</u> (uri)	none	notify-schemes-supported (1setOf uriScheme)
notify-events (1setOf type2 keyword)	notify-events-default (1setOf type2 keyword)	notify-events-supported (1setOf type2 keyword) <del>max-notify-max</del> -events-supported (integer(5:MAX))
notify- <del>text</del> -format (mimeMediaType)	none	notify- <del>text</del> -format-supported (1setOf mimeMediaType)
<u>notify-additional-formats</u> (1setOf mimeMediaType)	<u>none</u>	<u>notify-additional-formats-supported</u> (1setOf mimeMediaType)
<del>notify-subscriber</del> -user-data (octetString(63))	none	none
notify-charset (charset)	charset-configured (charset)	charset-supported (1setOf charset)
notify-natural-language (naturalLanguage)	natural-language-configured (naturalLanguage)	generated-natural-language-supported (1setOf naturalLanguage)
<u>notify-requested-attributes</u> (1setOf type2 keyword)	<u>none</u>	<u>notify-requested-attributes-supported</u> (1setOf type2 keyword)

1579 See the referenced sections for a definition of these operation attributes, since they are copied to the  
 1580 Subscription object as the Subscription Description attributes described in section 5.

1581 The following rules apply to Per-Job subscriptions created as part of the Job Creation operations:

- 1582 1. Any subscription can contain job events, printer events, or both.
- 1583 2. The Job Submission Subscription is only valid while the job is "not-completed". The job is "not-  
 1584 completed" while it is in the 'pending', 'pending-held', 'processing', and 'processing-stopped' states.  
 1585 The job changes from being "not-completed" to "retained" when it is done processing and enters any  
 1586 of the 'completed', 'canceled', or 'aborted' states. The job becomes "not-completed" again when it is  
 1587 restarted using the Restart-Job operation (see [ipp-mod]).
- 1588 3. Since no job is created for the Validate-Job operation, the only purpose of supplying the subscription  
 1589 operation attributes in the Validate-Job operation is to validate that the values are supported; the  
 1590 Printer object does not establish a notification subscription as a result of the Validate-Job operation.

- 1591 4. Since a Job Submission Subscription is included within a job submission operation, any interest in  
1592 job events is limited to "this job" only (the Job object created because of this job creation operation).  
1593 There is no mechanism to subscribe to events for all jobs or specifically some job other than this job  
1594 in a create operation. But see the Create-Printer-Subscription operation (section 9.2.1) for an explicit  
1595 operation to subscribe for job and/or printer events independently of any particular job submission,  
1596 i.e., Per-Printer subscriptions.
- 1597 5. Event reporting only occurs when a Notification Recipient has specified a subscription to any  
1598 event(s).
- 1599 6. The notification implementation MAY allow an administrator to configure a policy on what events  
1600 may be dropped.
- 1601 7. \*\* The client MUST supply the "~~notify-subscriber~~-user-data" (octetString(63)) attribute, if the  
1602 definition of the delivery method specified in the "~~notify-recipient~~notify-recipient-uri" attribute  
1603 REQUIRES the client to supply it.
- 1604 8. If the ~~OPTIONAL~~supplied value of "notify-charset" attribute is not supported~~or the supplied value is~~  
1605 not supported, the IPP Printer MUST return the attribute in the Unsupported Attributes Group but still  
1606 accept the operation, as with all Job create operations. In this case, the Printer MUST use the natural  
1607 language supplied in the "attributes-charset" Job creation operation attribute, if that natural language  
1608 value is supported by the Printer, else the Printer object MUST use the Printer's "charset-configured"  
1609 value. See the Print-Job operation in [ipp-mod].
- 1610 9. If the supplied value of ~~OPTIONAL~~ "notify-natural-language" attribute is not supported~~or the~~  
1611 supplied value is not supported, the IPP Printer MUST return the attribute in the Unsupported  
1612 Attributes Group but still accept the operation, as with all Job create operations. In this case, the  
1613 Printer MUST use the natural language supplied in the "attributes-natural-language" Job creation  
1614 operation attribute, if that natural language value is supported by the Printer, else the Printer object  
1615 MUST use the Printer's "natural-language-configured" value. See the Print-Job operation in [ipp-  
1616 mod].
- 1617 10. If the IPP Printer does not support the OPTIONAL "notify-requested-attributes" or does not support is  
1618 for the specified delivery method (e.g. it is a Human Consumable delivery method), it MUST return  
1619 the attribute in the Unsupported Attributes Group. If IPP Printer supports the OPTIONAL "notify-  
1620 requested-attributes" attribute, but does not support some of the supplied values, the IPP Printer  
1621 MUST return the attribute with its unsupported values in the Unsupported Attributes Group. In either  
1622 case, the Printer MUST still accept the Job creation operation and create a Per-Job subscription  
1623 without the attributes that are unsupported.
- 1624 ~~10. If a collection contains other unrecognized, unsupported member attributes and/or conflicting values, the~~  
1625 ~~attribute returned in the Unsupported Group is a collection containing the unrecognized, unsupported~~  
1626 ~~member attributes, and/or conflicting values. The Printer MUST return the unrecognized member~~  
1627 ~~attributes with the out of band value of 'unsupported'. The Printer MUST return the unsupported~~  
1628 ~~member attributes and conflicting values with their unsupported values. See [ipp-coll].~~



- 1629 11. If the number of events supplied in the "notify-events" attribute exceeds the Printer's "~~max-notify-~~  
1630 ~~max-events-supported~~" attribute, the Printer MUST accept the request with the status code  
1631 'successful-ok-ignored-or-substituted-attributes' and return the "~~job-notify-~~~~notify-xxx~~" ~~collection~~  
1632 ~~attributes~~ in the Unsupported Attributes Group with only the "job-events" member attribute  
1633 containing the events that exceed the maximum.
- 1634 12. If the Per-Job subscriptions ~~would exceed the limit of Per-Job subscriptions supported per job as~~  
1635 ~~specified by the Printer's "max-job-subscriptions-supported" attribute or~~ would exceed some  
1636 implementation-defined limit on the total number of Per-Job subscriptions for the Printer (if any), the  
1637 Printer MUST accept the request with the status code 'successful-ok-ignored-subscriptions', MUST  
1638 return the ~~all submitted~~ "~~job-notify-xxx~~" ~~attributes~~ in the Unsupported Attributes Group with ~~only~~  
1639 ~~the~~~~their~~ ~~collection~~ value(s) ~~that represent the excess subscriptions that are being ignored~~, and MUST  
1640 perform the Job Creation operation (see section 9.1.1), since the job can still be printed.
- 1641 13. If the job is accepted ~~and one or more~~~~the~~ subscriptions ~~are~~~~is~~ ignored, the status code returned is  
1642 'successful-ok-ignored-subscriptions'. This status code is returned even if other job attributes are  
1643 unsupported or in conflict. That is, if an IPP Printer finds a warning that would allow it to return  
1644 'successful-ok-ignored-subscriptions' and either 'successful-ok-ignored-or-substituted-attributes'  
1645 and/or 'successful-ok-conflicting-attributes', it must return 'successful-ok-ignored-subscriptions'. In  
1646 other words, the precedence for returning success codes is: 'successful-ok-ignored-subscriptions',  
1647 'successful-ok-conflicting-attributes', and 'successful-ok-ignored-or-substituted-attributes'.

### 1648 9.1.2 Create-Job-Subscription operation

1649 The OPTIONNAL Create-Job-Subscription operation creates a Per-Job Subscription object-. The client can  
1650 specify one or more job and/or printer events to be delivered as Event Notifications to one Notification  
1651 Recipient. For the Per-Job subscription objects, the Job events are for this job only. The printer events are  
1652 any events generated by that Printer for any job or when no job is involved at all (same as for Per-Job  
1653 Subscriptions).

1654 The Printer returns a subscription id and the length of time for which it has granted a lease for the  
1655 subscription.

1656 A client can unsubscribe using the Cancel-Subscription operation (section 9.3.4) and the subscription id.

1657 Two Create-Job-Subscription operations with the same events and same Notification Recipient MUST be  
1658 kept as distinct subscriptions and be assigned distinct subscription ids. A Printer MUST allow such  
1659 duplicate subscriptions such that Cancel-Subscription doesn't unsubscribe both subscriptions and MUST  
1660 send the Event Notifications twice to the Notification Recipient, since the "request-id" is supposed to count  
1661 monotonically for each Subscription object.

1662 If the Printer has a bounded set of concurrent Per-Job subscriptions and the request would exceed that  
1663 bound, the Printer **MUST** ~~rejects~~ the operation and returns the 'client-error-too-many-subscriptions' status  
1664 code. The client SHOULD try again later.

1665 Access Rights: To create Per-Job subscription objects, the authenticated user (see [IPP-MOD] section 8.3)  
1666 performing this operation MUST either be the job owner or have operator or administrator access rights for

1667 the Printer object (see [IPP-MOD] sections 1 and 8.5). Otherwise the IPP object MUST reject the operation  
 1668 and return: the 'client-error-forbidden', 'client-error-not-authenticated', or 'client-error-not-authorized' status  
 1669 code as appropriate.

1670 Request :

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

1671

Group 2: Subscription Attributes	Reference	client MUST supply	Printer support
<a href="#">notify-recipient-uri</a> (uri)	5.1	yes	REQUIRED
notify-events (1setOf type2 keyword)	5.2	no	REQUIRED
notify-text-format (mimeMediaType)	5.3	no	REQUIRED
<a href="#">notify-additional-formats</a> (1setOf mimeMediaType)	5.3	<u>no</u>	<u>OPTIONAL</u>
<a href="#">notify-requested-attributes</a> (1setOf type2 keyword)	5.4	<u>no</u>	<u>OPTIONAL</u>
<a href="#">notify-user-data</a> (octetString(63))	5.4	depends on delivery method	REQUIRED
notify-charset (charset)	5.7	no	<u>REQUIRED</u> <u>OPTIONAL</u>
notify-natural-language (naturalLanguage)	5.8	no	<u>REQUIRED</u> <u>OPTIONAL</u>
notify-persistence-requested (boolean)	see below	no	OPTIONAL

1672 Response :

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

1673

Group 2: Unsupported Attributes (see [ipp-mod] section 3.1.7)	REQUIRED if unsupported attributes
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1674

Group 3: Subscriptions Attributes	Reference	REQUIRED in response
<del>subscription-id</del> <u>notify-subscription-id</u> (integer(1:MAX))	5.10	REQUIRED
notify-persistence-granted (boolean)	5.15	REQUIRED

1675 Attribute Notes:

1676 "job-id" (integer(1:MAX)) - the client MUST either (1) supply this attribute, in combination with the  
 1677 "printer-uri" attribute, in order to create a Per-Job subscription for the Job identified by the "job-id"  
 1678 value or supply the "job-uri" instead, as with any Job operation:

1679 "job-uri" (uri) - the client MUST supply this attribute, if the "printer-uri" and "job-id" are not supplied, in  
 1680 order to identify the Job to which the Per-Job Subscription is being created.

1681 "~~notify-recipient~~ notify-recipient-uri" (uri) - the client MUST supply this attribute in order to have a  
 1682 subscription.

1683 "notify-event" (1setOf type2 keyword) - if the client does not supply this attribute, the Printer populates the  
 1684 "notify-events" Subscription Description attribute from its "notify-events-default" Printer  
 1685 Description attribute.

1686 "notify-~~text-format~~" (mimeMediaType) - if the client supplies this attribute and the delivery method  
 1687 specifies a Human Consumable form, the value this attribute indicates the format of the Event  
 1688 Notification content. If the client supplies this attribute and the delivery method specifies a  
 1689 Machine Consumable form, this attribute indicates the format of the "notify-text" attribute. which  
 1690 Human Consumable text format is requested for use in the Notification using the delivery method  
 1691 that the client supplies in the "notify-recipient" attribute. If the client does not supply this attribute,  
 1692 the Printer behaves as if this attribute were submitted with the value of 'text/plain'. Machine-  
 1693 Consumable form of the delivery method that the client supplies in the "notify-recipient" attribute is  
 1694 used.

1695 "notify-additional-formats" (1setOf mimeMediaType) - if the client supplies this attribute and the delivery  
 1696 method supports additional formats in the Event Notification content, this attribute indicates the  
 1697 additional formats to include in the Event Notification content. If the client does not supply this  
 1698 attribute, the Printer includes only the delivery method's default format in the Event Notification  
 1699 content.

1700 "notify-requested-attributes" (1setOf type2 keyword) - if the client supplies this OPTIONAL attribute, the  
 1701 value indicates which additional attributes to include in each Event Notification associated with this  
 1702 subscription beyond those attributes specified in Section 7.

1703 "~~subscriber-user-data~~notify-user-data" (octetString(63)) - the client MUST supply this attribute, if the  
1704 definition of the delivery method specified in the "~~notify-recipient~~notify-recipient-uri" attribute  
1705 REQUIRES the client to supply it.

1706 "notify-persistence-requested" (boolean) - whether or not the Per-Job Subscription is to be persistent, i.e.,  
1707 saved across power cycles. Note: Persistent trap registrations is a client option in SNMPv3  
1708 [RFC2573].

1709 "notify-persistence-granted" (boolean) - whether or not this Subscription object instance is persistent. This  
1710 attribute MUST be returned whether "notify-persistence-requested" is supported or not, so that the  
1711 client knows which.

## 1712 **9.2 Operations for Per-Printer Subscriptions *only***

1713 This section defines the operation requests and responses associated with the Per-Printer subscription and  
1714 its Subscription object.

### 1715 **9.2.1 Create-Printer-Subscription operation**

1716 The REQUIRED Create-Printer-Subscription operation creates a Per-Printer Subscription object . The  
1717 client can specify one or more job and/or printer events to be delivered as Event Notifications to one  
1718 Notification Recipient. For the Per-Printer subscription objects, the job events are for any job submitted to  
1719 the Printer. The printer events are any events generated by that Printer for any job or when no job is  
1720 involved at all.

1721 The Printer returns a subscription id and the time at which the subscription lease expires (which may be  
1722 earlier or later than the client requested).

1723 The client MUST renew the Per-Printer subscription using the Renew-Subscription operation (see section  
1724 9.3.3) before the lease runs out in order to maintain the subscription. A client can unsubscribe using the  
1725 Cancel-Subscription operation (section 9.3.4) and the subscription id.

1726 Two Create-Printer-Subscription operations with the same events and same Notification Recipient MUST  
1727 be kept as distinct subscriptions and be assigned distinct subscription ids. A Printer MUST allow such  
1728 duplicate subscriptions such that Cancel-Subscription doesn't unsubscribe both subscriptions and MUST  
1729 send the Event Notifications twice to the Notification Recipient, since the "request-id" is supposed to count  
1730 monotonically for each subscription.

1731 If the Printer has a bounded set of concurrent Per-Printer subscriptions and the request would exceed that  
1732 bound, the Printer rejects the operation and returns the 'client-error-too-many-subscriptions' status code.  
1733 The client SHOULD try again later.

1734 Access Rights: To create Per-Printer subscription objects, the authenticated user performing this operation  
1735 MUST have Per-Printer subscription rights for this Printer. Otherwise the IPP object MUST reject the  
1736 operation and return: the 'client-error-forbidden', 'client-error-not-authenticated', or 'client-error-not-  
1737 authorized' status code as appropriate.

1738 Request :

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

1739

Group 2: Subscription Attributes		Reference	client MUST supply	Printer support
	<a href="#">notify-recipient-uri</a> (uri)	5.1	yes	REQUIRED
	notify-events (1setOf type2 keyword)	5.2	no	REQUIRED
	notify- <del>text</del> -format (mimeMediaType)	5.3	no	REQUIRED
	<a href="#">notify-additional-formats</a> (1setOf <a href="#">mimeMediaType</a> )	5.4	<u>no</u>	<u>OPTIONAL</u>
	<a href="#">notify-requested-attributes</a> (1setOf type2 <a href="#">keyword</a> )	5.4	<u>no</u>	<u>OPTIONAL</u>
	<del>subscriber-user-data</del> <a href="#">notify-user-data</a> (octetString(63))	5.4	depends on the delivery method	REQUIRED
	notify-charset (charset)	5.7	no	<u>REQUIRED</u> <u>OPTIONAL</u>
	notify-natural-language (naturalLanguage)	5.8	no	<u>REQUIRED</u> <u>OPTIONAL</u>
	notify-lease-time-requested (integer(0:MAX))	see below	no	REQUIRED
	notify-persistence-requested (boolean)	see below	no	OPTIONAL

1740 Response :

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

1741

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

1742

Group 3: Subscription Attributes	Reference	REQUIRED in response
<del>subscription-id</del> <u>notify-subscription-id</u> (integer(1:MAX))	5.10	REQUIRED
notify-lease-expiration-time (integer(0:MAX))	5.11	REQUIRED
notify-server-up-time (integer(1:MAX))	5.14	REQUIRED
notify-persistence-granted (boolean)	5.15	REQUIRED

1743 Attribute Notes:

1744 "~~notify-recipient~~notify-recipient-uri" (uri) - the client MUST supply this attribute in order to have a  
1745 subscription.

1746 "notify-lease-time-requested" (integer(0:MAX) - the number of seconds requested for the subscription  
1747 lease. A value of 0 indicates a request that the Per-Printer Subscription lease never expire.  
1748 Supplying a 0 value MAY require authentication in order to be used, if 0 is supported at all.  
1749 If the client does not supply this attribute, the Printer uses its "notify-lease-time-default" Printer  
1750 Description attribute value (see section 6.8).

1751 "notify-event" (1setOf type2 keyword) - if the client does not supply this attribute, the Printer populates the  
1752 "notify-events" Subscription Description attribute from its "notify-events-default" Printer  
1753 Description attribute.

1754 ~~"notify-format" (mimeMediaType) - if the client supplies this attribute, the value indicates which Human  
1755 Consumable text format is requested for use in the Notification using the delivery method that the  
1756 client supplies in the "notify-recipient" attribute. If the client does not supply this attribute, the  
1757 Machine Consumable form of the delivery method that the client supplies in the "notify-recipient"  
1758 attribute is used.~~"notify-text-format" (mimeMediaType) - if the client supplies this attribute and the  
1759 delivery method specifies a Human Consumable form, this attribute indicates for format of the  
1760 Event Notification content. If the client supplies this attribute and the delivery method specifies a  
1761 Machine Consumable form, this attribute indicates format of the "notify-text" attribute. If the client  
1762 does not supply this attribute, the Printer behaves as if this attribute were submitted with the value  
1763 of 'text/plain'.

1764 "notify-additional-formats" (1setOf mimeMediaType) - if the client supplies this attribute and the delivery  
1765 method supports additional formats in the Event Notification content, this attribute indicates the  
1766 additional formats to include in the Event Notification content. If the client does not supply this  
1767 attribute, the Printer includes only the delivery method's default format in the Event Notification  
1768 content.

1769 "notify-requested-attributes" (1setOf type2 keyword) - if the client supplies this OPTIONAL attribute, the  
1770 value indicates which additional attributes to include in each Event Notification associated with this  
1771 subscription beyond those attributes specified in Section 7.

1772 ~~"subscriber-user-data~~notify-user-data" (octetString(63)) - the client MUST supply this attribute, if the  
1773 definition of the delivery method specified in the "~~notify-recipient~~notify-recipient-uri" attribute  
1774 REQUIRES the client to supply it.

- 1775 "notify-persistence-requested" (boolean) - whether or not the Per-Printer Subscription is to be persistent,  
1776 i.e., saved across power cycles. Note: Persistent trap registrations is a client option in SNMPv3  
1777 [RFC2573].
- 1778 "notify-lease-expiration-time" (integer(0:MAX)) - The Printer object MUST return this attribute which is  
1779 the time in the future at which the subscription lease will expire, i.e., the "printer-up-time" value (in  
1780 time ticks - see [ipp-mod] section 4.4.29) at which the Printer will delete the Subscription. A value  
1781 of 0 indicates that the lease subscription will never expire.
- 1782 "notify-server-up-time" (integer(1:MAX)) - The Printer object MUST return this attribute which is an alias  
1783 for the Printer's "printer-up-time" Printer Description attribute. The client subtracts this value from  
1784 the "notify-lease-expiration-time" value returned in order to determine the number of second in the  
1785 future that the subscription will expire. This computed value may be less than the requester  
1786 requested in the "notify-lease-time-requested" if it was greater than the MAX supported or more  
1787 than the requester requested if it was less than the MIN supported, as indicated in the Printer's  
1788 "notify-lease-time-supported" (rangeOfInteger(0:MAX)) attribute (see section 6.7).
- 1789 "notify-persistence-granted" - whether or not this Subscription object instance is persistent. This attribute  
1790 MUST be returned whether "notify-persistence-requested" is supported or not, so that the client  
1791 knows which.

1792

1793 **9.3 Common Operations for Per-Job and Per-Printer Subscriptions**

1794 This section defines the operations that are common to both Per-Job and Per-Printer subscriptions.

1795 **9.3.1 Get-Subscription-Attributes operation**

1796 The REQUIRED Get-Subscription-Attributes returns the requested attributes of the identified Subscription  
1797 object. See section 5.

1798 Request:

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

1799

Group 2: Subscription Attributes	Reference	client MUST supply	Printer support



	<del>subscription-id</del> notify-subscription-id (integer(1:MAX))	5.10	yes	REQUIRED
	requested-attributes (1setOf type2 keyword)	see below	no	REQUIRED

1800 Response:

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

1801

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

1802

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

1803 This operation is similar to the Get-Printer-Attributes operation.

1804 "requested-attributes" (1setOf keyword): The client OPTIONALLY supplies this attribute. The Printer  
 1805 object MUST support this attribute. It is a set of Subscription attribute names and/or the 'all'  
 1806 attribute group name in whose values the requester is interested. This set of attributes is returned for  
 1807 each Job object that is returned. If the client does not supply this attribute, the Printer MUST  
 1808 respond as if the client had supplied this attribute with the value: 'all'.



1809 **9.3.2 Get-Subscriptions operation**

1810 The REQUIRED Get-Subscriptions operation returns the requested attributes of the Subscription objects  
 1811 (see section 5).

1812 Request :

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

1813 Response :

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

1814

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

1815

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

1816

1817 Attribute Notes:

1818 This operation is similar to the Get-Jobs operation (see [ipp-mod]). If the client wants any attributes  
 1819 returned, including the "[subscription-id](#)[notify-subscription-id](#)", it must include the attribute keyword name  
 1820 in the "requested-attributes" operation attribute. If the "requested-attributes" operation attribute is omitted,  
 1821 the Printer MUST respond as if the client supplied the value: '[subscription-id](#)[notify-subscription-id](#)'.

- 1822 "job-id" (integer(1:MAX)) - If the client supplies this attribute, all of the Per-Job Subscription objects for  
1823 the identified job are candidates for return. If this attribute is omitted, all of the Per-Printer  
1824 Subscription objects are candidates for return.
- 1825 "limit" (integer(1:MAX)): The client **OPTIONALLY** supplies this attribute. The Printer object **MUST**  
1826 support this attribute. It is an integer value that determines the maximum number of Subscription  
1827 objects that a client will receive from the Printer even if "my-subscriptions" constrain which  
1828 subscriptions are returned. The limit is a "stateless limit" in that if the value supplied by the client is  
1829 'N', then only the first 'N' Subscriptions are returned in the Get-Subscriptions Response. There is no  
1830 mechanism to allow for the next 'M' Subscriptions after the first 'N' Subscriptions. If the client does  
1831 not supply this attribute, the Printer object responds with all applicable Subscriptions.
- 1832 "requested-attributes" (1setOf keyword): The client **OPTIONALLY** supplies this attribute. The Printer  
1833 object **MUST** support this attribute. It is a set of Subscription attribute names and/or the 'all'  
1834 attribute group name in whose values the requester is interested. This set of attributes is returned for  
1835 each Job object that is returned. If the client does not supply this attribute, the Printer **MUST**  
1836 respond as if the client had supplied this attribute with the value: 'all'.
- 1837 "my-subscriptions" (boolean): The client **OPTIONALLY** supplies this attribute. The Printer object **MUST**  
1838 support this attribute. It indicates whether Subscriptions from all users or just the Subscriptions  
1839 submitted by the requesting user of this request **MUST** be returned by the Printer object. If the  
1840 client does not supply this attribute, the Printer object **MUST** respond as if the client had supplied  
1841 the attribute with a value of 'false', i.e., Subscriptions from all users. The means for authenticating  
1842 the requesting user and matching the Subscription objects is the same as for jobs as described in  
1843 [ipp-mod] section 8.
- 1844 Groups 3 to N: Subscription Object Attributes: The Printer object responds with one set of Subscription  
1845 Object Attributes for each returned Subscription object. The Printer object ignores (does not  
1846 respond with) any requested attribute or value which is not supported or which is restricted by the  
1847 security policy in force, including whether the requesting user is the user that created the  
1848 Subscription object (subscribing user) or not (see [ipp-mod] section 8).

### 1849 **9.3.3 Renew-Subscription operation**

1850 The **REQUIRED** Renew-Subscription operation permits a client to request the IPP Printer to extend the  
1851 lease on a Subscription object instance. There is no way to renew a Per-Job subscription, since they are  
1852 automatically canceled after the job completes and no longer has any documents, i.e., the job is no longer  
1853 retained (see [ipp-mod] section 4.3.7.2). If the requested subscription object is a Per-Job subscription, the  
1854 Printer **MUST** grant an infinite lease by returning a 0 value for the "notify-lease-expiration-time".

1855 *Access Rights:* The authenticated user (see [IPP-MOD] section 8.3) performing this operation **MUST** either  
1856 be the owner of the Subscription object or have operator or administrator access rights for the Printer object  
1857 (see [IPP-MOD] sections 1 and 8.5). Otherwise the IPP object **MUST** reject the operation and return: the  
1858 'client-error-forbidden', 'client-error-not-authenticated', or 'client-error-not-authorized' status code as  
1859 appropriate.

1860 Request :

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

1861

Group 2: Subscription Attributes	Reference	client MUST supply	Printer support
" <del>subscription-id</del> notify-subscription-id" (integer(1:MAX))	5.10	yes	REQUIRED
"notify-lease-time-requested" (integer(0:MAX))	see below	no	REQUIRED

1862 Response :

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

1863

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

1864

Group 3: Subscriptions Attributes	Reference	REQUIRED in response
"notify-lease-expiration-time" (integer(0:MAX))	5.11	REQUIRED
"notify-server-up-time" (integer(1:MAX))	5.14	REQUIRED

1865

1866 Attribute Notes:

1867 "notify-lease-time-requested" (integer(0:MAX)) - the number of seconds requested for the Per-Printer  
1868 subscription lease. Same as Create-Printer-Subscriptions (see section 9.2.1).

1869 "notify-lease-expiration-time" - the time in the future when the subscription will expire. Same as for the  
1870 Create-Printer-Subscription operation (see section 9.2.1).

1871 "notify-server-up-time" - the Printer object MUST return this attribute which is an alias for the Printer's  
 1872 "printer-up-time" Printer Description attribute. The client subtracts this value from the "notify-  
 1873 lease-expiration-time" value returned in order to determine the number of second in the future that  
 1874 the subscription will expire (see further explanation in section 9.2.1).

1875 Note: There is no way to change any of the Subscription object attributes, except the "notify-lease-  
 1876 expiration-time" attribute (using the Renew-Subscription operation). In order to change other attributes, a  
 1877 client can create a new Subscription object and then use the Cancel-Subscription operation to cancel the old  
 1878 one (or do this in the other order, in case there is a limit on the number of Subscription object instances, as  
 1879 long as a short window with no Notifications is ok).

1880 Note: There is no need to renew a Per-Job Subscription, since it is effectively the time that the Job is active  
 1881 (see section 9.1).

1882 **9.3.4 Cancel-Subscription operation**

1883 The REQUIRED Cancel- Subscription operation allows a client to remove a Subscription object. No more  
 1884 Event Notifications are delivered for that Subscription. Once performed, there is no way to use that  
 1885 Subscription in the future. ~~Subscription-id~~Notify-subscription-id should not be reused immediately, so  
 1886 that a stale reference situation is not created. Same as for Cancel-Job and job-ids.

1887 *Access Rights:* The authenticated user (see [IPP-MOD] section 8.3) performing this operation MUST either  
 1888 be the owner of the Subscription object or have operator or administrator access rights for the Printer object  
 1889 (see [IPP-MOD] sections 1 and 8.5). Otherwise the IPP object MUST reject the operation and return: the  
 1890 'client-error-forbidden', 'client-error-not-authenticated', or 'client-error-not-authorized' status code as  
 1891 appropriate.

1892 Request :

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

1893

Group 2: Subscription Attributes		Reference	client MUST supply	Printer support
" <del>subscription-id</del> notify-subscription-id" (integer(1:MAX))		5.10	yes	REQUIRED

1894 Response :

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

1895

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

1896

## 1897 **10 Comparison of Per-Job versus Per-Printer Subscriptions**

1898 Per-Job and Per-Printer subscriptions are quite similar. Either type of subscription can subscribe to Job  
 1899 events, Printer events, or both. Both types of subscriptions can be queried using the Get-Subscriptions and  
 1900 Get-Subscription-Attributes operations and canceled using the Cancel-Subscription operation. Both types  
 1901 of subscriptions create Subscription objects which have the same attributes defined. However, there are  
 1902 some semantic differences between Per-Job subscriptions and Per-Printer subscriptions. A Per-Job  
 1903 Submission Subscription is established by the client when submitting a job and after creating the job using  
 1904 the Create-Job-Subscription operation by specifying the "job-id" of the job. A Per-Printer Subscription is  
 1905 established between a client and a Printer using the Create-Printer-Subscription operation. Some specific  
 1906 differences are:

- 1907 1. A client usually creates a Per-Job subscription as part of the Job Creation operations (Create-Job, Print-  
 1908 Job, and Print-URI), rather than using the OPTIONAL Create-Job-Subscription operation, especially  
 1909 since Printer implementations NEED NOT support the Create-Job-Subscription operation, since it is  
 1910 OPTIONAL.
- 1911 2. For Per-Job subscriptions, the subscription is only valid while the job is "not-complete" (see sections  
 1912 7.1.1 and 7.1.2) while for the Per-Printer subscriptions, the subscription is valid until the time (in  
 1913 seconds) that the Printer returned in the "notify-lease-expiration-time" operation attribute expires.
- 1914 3. Job Events in a Per-Job subscription apply only to "one job" (the Job created by the job creation  
 1915 operation or references by the Create-Job-Subscription operation) while Job Events in a Per-Printer  
 1916 subscription apply to ALL jobs contained in the IPP Printer object.

## 1917 ~~10 Out of Band Values~~

1918 ~~This section defines out of band values (see [ipp-mod] section 4.1) for use with attributes defined in this~~  
 1919 ~~and other documents.~~

1920 **10.1 'none'**

1921 ~~This out of band value permits a client to indicate in a request that a specified attribute in the request~~  
1922 ~~MUST NOT be applied to the job. Specifically, this value overrides the Printer's "xxx-default" attribute~~  
1923 ~~value for the attribute, if one exists. This out of band value is needed since attributes that are of the~~  
1924 ~~'collection', 'uri', and 'mimeType' type need a way for a client to specify that the Printer MUST NOT~~  
1925 ~~apply the value of an "xxx-default" attribute to the job. See [ipp-coll] for a complete specification,~~  
1926 ~~including encoding.~~

1927 **11 Conformance Requirements**

1928 It is OPTIONAL to implement this Event Notification specification. An implementation conforming to this  
1929 specification MUST also meet the Conformance Requirements detailed in [IPP-MOD] section 5. If this  
1930 Event Notification specification is implemented, IPP objects MUST support all of the REQUIRED object  
1931 attributes as defined in this document in the indicated sections:

- 1932 1. REQUIRED Subscription object attributes in section 5.
- 1933 2. REQUIRED Printer Description object attributes in section 6.
- 1934 3. REQUIRED attributes in Event Notification content in section 7.

1935 ~~In addition, the Printer MUST support the 'collection' attribute syntax (see [ipp-coll]).~~

1936 Extensions made to the events herein must be made such that new events or event attributes are backward  
1937 compatible to clients who implemented early versions of this notification specification.

1938 If this Event Notification specification is implemented, the operations described in section 8 MUST be  
1939 supported as described in Table 25:

1940 **Table 25 - Conformance Requirements for Operations**

Attribute	Conformance requirements
<del>"job-notify-xxx" (AsetOf collection) in Job Creation operations (section 8.1.1)</del>	REQUIRED
Create-Printer-Subscription (section 9.2.1)	REQUIRED
Create-Job-Subscription (section 9.1.2)	OPTIONAL
Get-Subscription-Attributes (section 9.3.1)	REQUIRED
Get-Subscriptions (section 9.3.2)	REQUIRED
Renew-Subscription (section 9.3.3)	REQUIRED
Cancel-Subscription (section 9.3.4)	REQUIRED

1941

## 12 IANA Considerations

IANA will be called on to register URL schemes for notification delivery methods, such as 'snmpnotify', for use in the "notify-recipient-uri" attribute, using the same procedures outlined in [ipp-mod].

**ISSUE: we need to work out the details on the registration procedure.**

## 13 Internationalization Considerations

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

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

## 14 Security Considerations

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

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

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

The standard security concerns (delivery to the right user, privacy of content, tamper proof content) apply to the notification delivery. IPP should use the security mechanism of the delivery method used. Some delivery mechanisms are more secure than others. Therefore, sensitive notifications should use the delivery 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 NOT return the "~~job-notify~~notify-xxx" attributes in the Unsupported Attributes Group (unless they are unsupported for some other reason), ~~with only the collection value(s) that represent the excess subscriptions that are being ignored~~, and MUST perform the Job Creation operation (see section 9.1.1), 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~~notify-recipient-uri" 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~~notify-xxx" operation attribute, MUST return the "~~notify-recipient~~notify-recipient-uri" attribute in the Unsupported Attributes Group, and perform the Job Creation operation (see section 9.1.1), 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~~notify-xxx" operation attribute and perform the Job Creation operation (see section 9.1.1), 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-notify-max~~-events-supported" attribute (see section 6.4).

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~~notify-xxx" operation attribute, MUST return the "notify-events" attribute in the Unsupported Attributes Group with only the excess events that are being ignored, and perform the Job Creation operation (see section 9.1.1), since the job can still be printed.

## 16 Encodings of Additional Attribute Tags encodings

The Subscription attributes tag and the Event Notification attributes tag are assigned the following delimiter tag values as extensions to the encoding defined in [ipp-pro]) for use in requests and responses to delimit Subscription object attribute Groups and Event Notification Content attribute Groups:

Tag Value (Hex)	Delimiter
0x06	subscription-attributes-tag
0x07	<del>event</del> -notification-attributes-tag

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## 2137 A. Appendix - Summary of Notification Attribute Usage

2138 This appendix summarizes the usage of Notification attributes in the Job operation attributes [collection](#), Job  
2139 object, Subscription object, Event Notification content, Job operations, and Subscriptions operations. The  
2140 legend for the notation used in the tables is given following each table.

	Objects		Event Notification content		Job operations		Subscription operations		
Attributes	Job	Subscription	Job Event Notification Content	Printer Event Notification Content	Job Creation Validate -Job	Create-Job-Subscription	Create-Printer-Subscription	Renew - Subscription	Cancel - Subscription

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

Attributes	Objects		Event Notification content		Job operations		Subscription operations		
	Job	Subscription	Job Event Notification Content	Printer Event Notification Content	Job Creation Validate -Job	Create-Job-Subscription	Create-Printer-Subscription	Renew - Subscription	Cancel - Subscription
<u>id</u> (integer (0:MAX))									
19. <del>subscription-id</del> <u>notify-subscription-id</u> (integer(1:MAX))		R	R	R			Return	R	R

- 2141 Legend: "R" - REQUIRED for Printer to support; "O" - OPTIONAL for Printer to support; "[ ]" - OPTIONAL for sender to send;
- 2142 Return - Printer MUST return; \* the client MUST supply for some delivery methods; \*\* - MUST be 0 for Per-Job Subscription
- 2143 objects; (n) means the value comes from the indicated Subscription Attribute

2144

Attributes	Objects		Event Notification		Job operations		Subscription operations		
	Job	Subscription	Job Event Notification	Printer Event Notification	Job Creation Validate -Job	Create -Job-Subscription	Create-Printer-Subscription	Renew - Subscription	Cancel - Subscription
<del>22.20.</del> printer-uri (uri)		R	R	R	R	R	R	R	R
<del>23.21.</del> printer-name (name(127))			<del>R</del> Human	<del>R</del> Human					
<del>24.22.</del> job-id (integer(1:MAX))	R		R	Per-Jb		R			
<del>25.23.</del> job-name (name(MAX)) [SNMP can truncate]	R		<del>R</del> Human	<del>Per-Jb</del> Human					
<del>26.24.</del> requesting-user-name (name(MAX))	R								
<del>27.25.</del> subscriber-user-name (name(MAX))		R	<del>R</del>	<del>R</del>					
<del>28.26.</del> job-state (type1 enum)	R		R	<del>Per Jb</del>					
<del>29.27.</del> job-state-reasons (1setOf type2 keyword)	R		R	<del>Per Jb</del>					
<del>30.28.</del> notify-server-up-time (integer(1:MAX))		R				Return	Return		
<del>34.29.</del> job-impressions-completed (integer(0:MAX))	O		<del>[pg/cp]</del> R						

2145 Legend: "R" - REQUIRED for Printer to support; "O" - OPTIONAL for Printer to support; "[ ]" - OPTIONAL for sender to send;  
2146 "[pg/cp]" - REQUIRED in a 'job-progress' or 'job-completed' notification if the corresponding Job attributes are supported ; (nn) - an  
2147 alternate source of the data in an Event Notification.



2148

Attributes	Objects		Event Notification		Job operations		Subscription operations		
		Printer object	Job Event Notification	Printer Event Notification	Job Creation, Validate -Job	Create -Job-Subscription	Create-Printer-Subscription	Renew - Subscription	Cancel - Subscription
<a href="#">41.30.</a> printer-state (type1 enum)		R		R					
<a href="#">42.31.</a> printer-state-reasons (1setOf type2 keyword)		R		R					
<a href="#">43.32.</a> printer-is-accepting-jobs (boolean)		R		R					
<a href="#">44.33.</a> notify-schemes-supported (1setOf uriScheme)		R							
<a href="#">45.34.</a> notify-events-default (1setOf type2 keyword)		R							
<a href="#">46.35.</a> notify-events-supported (1setOf type2 keyword)		R							
<a href="#">47.36.</a> <del>max-notify-max</del> -events-supported (integer(5:MAX))		R							
37. <a href="#">notify-text-format-supported</a> (1setOf <a href="#">mimeMediaType</a> )		<u>O</u>							
<a href="#">48.38.</a> notify- <del>additional</del> -formats-supported (1setOf <a href="#">mimeMediaType</a> )		<u>CR</u> <u>O</u>							
<a href="#">49.39.</a> <del>max-notify-max</del> -job-subscriptions-supported (integer(1:MAX))		<u>CR</u>							
<a href="#">50.40.</a> <del>max-notify-max</del> -printer-subscriptions-supported (integer(0:MAX))		R							
<a href="#">51.41.</a> notify-lease-time-supported (rangeOfInteger(0:MAX))		R							
<a href="#">52.42.</a> notify-lease-time-default (integer(0:MAX))		R							
<a href="#">53.43.</a> persistent-jobs-supported (boolean)		O							
<a href="#">54.44.</a> persistent-subscriptions-supported (boolean)		O							
<a href="#">55.45.</a> printer-state-change-time (integer(1:MAX))		O							

	Objects		Event Notification		Job operations		Subscription operations		
		Printer object	Job Event Notification	Printer Event Notification	Job Creation, Validate-Job	Create- -Job- Subscription	Create- Printer- Subscription	Renew- - Subscription	Cancel- - Subscription
Attributes									
<a href="#">56.46</a> .printer-state-change-date-time (dateTime)		O							

2149 Legend: "R" - REQUIRED for Printer to support; "O" - OPTIONAL for Printer to support; "[ ]" - OPTIONAL for sender to send;

2150 "CR" - CONDITIONALLY REQUIRED, i.e., REQUIRED if Human Consumable format supported;

## 2151 **B. Appendix: Change History**

2152 This section summarizes the changes to the document. Each sub-section is in reverse chronological order.  
2153 Adding or removing ISSUES that don't change the document are not listed here.

### 2154 **18.1 Changes to the March 6, 2000 version to create the March 8, 2000 version**

2155 The following changes were made to the March 6, 2000 version to create the March 8, 2000 version based  
2156 on the agreements reached on the mailing list:

- 2157 1. Changed the name of the SNMP delivery method from 'snmp' to 'snmpnotify', since the Notification  
2158 Recipient isn't an SNMP agent.
- 2159 2. Clarified that an implementation with only a single value for persistent-jobs-supported (boolean) or  
2160 persistent-subscriptions-supported (boolean) MAY make it settable to the single value or make it not-  
2161 settable.

### 2162 **18.2 Changes to the February 2, 2000 version to create the March 6, 2000 version**

2163 The following changes were made to the February 2, 2000 version to create the March 6, 2000 version  
2164 based on the agreements reached on the mailing list, at the February IPP WG meetings, and reflected in the  
2165 minutes:

- 2166 1. Clarified that this extension is intended as an extension to IPP/1.0, IPP/1.1, and future versions.
- 2167 2. Allocated the operation-id 0x0016 to 0x001B values for the Notification operations defined in the  
2168 document.
- 2169 3. Pre-pended the word "subscription-" on the front of the "request-id" Subscription object attribute to  
2170 distinguish it from the "request-id" parameter that is sent in every request and response.
- 2171 4. Added the term "settable" for describing attributes that are not READ-ONLY.
- 2172 5. Added the term "Subscription Creation operation" to stand for any operation that can create a  
2173 Subscription object: Job Creation operations (Create-Job, Print-Job, and Print-URI), Create-Job-  
2174 Subscription, and Create-Printer-Subscription.
- 2175 6. Changed the "subscriber-user-name" (name(MAX)) Subscription object attribute from OPTIONAL to  
2176 REQUIRED.
- 2177 7. Changed the name and semantics of "notify-printer-up-time(integer(1:MAX)) to notify-server-up-time  
2178 so that it can be either the Printer's uptime or a Notification Delivery Service uptime.
- 2179 8. Added the 'ipp:', 'indp:', 'mailto:', and 'snmp:' notification delivery schemes to the definition of the  
2180 "notify-recipients" to indicate possible schemes.

- 2181 9. Changed the name and semantics of "notify-text-format" (mimeMediaType) to "notify-format" so that it  
2182 can be used to specify either Human Consumable or Machine Consumable formats where the  
2183 implementation supports both. Clarified that this attribute controls whatever variable Notification  
2184 Content that the implementation supports, which may be an attachment to the fixed content format or  
2185 the contents of the "human-readable-report" (text(MAX)) attribute. Clarified that an implementation  
2186 NEED NOT support all of its supported Notification Content formats with all of its supported delivery  
2187 methods.
- 2188 10. Added 'text/xml', 'application/ipp', 'application/postscript', and 'image/tiff' and additional example  
2189 MIME media types for "notify-format" (mimeMediaType).
- 2190 11. Clarified that the recommend way for a client to determine whether or not a Printer supports Per-Job  
2191 Subscriptions is to query the Printer's "~~max-notify-max-job-subscriptions-supported~~" attribute, since  
2192 Create-Job-Subscriptions is an OPTIONAL operation.
- 2193 12. Clarified that the recommend way for a client to determine whether or not a Printer supports Per-Printer  
2194 Subscriptions is to query the Printer's "operations-supported" attribute to see if the Create-Printer-  
2195 Subscriptions operations is supported, since this is the usual way to determine a Printer's capabilities.
- 2196 13. Clarified that if "persistent-jobs-supported" (boolean) and "persistent-subscriptions-supported"  
2197 (boolean) are settable, then setting them must affect whether or not jobs and subscriptions are persistent.
- 2198 14. Allowed delivery methods to send operations with or without a response, depending on the definition of  
2199 the delivery method.
- 2200 15. Indicated that a deliver method definition is free to REQUIRE that the client supply the "~~subscriber-~~  
2201 ~~user-data~~notify-user-data" attribute.
- 2202 16. Required that the Printer support the "job-uri" operation attribute as a target, in addition to "printer-  
2203 uri"&"job-id", i.e., keep consistent with all Job operations.
- 2204 17. Changed the 'none' out-of-band value to be a reference to the collection document [ipp-coll], since the  
2205 use for it in this document is with the 'collection' attribute syntax.
- 2206 18. Clarified that a conforming implementation MUST support the 'collection' attribute syntax, since that is  
2207 required in Job Creation operations.
- 2208 19. Allocated the values to the new status codes defined in this document.
- 2209 20. Allocated the [ipp-pro] subscription-attributes-tag and notification-attributes-tag delimiter tags to  
2210 delimit Subscription attributes and Notification Content attributes in requests and responses.
- 2211 21. Changed the 'server-error-too-many-subscriptions' and 'server-error-too-many-events' to be client errors,  
2212 i.e., 'client-error-too-many-subscriptions' and 'client-error-too-many-events', since other errors of this  
2213 type are client errors.

2214

**2215 18.3 Changes to the October 14, 1999 version to create the February 2, 2000 version**

2216 The following changes were made to the October 14, 1999 version to create the February 2, 2000 version  
2217 based on the agreements reached at the October and December IPP WG meetings and reflected in the  
2218 minutes:

- 2219 1. Added a Java Listener as an example of a Notification Recipient.
- 2220 2. Clarified the object relationships in section 4.1.
- 2221 3. Clarified how job events differ for Per-Job versus Per-Printer Subscriptions.
- 2222 4. Added the ability for the Machine Consumable form to contain a Human Readable "human-readable-  
2223 report" (text) attribute so that both forms could be sent in the same Notification.
- 2224 5. Clarified that the 'none' value for notify-text-format (mimeType) has to be out-of-band, not the  
2225 text string 'none' as a mimeType.
- 2226 6. Clarified that 'none' means send the Machine Consumable form without the "human-readable-report"  
2227 (text) attribute, if it is defined.
- 2228 7. Clarified that Notification Recipients MUST be able to accept unrecognized attributes.
- 2229 8. Allowed the notification delivery method definition to be modeled as (1) a request with an operation  
2230 code without a response, (2) a request with a operation code with a response or (3) a response with a  
2231 status code.
- 2232 9. Added "notify-text-format" (mimeType) and "human-readable-report" (text(MAX)) to be able to  
2233 be sent in a Notification content, if the notification delivery method document permits it.
- 2234 10. Added "job-k-octets" (integer(0:MAX)), "job-impressions" (integer(0:MAX)), and "job-media-sheets"  
2235 (integer(0:MAX)) as OPTIONAL for Notification content for use in job-progress events to show the  
2236 target values so that the Notification Recipient can show a thermometer.
- 2237 11. Added a Subscription Attributes group (and subscription-attributes tag) the Create-Job-Subscription and  
2238 Create-Printer-Subscription requests and responses.
- 2239 12. Added the 'none' out-of-band value for use with "notify-text-format" (mimeType) attribute.
- 2240 13. Changed the job progress attributes from using -2 to mean 'unknown' as in the PWG Job Monitoring  
2241 MIB, to use the 'unknown' out-of-band value.

**18.4 Changes to the February 2, 2000 version to create the May 10, 2000 version**

The following changes were made to the February 2, 2000 version to create the May 10, 2000 version based on the agreements reached at the April IPP WG meetings and subsequent teleconferences:

1. Change "notify-format" to "notify-text-format" and made it apply only to the format of the "notify-text" (formerly called "human-readable-report") and Human Consumable form. A new attribute "notify-additional-formats" specifies the formats for the Machine Consumable contents of delivery methods that support multiple formats.
2. Change the "job-notify" collection attribute in Job Creation operations to be multiple "notify-xxx" attributes. This change eliminates the need for collection values. It also means that a Job Creation operation can create only one Subscription object.
3. Change the Machine Consumable form to be transport independent.
4. Reduce the set of REQUIRED attributes in the Machine Consumable form and add the OPTIONAL "notify-requested-attributes" attribute that allows a client to request additional attributes.
5. Specify the information that SHOULD be in the Human Consumable form

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**C. Appendix: Full Copyright Statement**

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