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

Status of this Memo

Abstract

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

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

A simple method is provided for subscribing to printing related events:
-    Two new subscription attributes are supplied by the client as part of an IPP create request (Print-Job, Print-URI, Create-Job, Validate-Job)

An event is some occurrence (either expected or unexpected) within the printing system. Events can be classified using two dimensions:
-    Either as Job Events or Device Events, and
-    Either as Errors, Warnings, or Reports

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

42

43 The full set of IPP documents includes:

44   Design Goals for an Internet Printing Protocol [IPP-REQ]
45   Rationale for the Structure and Model and Protocol for the Internet Printing Protocol [IPP-RAT]
46   Internet Printing Protocol/1.0: Model and Semantics (this document)
47   Internet Printing Protocol/1.0: Encoding and Transport [IPP-PRO]
48   Internet Printing Protocol/1.0: Implementer's Guide [IPP-IIG]
49   Mapping between LPD and IPP Protocols [IPP LPD]

50

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

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

59 The "Internet Printing Protocol/1.0: Model and Semantics", describes a simplified model with abstract
60 objects, their attributes, and their operations that are independent of encoding and transport. It introduces
61 a Printer and a Job object. The Job object optionally supports multiple documents per Job. It also
62 addresses security, internationalization, and directory issues.

63 The "Internet Printing Protocol/1.0: Encoding and Transport" document is a formal mapping of the
64 abstract operations and attributes defined in the model document onto HTTP/1.1. It defines the
65 encoding rules for a new Internet media type called "application/ipp".

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

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

73
74 **Table of Contents**

98

1   Summary of the Event Notification specification

Implementations conforming to this notification specification MUST support the following new
REQUIRED attributes and MAY support the following new OPTIONAL attributes:

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

    attribute name   **Syntax**
    --------------   ------
    "notify-recipients"   1setOf uri
    "notify-event-groups"   1setOf type2 keyword

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

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

    A subscription does *not* include:
      - complicated lists and sets of names of individual events that are of interest to the subscriber
      - arbitrary lists of additional attributes to be returned in the event report
      - specification of which format to use in the event report

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

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

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

5. OPTIONAL Job Description attributes: "job-trigger-date-time" and "job-trigger-message".

6. REQUIRED Printer Description attributes: "device-trigger-events" and "device-trigger-time" that
    store the current/last event and its time in seconds since the device was started

7. OPTIONAL Printer Description attributes: "device-trigger-date-time" and "device-trigger-message".

As events occur, for each event the Printer searches the set of subscriptions for any interest in that event.
As the Printer finds that some notification recipient is interested in that event (the notification recipient

138   is subscribed to the group of events to which the event belongs), an event report is generated and
139   delivered using the methods and target addresses identified in the subscription.

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

143

2   Terminology

145

146   Capitalized terms, such as MUST, MUST NOT, REQUIRED, SHOULD, SHOULD NOT, MAY,
147   NEED NOT, and OPTIONAL, have special meaning relating to conformance. These terms are
148   defined in [ipp-mod section 13.1 on conformance terminology, most of which is taken from RFC
149   2119 [RFC2119].
150   **Job Submitting End User -** A human end user who submits a print job to an IPP Printer.
151   **IPP Client -** The software component on the client system which implements the IPP protocol.
152   **Job Recipient -** A human who is the ultimate consumer of the print job. In many cases this will be
153   the same person as the Job Submitting End User, but need not be.
154   **Job Recipient Proxy -** A human acting on behalf of the Job Recipient. In particular, the Job
155   Recipient Proxy physically picks up the printed document from the Device, if the Job Recipient
156   cannot perform that function.
157   **Subscription -** The set of attributes that indicate the "what, where, who, and how" for notification.
158   Events Reports are generated for certain events (what) and delivered using various delivery
159   methods (how) to certain addresses (where and who).
160   **Notification Recipient -** Any entity identified as a recipient within a subscription.   Some
161   notification recipients are Job Submitting End Users and others are interested third parties, such
162   as the Job Recipient or Job Recipient Proxy.
163   **Notification Recipient Agent -** A program which receives event reports on behalf of the
164   notification recipient.
165   **Event -** An event is some occurrence (either expected or unexpected) within the printing system.
166   Events can be classified using two dimensions:
167   - Either as Job Events or Device Events, and
168   - Either as Errors, Warnings, or Reports
169
170   A Job event is some interesting state change in the Job object, and a Device event is some
171   interesting change in the Printer object.
172
173   A report event is purely informational, such as 'job-completed' or 'accepting-jobs'. A warning is
174   not serious and processing continues. An error is serious and either the job is aborted or the
175   device stops.
176
177   An event occurs for a job or device whether any entity is registered to be notified for that event
178   or not.
179

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

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

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

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

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

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

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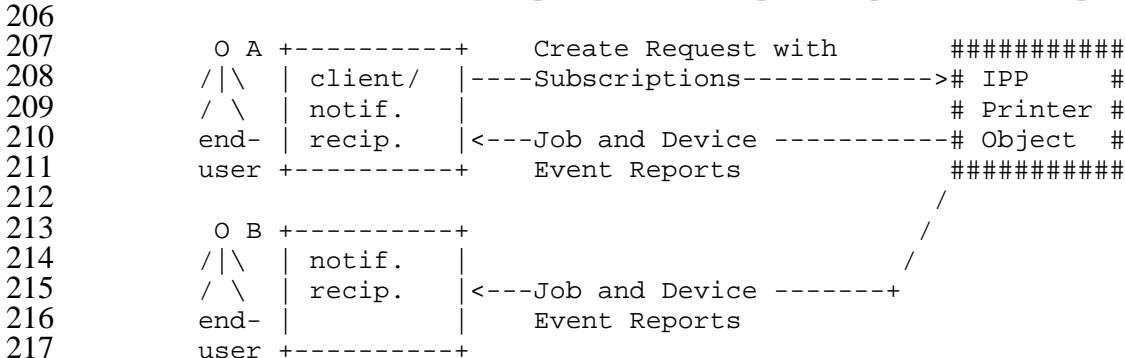197   machine consumable information.

198 **3   Model for Job and Device Event Notification**

199 Figure 1 shows the model.
200
201
202 Legend:
203
204   A = Client and Notification Recipient
205   B = Notification Recipient (subscription by some third party)
206
207   O A +----------+   Create Request with   ###########
208   /|\ | client/ |----Subscriptions------------># IPP   #
209   / \ | notif. | # Printer #
210   end- | recip. |<---Job and Device -----------# Object #
211   user +----------+   Event Reports   ###########
212   /
213   O B +----------+   /
214   /|\ | notif. | /
215   / \ | recip. |<---Job and Device -------+
216   end- | | Event Reports
217   user +----------+
218
219
220   **Figure 1 - Model for Job and Device Notification**

221 Note: This model does not mandate that the IPP Printer object implement the full semantics of
222 subscription, report generation, and multiple delivery methods. A simple (embedded) implementation
223 may be configured to use some notification service. Figure 2 shows this partitioning.
224
225
226
227   Create Request with   ###########
228   ----Subscriptions------------------># IPP   #
229   # Printer #
230   # Object #
231   ###########
232 |
233   *******|**********
234   *   Subscriptions   *
235   *   & Events   *
236   * |
237   *   +----v---------+
238   * | notification |
239   <---Job and Device -------*---------| service |
240   Event Reports   *   +--------------+
241   *
242   *
243
244   *** = Implementation configuration opaque boundary
245
246
247   **Figure 2 - Opaque Use of a Notification Service**
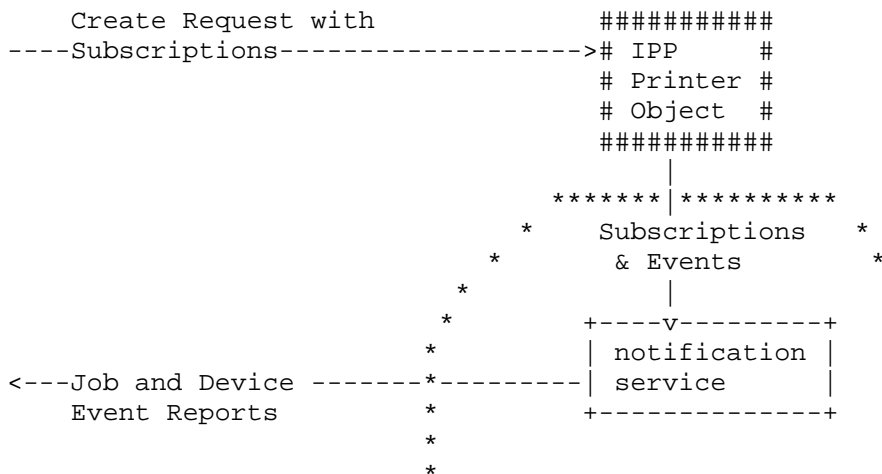
248 **4   New subscription Operation attributes**

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

254 The following rules apply:

255 1. Any subscription can contain job event groups, device event groups, or both.

256 2. The Job Submission Subscription is only valid while the job is "active". The job is "active" while it
257   is in the 'pending', 'processing', and 'processing-stopped' states. The job ceases to be active when it
258   enters the 'pending-held' state or until the time it is done processing and enters any of the
259   'completed', 'canceled', or 'aborted' states. The job becomes active again when it is released from the
260   'pending-held' state or is restarted using the Restart-Job operation (see [ipp-ops-set1]). Since no job
261   is created for the Validate-Job operation, the only purpose of supplying the subscription operation
262   attributes in the Validate-Job operation is to validate that the values are supported; the Printer object
263   does not establish a notification subscription as a result of the Validate-Job operation.

264 3. Since a Job Submission Subscription is included within a job submission operation, any interest in
265   job events is limited to "this job" only (the Job object created because of this job creation operation).
266   There is no mechanism to subscribe to events for all jobs or specifically some job other than this job
267   in a create operation. But see [ipp-sub] for such a mechanism to subscribe persistently for job and
268   printer events independently of any particular job submission.

269 *4.1   Two subscription operation attributes*

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

273 **4.1.1 notify-recipients (1setOf uri)**

274 The client supplies this operation attribute in a create request in order to subscribe for job events while
275 this job is active. In order to claim conformance to this notification specification, the Printer object
276 MUST support this attribute. This attribute describes both where (the address) and how (the delivery
277 method) event reports are to be delivered when any of the events specified in the "notify-events"
278 attribute occur. If the client does not supply this attribute in a create request, the Printer object MUST
279 not provide any job-based notification for this job.

280 Some notification delivery methods imply a fixed event group, and so ignore the supplied values of
281 "notify-event-groups". These delivery methods may be used with other delivery methods that do not
282 have such restrictions. Unless specified otherwise, a delivery method may be used with any event
283 group.

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

286 Standard uriScheme values are:

287   **'mailto':** a message is sent via email to the specified email address. The "text/plain" event report
288   content format is used for this method (see Section 5). This delivery method ignores the
289   supplied values of the "notify-event-groups" attribute and implies the 'job-completions-basic'
290   event group ('job-completed', 'job-aborted', 'job-canceled' events). The notification recipient
291   does not acknowledge receipt of the mail message.
292   **'ipp-tcp-notify':** an IPP notification report is sent via a TCP/IP socket that is opened by the Printer
293   object on the IP address specified in the URI using the specified port using the "host:port" HTTP
294   convention. For example:
295   ipp-tcp-notify://foo.com:6000
296   If the port is omitted, the default port is TBD (see Appendix C: Registration of ipp-tcp-notify
297   scheme for use with IPP). The "application/ipp" event report content format is used for this
298   method (see Section 54.1.2).
299   The event recipient does not respond or acknowledge the event report.
300   **'snmpv1-notify':** a notification report is sent as an SNMPv1 trap to the host specified as the address
301   in the URI. The notification recipient does not acknowledge receipt of the notification event
302   report (trap).
303   **'snmpv2-notify':** a notification report is sent as an SNMPv2 inform to the host specified as the
304   address in the URI. The notification recipient does acknowledge receipt of the notification event
305   report (inform).
306   **'snmpv3-notify':** a notification report is sent as an SNMPv3 inform to the host specified as the
307   address in the URI. The notification recipient does acknowledge receipt of the notification event
308   report (inform).
309   **'ipp-udp-notify':** an IPP notification report is sent via a UDP datagram that is opened by the Printer
310   object on the IP address specified in the URI using the specified port using the "host:port" HTTP
311   convention. For example:
312   ipp-udp-notify://bar.com:6000
313   If the port is omitted, the default port is TBD (see Appendix D: Registration of ipp-udp-notify
314   scheme for use with IPP). The UDP datagram contains the "application/ipp" event report content
315   format (see Section 54.1.2). The notification recipient does not acknowledge receipt of the
316   notification event report.
317   **'ndps-notify':** an IPP notification report is sent via NDPS notification mechanism. See ???.
318   ISSUE 1 - Need reference to NDPS documentation. Also need more description here, such as
319   which end opens, does the recipient acknowledge, and any salient information about the
320   transport.
321   **'sense-notify':** a notification report is sent as a SENSE UDP datagram [sense] that is opened by the
322   Printer object or notification service on the IP address specified in the URI using the specified
323   port using the "host:port" HTTP convention. The notification recipient does acknowledge
324   receipt of the notification event report.
325
326   ISSUE 2 - Which URL parameters should we mention (which like SLP) are removed before being used?
327

328   4.1.2 notify-event-groups (1setOf type2 keyword)

329   The client OPTIONALLY supplies this operation attribute in a create request. In order to claim
330   conformance to this notification specification, the Printer object MUST support this attribute. This
331   attribute identifies the event groups for which a notification event report is desired. If the client does not

332 supply this attribute in a create request, but does supply the "notify-recipients", the Printer object
333 assumes the 'job-completions-basic' event group value.

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

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

338 Standard event group keyword values are:
339   Special event groups:
340   **'none':** no notifications of any events (an IPP object can use this value to indicate that it is
341   configured not to support event notification; a client would not subscribe to this group).
342
343   Job Event Groups (See section 6.1 for a description of each job event):
344   **'job-state-changes-basic':** includes 'job-received', 'job-held', 'job-released', 'job-started-
345   processing', 'job-stopped', 'job-continued'
346   **'job-completions-basic':** includes 'job-completed', 'job-aborted', 'job-canceled'
347   **'job-warnings-basic':** includes 'job-warning' which are any implementation-specific job
348   warning events
349   **'job-errors-basic':** includes 'job-aborted' and any implementation-specific job errors
350
351   Note: The 'job-aborted' event appears in both the 'job-completions-basic' and 'job-errors-
352   basic' event groups, since it is both a completion and an error.
353
354 ISSUE 3 - which event groups are REQUIRED besides 'job-completion'?
355
356   Device Event Groups (See section 7.1 for a description of each job event):
357   **'device-reports-basic':** includes 'started-processing', 'became-idle', 'device-state-reason-
358   removed', 'accepting-jobs', and 'powered-up'
359   **'device-warnings-basic':** includes 'device-state-reason-warning-added' and - 'not-accepting-
360   jobs'
361   **'device-errors-basic':** includes 'device-stopped', 'device-state-reason-error-added', and
362   'powering-down'
363
364 ISSUE 4 - which device event groups are REQUIRED, if any?
365 ISSUE 5 - This simplified proposal no longer includes returning the Printer MIB alert codes, but relies
366 on "device-trigger-event' and IPP/1.0 [ipp-mod] "printer-state-reasons" keywords, which contain most of
367 the Printer MIB alert codes, except for the generic ones. Ok?

5   Event Report Content

369 Event reports are generated using the following content formats:
370   'application/ipp' - machine consumable event report content using the 'application/ipp' MIME media
371   type [ipp-mod] using the Get-Job-Attributes response encoding for job events and Get-Printer-
372   Attributes for device events. The attributes listed in section 5.1 are sent in a notification report
373   for job events. The attributes listed in section 5.2 are sent in a notification report for device

374 events. For any string in any event report, the charset and natural language rules that apply to all
375 IPP operations apply to the event report strings as well, since they are represented as operation
376 responses. The event content is filled in as follows:
377 Response Parameters:
378 "version-number" - the same version number as returned in the create response.
379 "status-code" parameter - the status code: "job-event" - 0x600 for job events, and
380 "device-event" - 0x601 for device events.
381 "request-id" - 0, since there is no request to which this "response" is associated.
382 Operation attributes:
383 "attributes-charset" and "attributes-natural-language" Operation attributes - the same
384 charset and natural language as the response to the original create request.
385 "status-message" - is not sent as an Operation attribute (the "job-trigger-message" and
386 "device-trigger-message" are sent in the Job Object Attributes and the Printer Object
387 Attributes groups, respectively.
388 Unsupported Attributes Group:
389 Is not sent.
390 Job Object Attributes Group and Printer Object Attributes Group:
391 See section 5.1 and 5.2, respectively.
392
393 **'text/plain'** - human consumable event report content type. The text message SHOULD include
394 information about the attributes in section 5.1 for job events or in section 5.2 for device events.
395 If the charset to be used in the mail message is other than US-ASCII, the /charset parameter must
396 be included in the value of this content-type header and in the event report content [RFC2046].
397 The notification delivery method dictates the event report content type to be used. For example, 'mailto'
398 uses "text/plain" and 'ipp-tcp-notify' uses "application/ipp".

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

5.1 Basic Job event report content

402 This section lists the attributes that are included in any event report content for each job event group.
403 Additional job event groups can be registered which include additional attributes. However, all job
404 event groups MUST include the following REQUIRED "basic" job object attributes and MAY include
405 the following OPTIONAL "basic" job object attributes in any job event report. All job event reports
406 MUST use the Get-Job-Attributes response syntax. The following "basic" job object attributes are sent
407 in the job event report as Job Attributes in any order:

```
408   +----------------------------------+----------+-----------------+
409   | Job object attribute             | REQUIRED?| reference       |
410   +----------------------------------+----------+-----------------+
411   | job-printer-uri (uri)            | REQUIRED | [ipp-mod] 4.3.3 |
412   +----------------------------------+----------+-----------------+
413   | job-id (integer(1:MAX))          | REQUIRED | [ipp-mod] 4.3.2 |
414   +----------------------------------+----------+-----------------+
415   | job-trigger-events               | REQUIRED | 6.1             |
416   |     (1setOf type2 keyword)       |          |                 |
417   +----------------------------------+----------+-----------------+
418   | job-trigger-message (text(255))  | OPTIONAL | 6.4             |
419   +----------------------------------+----------+-----------------+
420   | job-trigger-time (integer(1:MAX))| REQUIRED | 6.5             |
421   +----------------------------------+----------+-----------------+
422   | job-trigger-date-time (dateTime) | OPTIONAL | 6.6             |
423   +----------------------------------+----------+-----------------+
424   | job-state (type1 enum)           | REQUIRED | [ipp-mod] 4.3.7 |
425   +----------------------------------+----------+-----------------+
426   | job-state-reasons                | OPTIONAL | [ipp-mod] 4.3.8 |
427   |     (1setOf type2 keyword)       |          |                 |
428   +----------------------------------+----------+-----------------+
429   | job-impressions-completed        | OPTIONAL | [ipp-mod] 4.3.21|
430   |     (integer(0:MAX))             |          |                 |
431   +----------------------------------+----------+-----------------+
432
```

433   If "status-message" is supported as an Operation attribute in operation responses, then "job-trigger-
434   message" MUST be supported in the event report content. If "job-impressions-completed" is supported
435   as a Job Description attribute, then it MUST be supported in event report content.

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

5.2   *Basic device event report content*

440   This section lists the attributes that are included in any event report content for each device event group.
441   Additional device event groups can be registered which include additional attributes. However, all
442   device event groups MUST include the following REQUIRED "basic" attributes and MAY include the
443   following OPTIONAL "basic" job object attributes in any device event report.   All device event reports
444   MUST use the Get-Printer-Attributes response syntax. The following "basic" Printer object attributes
445   are sent in the device event report as Printer Attributes in any order:

```
446  +-----------------------------------+----------+-------------------+
447  | Printer object attribute          | REQUIRED?| reference         |
448  +-----------------------------------+----------+-------------------+
449  | printer-uri-supported (uri)       | REQUIRED | [ipp-mod] 4.4.1   |
450  +-----------------------------------+----------+-------------------+
451  | device-trigger-events             | REQUIRED | 7.1               |
452  |     (1setOf type2 keyword)        |          |                   |
453  +-----------------------------------+----------+-------------------+
454  | device-trigger-message (text(255))| OPTIONAL | 7.2               |
455  +-----------------------------------+----------+-------------------+
456  | device-trigger-time               | REQUIRED | 7.3               |
457  |       (integer(1:MAX))            |          |                   |
458  +-----------------------------------+----------+-------------------+
459  | device-trigger-date-time (dateTime)| OPTIONAL| 7.4               |
460  +-----------------------------------+----------+-------------------+
461  | printer-state (type1 enum)        | REQUIRED | [ipp-mod] 4.4.10  |
462  +-----------------------------------+----------+-------------------+
463  | printer-state-reasons             | OPTIONAL | [ipp-mod] 4.4.11  |
464  |     (1setOf type2 keyword)        |          |                   |
465  | printer-is-accepting-jobs (boolean)| REQUIRED| [ipp-mod] 4.4.20  |
466  +-----------------------------------+----------+-------------------+
```

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

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

472 # 6   Job Description Attributes

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

474 ### 6.1   notify-recipients (1setOf uri)

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

480 ### 6.2   notify-event-groups (1setOf type2 keyword)

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

487   ### 6.3   *job-trigger-events (type2 keyword)*

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

495   The standard keyword values are:

496   'job-received': when the Printer object accepts the create operation (i.e., when the job is created no
497   matter whether in the 'pending' or 'pending-held' states).
498   'job-held': when the job enters the 'pending-held' state using some protocol operation, such as Hold-
499   Job (see [ipp-ops-set1]), or the system or device holds the job because of some requirement that
500   cannot be met and other jobs could be processed, if there are any.
501   'job-released': when the job leaves the 'pending-held' state and enters the 'pending' or 'processing'
502   states due to the user, operator, or system releasing the held job using some protocol operation,
503   such as Release-Job (see [ipp-ops-set1]), or some internal or local operation.
504   'job-started-processing': the Printer starts processing the Job (i.e., when the job leaves the 'pending'
505   or other state and enters the 'processing' state).
506   'job-stopped': The Printer stopped processing the job and the job entered the 'processing-stopped'
507   state.
508   'job-continued': The Printer continues processing the job, i.e., the job leaves the 'processing-stopped'
509   state and re-enters the 'processing' state.
510   'job-warning': when the job encounters a condition which does not abort the job and does not require
511   human intervention, such as the interpreter encountering a request for a missing font, but for
512   which it is able to perform font substitution. A device warning, such as 'toner-low', is a 'device-
513   warning', NOT a 'job-warning'.
514   'job-completed': when the job completes processing (with or without errors or warnings) and enters
515   the 'completed' state.
516   'job-aborted': when the job was aborted by the system while in the 'processing' or 'processing-
517   stopped' state, due to some encountered problem that cannot be remedied by human intervention.
518   'job-canceled': when the job was canceled by the user or operator using the Cancel-Job operation
519   while the job was in any state.
520
521   ISSUE 7 - which events are REQUIRED besides 'job-completed'?

522   ### 6.4   *job-trigger-message (text(255))*

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

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

528   If the Printer object supports the "job-trigger-message" Job Description attribute, the Printer object
529   MUST be able to generate this message in any of the natural languages identified by the Printer object's

530   "generated-natural-language-supported" attribute (see the "attributes-natural-language" operation
531   attribute specified in [ipp-mod] section 3.1.4.1). As described in [ipp-mod] section 3.1.4.1 for any
532   returned 'text' attribute, if there is a choice for generating this message, the Printer object uses the natural
533   language indicated by the value of the "attributes-natural-language" in the client create request if
534   supported, otherwise the Printer object uses the value in the Printer object's own "natural-language-
535   configured" attribute.

6.5   job-trigger-time (integer(1:MAX))

537   This REQUIRED attribute indicates the point in time at which the most recent job event occurred for
538   this job. In order to populate this attribute, the Printer object uses the value in its "printer-up-time"
539   attribute at the time the event occurred.

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

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

6.6   job-trigger-date-time (dateTime)

549   This OPTIONAL attribute indicates the point in time at which the most recent job event occurred for
550   this job. In order to claim conformance to this notification specification, the Printer object MUST
551   support this Job Description attribute if it also supports the "printer-current-time" Printer Description
552   attribute (which also requires a date). The Printer object MUST supply a copy of this attribute in every
553   event report that it sends to a notification recipient, if it supports this attribute. This attribute is also
554   available to any client using a Get-Job-Attributes or Get-Jobs operation for this job. The first job event
555   for a job is the 'job-received' event when the job is created. Therefore, this job attribute always has a
556   value.

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

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

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

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

570 otherwise the Printer object uses the value in the Printer object's own "natural-language-configured"
571 attribute.

7   Printer Description Attributes

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

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

575 This attribute indicates the most recent device event(s) that occurred for this device. Multiple values
576 MAY be used when more than one event occurs at the same time. In order to claim conformance to this
577 notification specification, the Printer object MUST support this Printer Description attribute. The
578 Printer object supplies a copy of this attribute in every device event report that it sends to a notification
579 recipient. This attribute is also available to any client using a Get-Printer-Attributes request for this
580 Printer object. The first device event for a device is 'powered-up', so this printer attribute always has a
581 value.

582 The standard keyword values are:
583   Device-report events include:
584   **'started-processing'** - when the Printer object enters the 'processing' state.
585   **'became-idle'** - when the Printer object enters the 'idle' state
586   **'device-state-reason-removed'** - when any value is removed from the Printer's "printer-state-
587   reasons" attribute, such as 'toner-low-warning' or 'media-jam'
588   **'accepting-jobs'** - when the Printer starts accepting jobs, i.e., when the value of the Printer
589   object's "printer-is-accepting-jobs" attribute changes to 'true'
590   **'powered-up'** - when the device is powered up.
591
592   From [ipp-mod] section 4.4.11, device reports are indicated as "printer-state-reasons"
593   keywords with a '-report' suffix.   An implementation may choose to omit some or all device-
594   reports. Some device-reports specify finer granularity about the printer state; others serve as a
595   precursor to a warning. A 'device-report' event MUST not indicate anything that affects the
596   printed output.

597   Note: Printer MIB equivalent events that fall in this report group include the
598   alertRemovalOfBinaryChangeEntry(1801) alert that indicates that a binary change event
599   entry row has been removed from the Alert Table and any event with the
600   prtAlertSeverityLevel value set to noInterventionRequired(7).
601
602   Device-warning events include:
603   **'device-state-reason-warning-added'** - when a warning value is added to the Printer's "printer-
604   state-reasons" attribute, such as 'media-low-warning', i.e., any 'xxx-warning' value'
605   **'not-accepting-jobs'** - when the Printer ceases to accept jobs, i.e., when the value of the Printer's
606   "printer-is-accepting-jobs" attribute changes to 'false'
607
608   From [ipp-mod] section 4.4.11, device warnings are indicated as "printer-state-reasons"
609   keywords with a '-warning' suffix.

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

612

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

619

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

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

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

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

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

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

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

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

642   This REQUIRED attribute indicates the point in time at which the most recent printer event occurred for
643   this device. In order to populate this attribute, the Printer object uses the value in its "printer-up-time"
644   attribute at the time the event occurred.

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

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

653 *7.4 device-trigger-date-time (dateTime)*

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

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

664 *7.5 notify-recipients-schemes-supported (1setOf uriScheme)*

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

668 *7.6 notify-event-groups-supported (1setOf type2 keyword)*

669 This attribute describes the event groups supported by this Printer object. In order to claim conformance
670 to this notification specification, the Printer object MUST support this Printer Description attribute.
671 Standard values are defined in Section 4.1.2)

672 8 References

673 [draft-prtmib]
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675 [ipp-mod]
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678 [ipp-ops-set1]
679   Bergman, R., Hastings, T., Herriot R., Moore, P., "Internet Printing Protocol/1.0: Additional
680   Optional Operations - Set 1", <ipp-ops-set1-981023.txt>, work in progress, October 23, 1998.

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683   notification-printer-980701>, work in progress, July 1, 1998.

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

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

690 [RFC2119]
691   S. Bradner, "Key words for use in RFCs to Indicate Requirement Levels", RFC 2119 , March
692   1997

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

696

697

698

699

9   Appendix C: Registration of ipp-tcp-notify scheme for use with IPP

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

705 **TBD**

706

707 **Required parameters:** none

708 **Optional parameters:** none

709 **Encoding considerations:**

710 **Security considerations:**

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

714 **Interoperability considerations:**

715 **TBD**

716

717 **Published specification:**

718 [ipp-not]   Isaacson, S., Martin, J., deBry, R., Hastings, T., "Internet Printing Protocol/1.0: Event
719   Notification" draft-ietf-ipp-notification-00.txt, January, 1999.

Applications which use this URL scheme:

720

721 <mark>TBD</mark>

722 **Person & email address to contact for further information:**

723 Thomas N. Hastings
724 Xerox Corporation
725 737 Hawaii St.
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727

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731 10   Appendix D: Registration of ipp-udp-notify scheme for use with IPP

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

736 <mark>TBD</mark>

737

738 **Required parameters:** none

739 **Optional parameters:** none

740 **Encoding considerations:**

741 **Security considerations:**

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

745 **Interoperability considerations:**

746 <mark>TBD</mark>

747

748 **Published specification:**

749 [ipp-not]   Isaacson, S., Martin, J., deBry, R., Hastings, T., "Internet Printing Protocol/1.0: Event
750   Notification" draft-ietf-ipp-notification-00.txt, January, 1999.

751   **Applications which use this URL scheme:**

752   <mark>TBD</mark>

753   **Person & email address to contact for further information:**

754   Thomas N. Hastings
755   Xerox Corporation
756   737 Hawaii St.
757   El Segundo, CA 90245
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759   Phone: (310) 333-6413

760   Fax: (310) 333-5514

761   Email: hastings@cp10.es.xerox.com

762   **11   Appendix E: Full Copyright Statement**

780   **12   Appendix E: Change History**

781   Changes are listed in reverse chronological order:

782   ***12.1 Changes to the January 18, 1999 to make the January 20, 1999 version***

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

784   1.   Made this an INTERNET-DRAFT.

785   2.   Indicated that a new default port is needed for the delivery methods.

786   3.   Added Appendices in which to put the registration information for the URL schemes for each
787   delivery method.

788   4.   Clarified which parameters, Operation attributes, and Job/Printer attributes are supplied in an event
789   content: the request-id is 0, the status-code is new 'job-event' 0x600 or 'device-event' 0x601.

790   5.   Changed "job-trigger-event" and "device-trigger-event" to be 1setOf so that multiple events that
791   occur at the same time MAY be send as one event content.

792   6.   Added "job-trigger-time" as a REQUIRED Job Description and event content attribute which is in
793   seconds since power up.

794   7.   Changed "job-trigger-date-time" and "job-state-reasons" to OPTIONAL.

795   8.   Changed "status-message" to be an OPTIONAL "job-trigger-message" event content attribute and
796   also made it a Job Description attribute.

797   9.   Added "device-trigger-time" as a REQUIRED Printer Description and event content attribute which
798   is in seconds since power up.

799   10. Changed "device-trigger-date-time" and "printer-state-reasons" to OPTIONAL.

800   11. Changed "status-message" to be an OPTIONAL "device-trigger-message" event content attribute
801   and also made it a Printer Description attribute.

802   12. Removed the "job-id" attribute from the device event content.

803   ***12.2 Changes to the December 10, 1998 to make the January 18, 1999 version***

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

805   1.   Changed the names of the REQUIRED notify-recipient keywords from: 'ipp-tcp-socket' and 'ipp-
806   udp-socket' to 'ipp-tcp-notify' and 'ipp-udp-notify'.

807   2.   Added '-notify' to the OPTIONAL 'snmpv1', 'snmpv2', and 'snmpv3' delivery method names.

808   3.   Changed the OPTIONAL 'sense-datagram' to 'sense-notify' to be consistent.

809   4.   Added 'ndps-notify' as an OPTIONAL keyword.

810   5.   Deleted the 'all-basic', 'all-job-events-basic', and 'all-device-events-basic'. Clients should be explicit
811   about which groups they want. If new groups are added, the clients won't know what to do with
812   them, if they had subscribed to 'all-xxx' groups.

813   6.   Changed the names of "job-last-event" and "job-last-date-time-of-event" to "job-trigger-event" and
814   "job-trigger-date-time" events, since the events trigger the notification delivery, but the attribute
815   values remain after the event has been delivered.

816   7.   Added "status-message" as an OPTIONAL event report content attribute.

817   8.   Changed "job-impressions-completed" to OPTIONAL.

818   9.   Indicated that OPTIONAL attributes are not sent in the event report content if they are not
819   supported.

820 10. Required that "status-message" and/or "job-impressions-completed" be sent in an event report
821   content if they are supported as an Operation attribute and a Job Description attribute, respectively.

822 11. Added REQUIRED "device-trigger-event", REQUIRED "job-id", and OPTIONAL "status-message"
823   to the device event report content.

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

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

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

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

829 1. Clarified the terminology so that an "event" doesn't necessarily mean that a notification report is
830   delivered.

831 2. Removed many of the job and printer attributes for being sent in a notification event report, so that
832   we can get agreement on a basic set of event report content. Only attributes really needs are
833   included, including what may be needed for FAX. Changed the names of the event groups by
834   adding the suffix '-basic' to indicate that these event groups return only basic information.
835   Additional event groups can be registered in order to get more attributes as needed for accounting
836   and more detailed job monitoring purposes.

837 3. Deleted the "job-progress" event group. We can bring it back when we agree to all of the extra
838   attributes. Its not very useful with only the basic attributes.

839 4. The printer events are indicted using the "printer-state-reasons" values, instead of the Printer MIB
840   alert codes. Since most of the Printer MIB alert codes, except for the generic ones, have equivalent
841   IPP keyword reason values, this should be a problem and makes IPP more readably implemented in
842   a server that doesn't have the Printer MIB.

843 5. Added the "job-last-event" job description attribute to give the job event some persistence.

844 6. Changed the job's "time-at-event (integer)" to "job-last-date-time-of-event (dateTime)" to give an
845   absolute date and time, in case events are being relayed back through multiple servers, such as in
846   FAX. Also made it a Job Description attribute to give it persistence.

847 7. Changed the printer's "time-at-event(integer)" to "printer-last-date-time-of-event(dateTime)" to give
848   an absolute date and time, in case events are being relayed back through multiple servers, such as in
849   FAX. Also made it a Printer Description attribute to give it persistence.

850 8. Added the IPP/1.0 "printer-is-accepting-jobs" to the event report, since changes in its value are really
851   device state changes.

852 9. Added the complete semantics for each job event under the "last-job-event" Job Description
853   attribute.