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17 Internet Printing Protocol/1.0 & 1.1: **IPP Event Notification**
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19
20 Status of this Memo

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30 **Abstract**

31 This document describes an extension to the IPP/1.0 & IPP/1.1 model that allows end users to subscribe
32 to printing related events ~~as part of job submission~~. ~~This type of s~~Subscriptions ~~is called a~~include "Job
33 Submission Subscription" and "Explicit Subscriptions".

34 "Job Submission Subscriptions" are specified by the end-user when submitting a job. "Explicit
35 Subscriptions" are created by performing explicit subscription operations on the Printer or an identified
36 Job object.

37 A subscription includes:

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

40 Job Submission Subscriptions: A simple method is provided for subscribing to printing related events
41 when a job is submitted:

- 42 - Two new subscription attributes are supplied by the client as part of an IPP create request (Print-
43 Job, Print-URI, Create-Job, Validate-Job): "notify-recipients (1setOf uri)" and "notify-events
44 (1setOf type2 keyword)".

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

- 47 - Either as Job Events or DevicePrinter Events, and
- 48 - Either as Errors, Warnings, or Reports

49
50 "Explicit Subscriptions": Three new Printer operations are specified: Subscribe-Job, Subscribe-Printer,
51 Renew-Subscription, and Unsubscribe. The semantics of the two subscription Operation attributes
52 ("notify-events" and "notify-recipients") used in create operations is preserved. These two subscription
53 attributes are supplied by the client as operation attributes in this new Subscribe operation, along with a
54 new "notify-lease-time" operation attribute.

55 A client can remove a subscription explicitly using the Unsubscribe operation or can let the lease time
56 expire. A client can extend the lease time for a subscription using the Renew-Subscription operation.
57

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

60
61 The full set of IPP documents includes:

- 62 Design Goals for an Internet Printing Protocol [IPP-REQ]
- 63 Rationale for the Structure and Model and Protocol for the Internet Printing Protocol [IPP-RAT]
- 64 Internet Printing Protocol/1.1: Model and Semantics [IPP-MOD]
- 65 Internet Printing Protocol/1.1: Encoding and Transport [IPP-PRO]
- 66 Internet Printing Protocol/1.0: Implementer's Guide [IPP-IIG]
- 67 Mapping between LPD and IPP Protocols [IPP LPD]

68
69 The "Design Goals for an Internet Printing Protocol" document takes a broad look at distributed printing
70 functionality, and it enumerates real-life scenarios that help to clarify the features that need to be
71 included in a printing protocol for the Internet. It identifies requirements for three types of users: end
72 users, operators, and administrators. It calls out a subset of end user requirements that are satisfied in
73 IPP/1.0. Operator and administrator requirements are out of scope for version 1.0. A few OPTIONAL
74 operator operations have been added to IPP/1.1.

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

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

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

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

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

95
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167

168 **1 Model for Job and Printer Event Notification**

169 "Job Submission Subscriptions" are created by the end-user upon creation of the job. "Explicit
 170 Subscriptions" are accomplished by performing independent operations on the printer or a certain job.

171 Figure 1 shows the "Job Submission Subscription" model.

172

173

174 Legend:

175

176 A = Client and Notification Recipient

177 B = Notification Recipient

178

```

179      O A +-----+                               #####
180      /|\ | client/ | ----Print-Job-----># IPP      #
181      / \ | notif.  |                               # Printer #
182      end-| recip. | <---Job and Printer -----# Object  #
183      user +-----+      Notifications          #####
184
185      O B +-----+                               /
186      /|\ | notif.  |                               /
187      / \ | recip. | <---Job and Printer -----+
188      end-|         |      Notifications
189      user +-----+

```

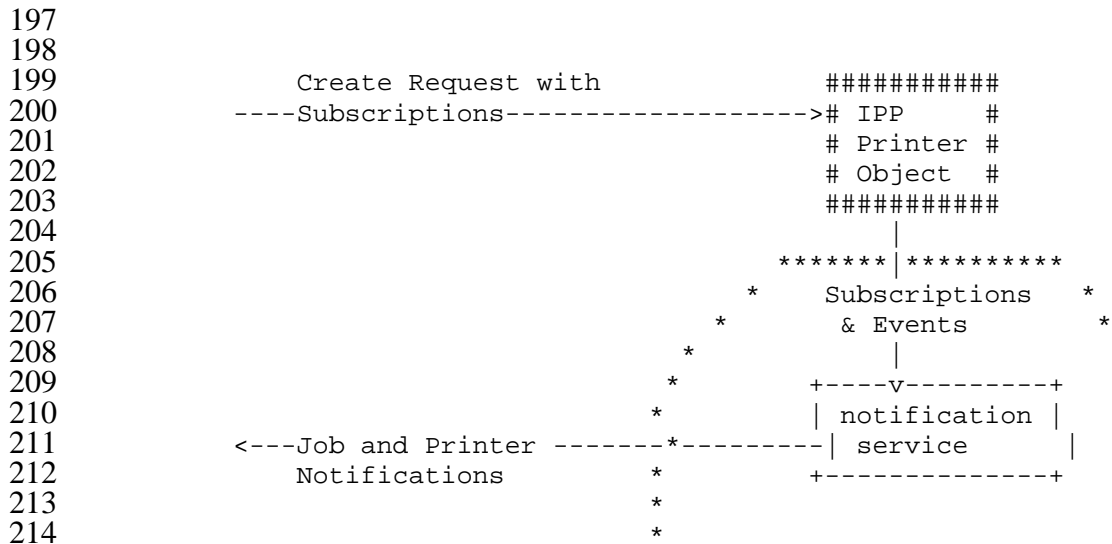
190

191

192 **Figure 1 - Model for "Job Submission" Notification**

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

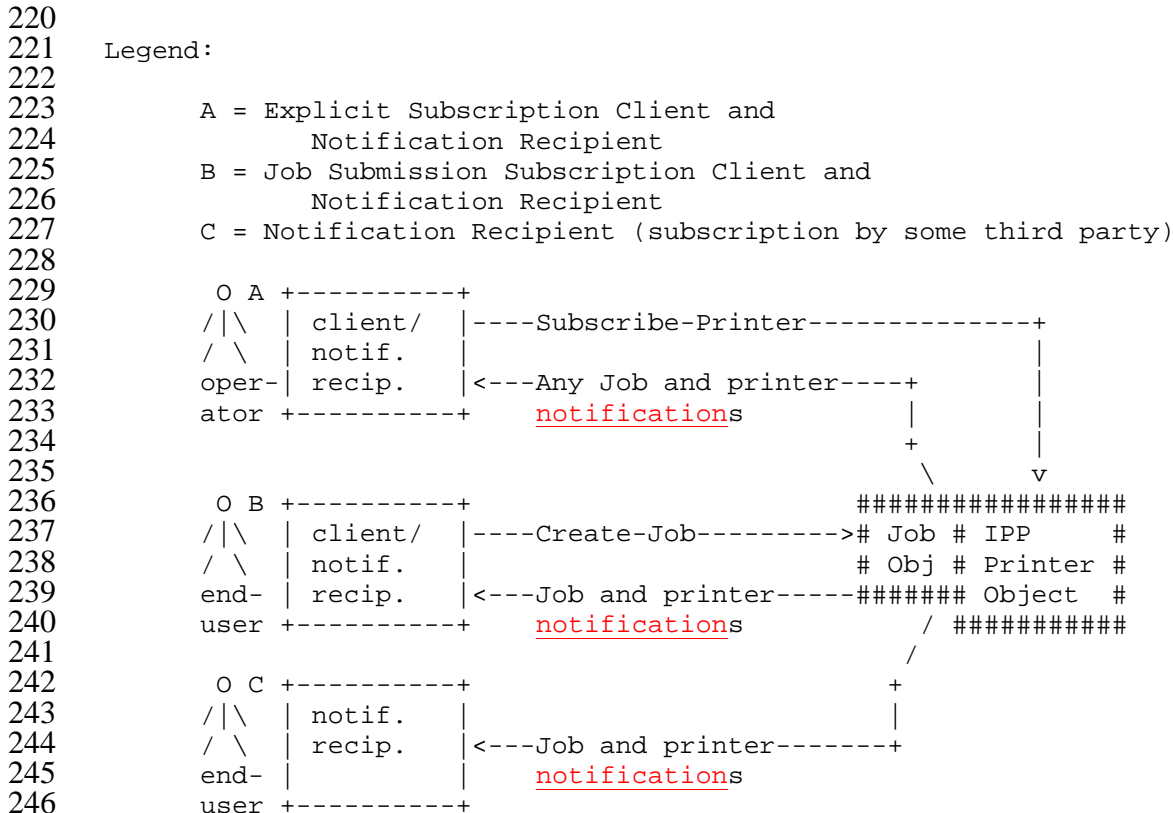
196



*** = Implementation configuration opaque boundary

Figure 2 - Opaque Use of a Notification Service

219 Figure 3 shows the "Explicit Subscription" model.



248 An accounting application may be used as Element A which subscribes to the events
 249 of a printer and receives all job and printer notifications.

251 **ISSUE 1:** Do we need to add a Subscription object that contains the "notify-recipients", "notify-events",
 252 "subscription-id", and "lease-time" attributes (and possibly the opaque subscription attribute, if we add
 253 it)? The Subscription object is contained in the Printer or Job object for each Explicit Printer or Job
 254 subscription created. In the case of Job Submission Subscription, the Subscription object is degenerate
 255 and the Job has only the "notify-recipients" and the "notify-events" attributes. The subscription-id is
 256 used in operations on the Subscription object, in addition to the Job or Printer object target.

257 **Figure 3 - Model for "Explicit Subscription" Notification**

259 **2 Summary of the Event Notification specification**

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

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

264 attribute name	265 Syntax
-----	-----

266 "notify-recipients" 1setOf uri
 267 "notify-events" 1setOf type2 keyword

268
 269 The presence of the "notify-recipients" indicates that notification is desired. The values of "notify-
 270 recipients" are URIs that identify the notification delivery method and delivery address to use for
 271 ~~event-report~~notifications (See Section 5.1.1). The delivery method dictates the event
 272 reportnotification content type to be used. For example, 'mailto' uses "multipart/report" and 'ipp-tcp-
 273 notify' uses "application/ipp". The values for "notify-events" are keywords representing job events
 274 or deviceprinter events (See Section 5.1.2). Each events implies a set of attributes to be sent in the
 275 event-reportnotification. ~~Some delivery methods imply a fixed subset of the events. For example,~~
 276 ~~the 'mailto' delivery method only uses the 'job-completed' event.~~

277
 278 These subscription operation attributes can be supplied by the client in any of the IPP job submission
 279 operations: Print-Job, Print-URI, Create-Job, and Validate-Job. Subscriptions that include interest in
 280 job events apply only to the job being submitted and no other job.

281 A subscription does *not* include:

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

285
 286 ~~ISSUE 1: If notification is requested, but the printer doesn't support notification, does the job get~~
 287 ~~rejected?~~

289 ~~1.2.~~ REQUIRED "notify-recipients" and "notify-events" Job Description attributes are populated from
 290 the corresponding create request Operation attributes of the same names.

- 291 3. REQUIRED Printer Description attributes: "notify-recipients-schemes-supported" and "notify-
 292 events-supported" that describe the notification delivery methods and the events that it supports,
 293 respectively.
- 294 4. REQUIRED Job Description attributes: "job-trigger-events" and "job-trigger-time" that store the
 295 current/last job event and its time in seconds since the deviceprinter was started; "previous-job-
 296 state" and "~~previous-job-state-reasons-added~~" and "~~job-state-reasons-deleted~~" that ~~store the job state~~
 297 ~~and job state reasons before the event occurred~~ present what values changed regarding job state.
- 298 5. OPTIONAL Job Description attribute: "job-trigger-date-time"
- 299 6. CONDITIONAL Job Description attribute: "job-trigger-message" if "status-message" is supported as
 300 an Operation attribute.
- 301 7. REQUIRED Printer Description attributes: "deviceprinter-trigger-events" and "deviceprinter-
 302 trigger-time" that store the current/last deviceprinter event and its time in seconds since the
 303 deviceprinter was started; "previous-printer-state" and "~~previous-printer-state-reasons-added~~" and
 304 "~~printer-state-reasons-deleted~~" that ~~store the device state and device state reasons before the event~~
 305 ~~occurred~~ present what values changed regarding printer state.
- 306 8. OPTIONAL Printer Description attribute: "deviceprinter-trigger-date-time"
- 307 9. CONDITIONAL Printer Description attribute: "deviceprinter-trigger-message" that MUST be
 308 supported if "status-message" is supported as an Operation attribute.

309 There are two steps that IPP notification must take regarding each event – an internal event recording,
310 and an external ~~notification~~~~event reporting~~. 1) As events occur, the printer internally records in the job
311 objects and the printer objects those events which are required to be supported by the system and those
312 that are subscribed to by a notification recipient. 2) As events occur, for each event the Printer searches
313 the set of subscriptions for any interest in that event. As the Printer finds that some notification recipient
314 is interested in that event (the notification recipient is subscribed to the event), ~~an ev~~ the sequence
315 number for that event is incremented and a ~~ent-report~~notification is generated and delivered using the
316 methods and target addresses identified in the subscription. The sequence number permits a Notification
317 Recipient to detect duplicate notifications due either to duplicate subscriptions or retries and to detect
318 dropped notifications.

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

322 ~~If IPP-Notification "Explicit Subscription" is implemented, the IPP Printer MUST support four~~ three new
323 Printer operations: Subscribe-Printer, ~~Subscribe-Job~~, Renew-Subscription, and Unsubscribe. These
324 operations allow a client that is not submitting a job to subscribe, renew a subscription, and to
325 unsubscribe independently from job submission. In addition, the Subscribe-Job operation permits a
326 client to add a subscription to an already submitted job.

327 A REQUIRED operation attribute, "notify-lease-time", specifies the length of time in seconds that the
328 subscription is to be in effect, after which the subscription is automatically canceled.

329 A REQUIRED operation attribute, "subscription-id", allows a client to maintain a reference to the
330 applicable subscriptions made and know which notifications were generated as a result of this
331 subscription.

332 The subscription created by a Subscribe-Job or Subscribe-Printer operation is called an "Explicit
333 Subscription". Just like Job Submission Subscriptions, these subscriptions can include job and/or printer
334 events. Subscriptions for Job Events in Subscribe-Job operation apply to that job only, while Job events
335 in the Subscribe-Printer operation apply to all jobs. For the Subscribe-Printer subscriptions, it is most
336 likely that the subscribing entity is either a server-based device management application submitting jobs
337 to a device which has IPP embedded in it or an accounting application collecting accounting data.

338 3 Terminology

339
340 Capitalized terms, such as MUST, MUST NOT, REQUIRED, SHOULD, SHOULD NOT, MAY,
341 NEED NOT, and OPTIONAL, have special meaning relating to conformance to this
342 specification. These terms are defined in [ipp-mod section 13.1 on conformance terminology,
343 most of which is taken from RFC 2119 [RFC2119].

344 READ-ONLY - indicates an attribute the MUST NOT be settable using the Set-Job-Attributes or
345 Set-Printer-Attributes operations.

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

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

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

350 **Job Recipient Proxy** - A human acting on behalf of the Job Recipient. In particular, the Job
351 Recipient Proxy physically picks up the printed document from the [DevicePrinter](#), if the Job
352 Recipient cannot perform that function.

353 **Subscription** - The set of attributes that indicate the "what, where, who, and how" for notification.
354 [Events-ReportsNotifications](#) are generated for certain events (what) and delivered using various
355 delivery methods (how) to certain addresses (where and who).

356 **Job Submission Subscription** - A Subscription that a client specifies as part of a create job
357 operation (Print-Job, Print-URI, Create-Job, and Validate-Job).

358 **Explicit Subscription** - A Subscription that a client specifies using an explicit operation, Subscribe-
359 Job, Subscribe-Printer, that is attached to a Job or Printer object, respectively.

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

363 **Notification Recipient Agent** - A program which receives [event-reportnotifications](#) on behalf of the
364 notification recipient.

365 **Event** - An event is some occurrence (either expected or unexpected) within the printing system. A
366 property of an event is that it only occurs at one instant in time and does not span the time the
367 physical event takes place. For instance, jam-occurred and jam-cleared are two distinct events.
368 The jam-occurred event is reported only when the jam initially occurs. Each event is recorded
369 internally when it occurs. In addition the event is reported externally if there is one or more
370 event subscriptions outstanding for that event.

371

372 Events can be classified along two dimensions:

- 373 - Either as Job Events or [DevicePrinter](#) Events, and
- 374 - Either as Errors, Warnings, or Reports

375

376 A Job event is some interesting state change in the Job object, and a [DevicePrinter](#) event is some
377 interesting change in the Printer object.

378

379 A report event is purely informational, such as 'job-completed' or 'accepting-jobs'. A warning is
380 not serious and processing continues. An error is serious and either the job is aborted or the
381 [deviceprinter](#) stops. These are typical uses of the terms report, warning, and error, although the
382 actual usage is implementation dependent.

383

384 An event occurs for a job or [deviceprinter](#) whether any entity is registered to be notified for that
385 event or not. The most recent event(s) of all possible events are recorded in a job object and a
386 [deviceprinter](#) object, and [an-event-reportnotification](#) is only generated depending on the set of
387 subscriptions outstanding.

388

389 **Event-ReportNotification** - When an event occurs, [an-event-reportnotification](#) is generated that
390 fully describes the event (what the event was, where it occurred, when it occurred, etc.). [Event](#)
391 [reportNotifications](#) are delivered to all the Notification Recipients that are subscribed to that
392 event, if any. The [event-reportnotification](#) is delivered to the address of the Notification
393 Recipient using the notification delivery method defined in the subscription. However, [an Event](#)
394 [ReportNotification](#) is sent ONLY if there is a corresponding subscription.

395 **Notification Delivery Method** (or **Delivery Method** for short) - ~~Event-report~~Notifications are
396 delivered using a method, such as email, TCP/IP, etc.
397 **Immediate Notification** - ~~Event-report~~Notifications that are delivered using a delivery method
398 which is not store-and-forward (e.g. TCP connection, UDP datagram). This can be on the order
399 of several minutes subject to network latency.
400 **Queued Notification** - ~~Event-report~~Notifications that are delivered using a delivery method which
401 has some sort of store-and-forward mechanism (e.g., email).
402 **Human Consumable ~~Event-Report~~Notification** - ~~Event-report~~Notifications that are intended to be
403 consumed by human end users only. (Further define)
404 **Machine Consumable ~~Event-Report~~Notification** - ~~Event-report~~Notifications that are intended for
405 consumption by a program only. (Further define)
406 **Mixed Format ~~Event-Report~~Notification** - A mixed ~~event-report~~notification may contain both
407 human consumable and machine consumable information.

408 4 Job Submission Subscriptions versus Explicit Subscriptions

409 There are semantic differences between job submission subscriptions and explicit subscriptions. A "Job
410 Submission Subscription" is established between the client and the device when a job create request is
411 made. The attributes as specified in this document are sent to the device and the response includes
412 attributes telling the client if the subscription was successful or not. An "Explicit Subscription" is
413 established between a client and a device using the four new operations: Subscribe-Job, Subscribe-
414 Printer, Unsubscribe, and Renew-Subscription. Some specific differences are:

- 415 1. Either type of subscription can register for job events, printer events, or both.
- 416 2. For "Job Submission Subscriptions" and the Subscribe-Job operation, the subscription is only valid
417 while the job is "not-complete" (see sections 5 and 6).
- 418 3. For the Subscribe-Printer operation, the subscription is valid until it is explicitly canceled with an
419 Unsubscribe operation or the time (in seconds) that was specified in the "notify-lease-time"
420 operation attribute expires, whichever occurs first.
- 421 4. Job Events in a "Job Submission Subscription" and Subscribe-Job operation apply only to "one job"
422 (the Job specified within the create-job or subscribe-job operation).
- 423 5. Job Events in a Printer-Subscription operation apply to ALL jobs contained in the IPP Printer object.
- 424 6. Printer Events in all subscriptions apply no matter which job is being processed.

425

426 5 Job Submission Subscription~~New subscription Operation attributes~~

427 "Job Submission Subscriptions" are specified by the end-user when submitting a job to the Printer using
428 ~~This section specifies~~ two new subscription operation attributes described in this section. A client
429 subscribes to events by supplying these attributes in any create request (i.e., a Print-Job Request, Print-
430 URI Request, Validate-Job Request, or a Create-Job Request). These attributes are multi-valued
431 attributes; the client can supply more than one value. If the client does not supply these attributes in the

432 create operation, there is no subscription made (either implicitly or explicitly). However, a client can
433 add a subscription to a previously created Job object using the Subscribe-Job operation (see section 6.1).

434 The following rules apply:

- 435 1. Any subscription can contain job events, deviceprinter events, or both.
- 436 2. The Job Submission Subscription is only valid while the job is "not-completed". The job is "not-
437 completed" while it is in the 'pending', 'pending-held', 'processing', and 'processing-stopped' states.
438 The job changes from being "not-completed" to "retained" when it is done processing and enters any
439 of the 'completed', 'canceled', or 'aborted' states. The job becomes "not-completed" again when it is
440 restarted using the Restart-Job operation (see [ipp-ops-set1mod]). Since no job is created for the
441 Validate-Job operation, the only purpose of supplying the subscription operation attributes in the
442 Validate-Job operation is to validate that the values are supported; the Printer object does not
443 establish a notification subscription as a result of the Validate-Job operation.
- 444 3. Since a Job Submission Subscription is included within a job submission operation, any interest in
445 job events is limited to "this job" only (the Job object created because of this job creation operation).
446 There is no mechanism to subscribe to events for all jobs or specifically some job other than this job
447 in a create operation. But see the Subscribe-Printer operation (section 6.2) [ipp-sub] for an explicit
448 operation such a mechanism to subscribe persistently for job and/or printer events independently of
449 any particular job submission.
- 450 4. Event recording internal to the system must always occur for required events and subscribed events.
451 Event reporting only occurs when a notification recipient has specified a subscription to any
452 event(s).
- 453 5. The notification implementation MAY allow an administrator to configure a policy on what events
454 may be dropped.

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

458 **4.15.1 Subscription operation attributes**

459 Two subscription operation attributes are OPTIONALLY supplied by the client in create operations:
460 Print-Job, Print-URI, Create-Job, and Validate-Job. Both operation attributes are REQUIRED to be
461 supported by Printer objects that support this notification specification. These operation attributes
462 permit a client to specify a single subscription consisting of one or more job and/or printer events that
463 are to be delivered to one or more Notification Recipients. In order to specify additional sets of events
464 to be delivered to different Notification Recipients during the lifetime of the job, see the Subscribe-Job
465 operation (section 6.1).

466 If a Printer does not support this notification specification, then it MUST ignore these operation
467 attributes and return them in the response indicated as attributes that are not supported. See [ipp-mod]
468 section 3.1.7 for details on returning Unsupported Attributes.

469 **1.1.15.1.1 notify-recipients (1setOf uri)**

470 The client supplies this operation attribute in a create request in order to subscribe for job and/or printer
471 events while this job is "not-completed". In order to claim conformance to this notification

472 specification, the Printer object MUST support this attribute. This attribute describes both where (the
473 address of the Notification Recipients) and how (the delivery method) event-report-notifications are to be
474 delivered when any of the events specified in the "notify-events" attribute occur. If the client does not
475 supply this attribute in a create request, the Printer object MUST NOT provide any job-basedJob
476 Submission Subscription notification for this job.

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

481 **ISSUE 2:** Delete previous sentence that says that some delivery methods can defined to not use some
482 events?

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

485 Standard uriScheme values are:

486 **'mailto':** a 'multipart/report' [RFC1892] message is sent via email to the specified email address. It
487 MUST consist of both a "text/plain" part for display to a user and an 'application/ipp' part which
488 is an event-report-notification that a program can process (see Section 6). This delivery method
489 ignores the supplied values of the "notify-events" attribute and implies the 'job-completed' event
490 (new state is 'completed', 'aborted', or 'canceled'). The notification recipient does not
491 acknowledge receipt of the mail message.

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

493
494 ~~ISSUE 2—Should we make the 'http' notification method (using POST) REQUIRED, instead of 'ipp-~~
495 ~~tcp-notify' and 'ipp-udp-notify'? Then we don't need to register anything for the two REQUIRED~~
496 ~~methods.~~

497
498 **'ipp-tcp-notify':** (REQUIRED) an IPP event-report-notification is sent via a TCP/IP socket that is
499 opened by the Printer object on the IP address specified in the URI using the specified port using
500 the "host:port" HTTP convention. For example:

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

502 If the port is omitted, the default port is TBD (see Registration of ipp-tcp-notify scheme for use
503 with IPP). The "application/ipp" event-report-notification content format is used for this method
504 (see Section 7.1).

505 The event recipient does not respond or acknowledge the event-report-notification.

506 **ISSUE 3:** For TCP/IP delivery, what about leaving the connection open versus having to
507 reestablish a connection for each event? Who specifies: client in subscription, Printer
508 implementation, Notification Recipient, Administrator?

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

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

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

518 **ISSUE 4 – Move SNMP trap delivery methods to another document? Which one?**

519
520 **'ipp-udp-notify'**: (REQUIRED) an IPP ~~event-report~~[notification](#) is sent via a UDP datagram that is
521 opened by the Printer object on the IP address specified in the URI using the specified port using
522 the "host:port" HTTP convention. For example:

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

524 If the port is omitted, the default port is TBD (see Registration of ipp-udp-notify scheme for use
525 with IPP). The UDP datagram contains the "application/ipp" ~~event-report~~[notification](#) content
526 format (see Section 6). The notification recipient does not acknowledge receipt of the
527 notification ~~event-report~~.

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

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

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

536
537 ~~ISSUE 5—Can we get rid of most of these notification methods? Having a large number means that we~~
538 ~~don't have much interoperability.~~

539
540 If the client specifies a "notify-recipients" URI scheme that is not supported by the ~~device~~[printer](#), the
541 Printer MUST return the [new] 'client-error-notify-uri-scheme-not-supported' in the IPP response in
542 reply to the create request.

543
544 **ISSUE 5 - Which URL parameters should we mention (which like SLP) are removed before being used?**

545

546

547 **1.1.25.1.2 notify-events (1setOf type2 keyword)**

548 The client OPTIONALLY supplies this operation attribute in a create request. In order to claim
549 conformance to this notification specification, the Printer object MUST support this attribute. This
550 attribute identifies the ~~job and/or printer~~ events ~~that are to be delivered to the Notification Recipients as~~
551 ~~notifications~~[for which a notification event report is desired](#). If the client does not supply this attribute in
552 a create request, but does supply the "notify-recipients", the Printer object uses ~~its~~[the](#) "notify-events-
553 default" ~~event-attribute~~ value ([see section 9.9](#)).

554 There are both job events and ~~device~~[printer](#) events. Each job and ~~device~~[printer](#) event is assigned a
555 keyword to use in this attribute and in the ~~event-report~~[notification](#).

556 Standard event keyword values are:

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

559 ISSUE 6 - Should we add a third operation attribute to Job Submission Subscriptions, Subscribe-Job,
560 and Subscript-Printer that is an opaque octet-string that is passed to the Notification Recipient on every
561 notification, as in Jini? This operation attribute would be OPTIONAL for the client to supply and the
562 Printer to support.

563 **6 Explicit Subscriptions**

564 "Explicit Subscriptions" are created by performing explicit subscription operations on the Printer or an
565 identified Job object. These operations are: Subscribe-Job, Subscribe-Printer, Renew-Subscription, and
566 Unsubscribe. These operations are like any other IPP operation with respect to common operation
567 attributes (target, charset, "requesting-user-name", natural language, unsupported attributes, etc.).

568 If a printer crashes or is rebooted, an attempt should be made for the Printer object to maintain all of the
569 subscriptions currently active.

570 ISSUE 7 - Rather than adding the Subscribe-Job operation (and possibly corresponding Renew-Job-
571 Subscription and Unsubscribe-Job-Subscription operations), why not go back to the original proposal
572 that has a 1setOf collection for the create job operations. The collection contains the two simple "notify-
573 recipients" (1setOf uri) and "notify-events (1setOf type2 keyword). We could say that only one
574 collection value is sufficient for conformance to help the low end. Supporting additional values would
575 give the same functionality as the Subscribe-Job operation, but would happen when the job was
576 submitted.

577 **6.1 Subscribe-Job Operation**

578 This OPTIONAL operation allows a client to add an explicit notification subscription to a Job object
579 after the job has been created, in case the client did not supply a Job Submission Subscription when the
580 job was submitted. Also this operation allows a client to set up multiple Job Subscriptions with different
581 sets of events for different Notification Recipients. With the Job Submission Subscription (section 5) all
582 Notification Recipients receive the same set of events. If this operation is supported, then Job
583 Submission Subscription MUST be supported, as well as the other Explicit Subscription operations
584 (Subscribe-Printer, Renew-Subscription, and Unsubscribe).

585 The Printer returns a subscription id so that a client can unsubscribe to the explicit subscription using the
586 Unsubscribe operation (section 6.4) before the job completes. The Printer does not return a lease time,
587 since the subscription lasts until the job completes.

588 Two Subscribe-Job operations with the same events and same Notification Recipients MUST be kept as
589 distinct subscriptions and be assigned distinct subscription ids. A Printer MAY suppress sending
590 duplicate notifications to the same Notification Recipient, but the printer MUST allow duplicate
591 subscriptions such that Unsubscribe doesn't unsubscribe both subscriptions.

592 The subscription expires after the job completes (enters the 'completed', 'canceled', or 'aborted' job
593 states) just as with the Job Submission Subscription. See section 5 for more detail.

594 Access Rights: The authenticated user (see [ipp-mod] section 8.3) performing this operation must either
595 be the job owner of the current job or an operator or administrator of the Printer object (see [ipp-mod]

596 sections 1 and 8.5). Otherwise, the IPP object MUST reject the operation and return: 'client-error-
597 forbidden', 'client-error-not-authenticated', or 'client-error-not-authorized' as appropriate.

598 **6.1.1 Subscribe-Job Request**

599 The following groups of attributes are part of the Subscribe Request:

600 Group 1: Operation Attributes

601 Natural Language and Character Set:

602 The "attributes-charset" and "attributes-natural-language" attributes as described in [ipp-mod]
603 section 3.1.4.1.

604 Target:

605 Either (1) the "printer-uri" (uri) plus "job-id" (integer(1:MAX)) or (2) the "job-uri" (uri)
606 operation attribute(s) which define the target for this operation as described in [ipp-mod] section
607 3.1.5.

608 Requesting User Name:

609 The "requesting-user-name" (name(MAX)) attribute SHOULD be supplied by the client as
610 described in [ipp-mod] section 8.3.

611 "notify-recipients" (1setOf uri):

612 The client MUST supply this attribute. The Printer object MUST support this attribute, if it
613 supports this operation. This attribute describes both where (the address of the Notification
614 Recipients) and how (the delivery method) notifications are to be delivered as notifications when
615 any of the events specified in the "notify-events" attribute occur. See section 5.1.1.

616 "notify-events" (1setOf type2 keyword):

617 The client OPTIONALLY supplies this attribute. The Printer object MUST support this
618 attribute, if it supports this operation. This attribute identifies the job and/or printer events that
619 are to be delivered to the Notification Recipients as notifications (see section 5.1.2). If the client
620 does not supply this attribute, then the Printer object uses its "notify-events-default" attribute
621 value (see section 9.9).

622 **~~4.1.2~~6.1.2 Subscribe-Job Response**

623 The following groups of attributes are part of the Subscribe-Job Response:

624 Group 1: Operation Attributes

625 Status Message:

626 In addition to the REQUIRED status code returned in every response, the response
627 OPTIONALLY includes a "status-message" (text(255)) and/or a "detailed-status-message"
628 (text(MAX)) operation attribute as described in [ipp-mod] sections 13 and 3.1.6.

629 Natural Language and Character Set:

630 The "attributes-charset" and "attributes-natural-language" attributes as described in [ipp-mod]
631 section 3.1.4.2.

632

639 "subscription-id" (integer(1:MAX)):
640 The Printer object MUST support this attribute and return it in the response. It contains an
641 integer subscription identifier assigned by the Printer object for use in notifications and
642 Unsubscribe operations. There is no need to renew, since the lease is the same as for Job
643 Submission operations, i.e., until the Job is completed.
644

645 Group 2: Unsupported Attributes

646 See [ipp-mod] section 3.1.7 for details on returning Unsupported Attributes.
647

648 **4.26.2 Subscribe-Printer Operation**

649 This OPTIONAL operation allows a client to add an explicit notification subscription to a Printer object
650 at any time, whether or not the client has submitted a job to that Printer. The client can specify one or
651 more job and/or printer events to be delivered as notifications to one or more Notification Recipients.
652 The job events are for any job submitted to the Printer. The printer events are any events generated by
653 that Printer. If "Explicit Subscriptions" is implemented, this operation is REQUIRED to be supported
654 by the Printer.

655 The Printer returns a subscription id and the length of time for which it has granted a lease for the
656 subscription. The client must renew the subscription using the Renew-Subscription operation (see
657 section 6.3) before the lease runs out in order to maintain the subscription. A client can unsubscribe
658 using the Unsubscribe operation (section 6.4) and the subscription id.

659 Two Subscribe-Printer operations with the same events and same Notification Recipients MUST be kept
660 as distinct subscriptions and be assigned distinct subscription ids. A Printer MAY suppress sending
661 duplicate notifications to the same Notification Recipient, but the printer MUST allow duplicate
662 subscriptions such that Unsubscribe doesn't unsubscribe both subscriptions.

663 If the Printer has a bounded set of concurrent subscriptions (for the specified events or any events), the
664 printer rejects the operation and returns the 'server-error-too-many-subscriptions' status code. The client
665 SHOULD try again later.

666 Access Rights: The authenticated user (see [IPP-MOD] section 8.3) performing this operation must be
667 an operator or administrator of the printer object (see [IPP-MOD] sections 1 and 8.5). Otherwise the
668 IPP object must reject the operation and return: client-error-forbidden, client-error-not-authenticated,
669 and client-error-not-authorized as appropriate.

670 **4.1.16.2.1 Subscribe-Printer Request**

671 The following groups of attributes are part of the Subscribe-Printer Request:

672 Group 1: Operation Attributes

673 Natural Language and Character Set:

674 The "attributes-charset" and "attributes-natural-language" attributes as described in [ipp-mod]
675 section 3.1.4.1.

676 Target:

677 The "printer-uri" (uri) operation attribute which is the target for this operation as described in
678 [ipp-mod] section 3.1.5.
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Requesting User Name:

The "requesting-user-name" (name(MAX)) attribute SHOULD be supplied by the client as described in [ipp-mod] section 8.3.

"notify-recipients" (1setOf uri):

The client MUST supply this attribute. The Printer object MUST support this attribute, if it supports this operation. This attribute describes both where (the address of the Notification Recipients) and how (the delivery method) notifications are to be delivered as notifications when any of the events specified in the "notify-events" attribute occur. See section 5.1.1.

"notify-events" (1setOf type2 keyword):

The client OPTIONALLY supplies this attribute. The Printer object MUST support this attribute, if it supports this operation. This attribute identifies the job and/or printer events that are to be delivered to the Notification Recipients as notifications (see section 5.1.2). If the client does not supply the attribute, then the Printer object uses its "notify-events-default" attribute value (see section 9.9).

"notify-lease-time" (integer(0:MAX)):

The client OPTIONALLY supplies this attribute. The printer object MUST support this attribute, if it supports this operation. This attribute requests a lease time for the subscription, i.e., the number of seconds before the subscription expires.

There is no way to query the outstanding subscriptions. Instead, every subscription has a lease time, so that no subscription can be carried too long and become a dead subscription because the Notification Recipient has gone away.

If the client does not supply this attribute in the request, the Printer object uses its "notify-lease-time-default" attribute value (see section 9.12).

"printer-message-from-operator":

If the client supplies this attribute, the Printer copies its value to the Printer's "printer-message-from-operator" Printer Description attribute.

1.1.26.2.2 Subscribe-Printer Response

The following groups of attributes are part of the Subscribe-Printer Response:

Group 1: Operation Attributes

Status Message:

In addition to the REQUIRED status code returned in every response, the response OPTIONALLY includes a "status-message" (text) operation attribute as described in [ipp-mod] section 3.1.6.

722

Natural Language and Character Set:

723

The "attributes-charset" and "attributes-natural-language" attributes as described in [ipp-mod] section 3.1.4.1.

724

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"subscription-id" (integer(1:MAX)):

728

The Printer object MUST support this attribute and return it in the response. It contains an integer subscription identifier assigned by the Printer object for use in notifications and Renew-Subscription/Unsubscribe operations.

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732

"notify-lease-time" (integer(0:MAX)):

733

The Printer object MUST support this attribute and return it in the response. It contains the actual lease time granted, which MUST be in the range specified by the Printer's "notify-lease-time-supported" attribute. If the client supplied a value that is less than the minimum or greater than the maximum, the Printer sets the actual lease time to the minimum or maximum value, respectively, but otherwise accepts and performs the operation normally and no special status code is returned. It is up to the client to check this returned value, if it cares.

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"initial-sequence-numbers" (1setOf integer(1:MAX)):

741

The Printer object MUST support this attribute and return it in the response. It contains the sequence number values that will be sent in the first notification for each of the events in the "notify-events" operation attribute in the request. The order of the values of this attribute correspond to the order of the values in the "notify-events" operation attribute. Since the event sequence numbers are associated with the event, not the subscription, there is a single sequence number attribute for the Printer for each event, which is counting monotonically for each event separately. Therefore, a Notification Recipient that is concerned about missing notifications, needs to know the first value to expect.

Note: The subscribing client needs to convey this value to the Notification Recipient, in case the Notification Recipient cares.

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ISSUE 8 - Should the event sequence number be associated with the event (see section 7.1) as in Jini, or with the Subscription object? If the latter, then notification batching could happen for the same subscription. Then "xxx-trigger-event" could be changed back to 1setOf to agree with the "notify-events" operation, Job Description, and Printer Description attributes. Then event sequence numbers always start with 1 for Explicit Printer Subscriptions, just like for Explicit Job and Job Submission Subscriptions and there is no need to return the starting sequence number for Printer events.

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"detailed-status-message" (text(MAX))

760

The OPTIONAL "detailed-status-message" operation attribute provides additional more detailed technical and implementation-specific information about the operation. The "detailed-status-message" attribute's syntax is "text(MAX)". See [ipp-mod] section 3.1.6.3 for more information.

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Group 2: Unsupported Attributes

765

See [ipp-mod] section 3.1.7 for details on returning Unsupported Attributes.

766 **4.36.3 Renew-Subscription**

767 This OPTIONAL operation allows a client to renew the lease time on an already established explicit
768 subscription. The client supplies the "subscription-id" for this operation that was returned in the
769 previous Subscribe-Job or Subscribe-Printer operation that created the subscription. If "Explicit
770 Subscriptions" is implemented, this operation is REQUIRED to be supported by the Printer.

771 The Subscription-id MUST NOT change upon renewal of the lease.

772 **4.1.16.3.1 Renew-Subscription Request**

773 The following groups of attributes are part of the Subscribe Request:

774 Group 1: Operation Attributes

775 Natural Language and Character Set:

776 The "attributes-charset" and "attributes-natural-language" attributes as described in [ipp-mod]
777 section 3.1.4.1.

778

779 Target:

780 The "printer-uri" (uri) operation attribute which is the target for this operation as described in
781 [ipp-mod] section 3.1.5.

782

783 **ISSUE 9 - A "printer-uri" plus "subscription-id" isn't enough to target an Explicit Job**
784 **Subscription? Do we really need both Renew-Printer-Subscription and Renew-Job-Subscription,**
785 **both which require a "subscription-id", but the former has a Printer object target and the latter**
786 **has a Job object target?**

787

788 Requesting User Name:

789 The "requesting-user-name" (name(MAX)) attribute SHOULD be supplied by the client as
790 described in [ipp-mod] section 8.3.

791

792 "subscription-id" (integer(1:MAX)):

793 The client MUST supply this attribute. The printer object MUST support this attribute. It
794 identifies the subscription to be renewed, i.e., it is the integer subscription identifier returned by
795 the Printer object in a previous Subscribe or Renew-Subscription operation.

796

797 The Printer returns a 'client-error-not-found' status code, if the subscription id is not found (or
798 has expired).

799

800 "notify-lease-time" (integer(0:MAX)):

801 See the description of "notify-lease-time" for the Subscribe operation request in Section .6.2.1.

802

803

804 **4.1.26.3.2 Renew-Subscription Response**

805 The following groups of attributes are part of the Subscribe Response:

806 Group 1: Operation Attributes

807 Status Message:
808 In addition to the REQUIRED status code returned in every response, the response
809 OPTIONALLY includes a "status-message" (text) operation attribute as described in [ipp-mod]
810 section 3.1.6.

811 Natural Language and Character Set:
812 The "attributes-charset" and "attributes-natural-language" attributes as described in [ipp-mod]
813 section 3.1.4.1.

814 "notify-lease-time" (integer(0:MAX)):
815 See the description of "notify-least-time" for the Subscribe operation response in Section 6.2.2.

816 Group 2: Unsupported Attributes

817 See section 3.1.7 for details on returning Unsupported Attributes.

818 Access Rights: The authenticated user (see [IPP-MOD] section 8.3) performing this operation must be an
819 operator or administrator of the printer object (see [IPP-MOD] sections 1 and 8.5). Otherwise the IPP
820 object must reject the operation and return: client-error-forbidden, client-error-not-authenticated, and
821 client-error-not-authorized as appropriate.

822 **ISSUE 10 - Can't we have authentication for subscriptions as we have for jobs? Then the owner of the**
823 **subscription, i.e., the user that performed the Explicit Subscription can Renew or Unsubscribe.**

824 **4.46.4 Unsubscribe**

825 This OPTIONAL operation allows a client to unsubscribe explicit notification subscription. The
826 "subscription-id" is required to perform this operation. Once a client performs an Unsubscribe
827 operation, the Printer (or an associated notification service) immediately stops sending notifications to
828 the associated Notification Recipient(s) for that subscription. If "Explicit Subscriptions" is
829 implemented, this operation is REQUIRED to be supported by the Printer.

830 **ISSUE 11 - Add way to the Unsubscribe operation to unsubscribe all subscriptions? all "my"**
831 **subscriptions?**

832 Access Rights: The authenticated user (see [IPP-MOD] section 8.3) performing this operation must be an
833 operator or administrator of the printer object (see [IPP-MOD] sections 1 and 8.5). Otherwise the IPP
834 object must reject the operation and return: client-error-forbidden, client-error-not-authenticated, and
835 client-error-not-authorized as appropriate.

836 **ISSUE 12 - Can't we have authentication for subscriptions as we have for jobs? Then the owner of the**
837 **subscription, i.e., the user that performed the Explicit Subscription can Renew or Unsubscribe. Or does**
838 **the lease and sequence number concepts mean that only operators need to be able to Unsubscribe?**

839 **1.1.16.4.1 Unsubscribe Request**

840 The following groups of attributes are part of the Unsubscribe Request:

841 Group 1: Operation Attributes

842 Natural Language and Character Set:
843 The "attributes-charset" and "attributes-natural-language" attributes as described in [ipp-mod]
844 section 3.1.4.1.

849

850

Target:

851

The "printer-uri" (uri) operation attribute which is the target for this operation as described in [ipp-mod] section 3.1.5.

852

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ISSUE 13 - A "printer-uri" plus "subscription-id" isn't enough to target an Explicit Job Subscription? Do we really need both Unsubscribe-Printer and Unsubscribe-Job, both which require a "subscription-id", but the former has a Printer object target and the latter has a Job object target?

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Requesting User Name:

860

The "requesting-user-name" (name(MAX)) attribute SHOULD be supplied by the client as described in [ipp-mod] section 8.3.

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"subscription-id" (integer(1:MAX)):

864

The client MUST supply this attribute. The printer object MUST support this attribute. It identifies the subscription to be removed, i.e., it is the integer subscription identifier returned by the Printer object in a previous Subscribe or Renew-Subscription operation.

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The Printer returns a 'client-error-not-found' status code, if the subscription id is not found (or has expired).

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871

4.1.26.4.2 Unsubscribe Response

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The following groups of attributes are part of the Unsubscribe Response:

873

Group 1: Operation Attributes

874

Status Message:

875

In addition to the REQUIRED status code returned in every response, the response OPTIONALLY includes a "status-message" (text) operation attribute as described in [ipp-mod] section 3.1.6.

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879

Natural Language and Character Set:

880

The "attributes-charset" and "attributes-natural-language" attributes as described in [ipp-mod] section 3.1.4.1.

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Group 2: Unsupported Attributes

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See section 3.1.7 for details on returning Unsupported Attributes.

885

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ISSUE 14 - Do we need a Get-Printer-Subscriptions operation that returns a list of explicit subscriptions to the Printer object? Jini has such an operation. This operation could be used by a client that has forgotten the subscription id of a long standing subscription. On the other hand, the lease concept was introduced to eliminate the need for a Get-Printer-Subscriptions operation. Also the sequence number mechanism also helps with filtering out duplicate subscriptions that send the same event more than once, since the same sequence number is send in each. If we do add a Get-Printer-Subscriptions operation,

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892 then probably need to include a "which-subscriptions" operation attribute with values: 'my-subscriptions'
893 and 'all-subscriptions', just like Get-Jobs?

894 **7 Notification ~~Event Report~~ Content**

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

897 **7.1 Notification content MIME media type formats**

898 Once a client's create job request, Subscribe-Job, or Subscribe-Printer is successful, the devicePrinter
899 adds the "notify-recipients" and "notify-events" attribute values to its subscription information on the
900 Job, Job, or Printer object, respectively, and returns the appropriate create-response. Subsequently,
901 event-reportnotifications are asynchronously sent based on the subscription information stored by the
902 devicePrinter. The following descriptions give more detail on how the event-reportnotifications are
903 formed for each type.

904 An implementation MUST NOT extend the contents of a notification.

905 Event-reportNotifications are generated using the following content formats:

906 'application/ipp' - machine consumable event-reportnotification content using the 'application/ipp'
907 MIME media type [ipp-mod] using the Get-Job-Attributes response encoding for job events and
908 Get-Printer-Attributes for deviceprinter events. The attributes listed in section 7.2 are sent in an
909 event-reportnotification for job events. The attributes listed in section 7.3 are sent in an event
910 reportnotification for deviceprinter events. For any string in any event-reportnotification, the
911 charset and natural language rules that apply to all IPP operations apply to the event
912 reportnotification strings as well, since they are represented as operation responses. The event
913 content is filled in as follows:

914 Response Parameters:

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

916 "status-code" parameter - the status code: 'basic-job-event' - 0x600 for job events, and
917 'basic-deviceprinter-event' - 0x601 for deviceprinter events.

918 "request-id" - 0, since there is no request to which this "response" is associated a sequence
919 number so that each subscription type of event has a running event counter that
920 increments by 1. For job subscriptions, the event count is kept separately for each job
921 and job event pair and the first value passed in a notification MUST be 1. The
922 Notification Recipient can detect events that arrive out of order or are dropped. For
923 the Explicit Printer subscriptions, the sequence number is kept for each event
924 separately and it counts up from 1 starting with initial power-up.

925 ISSUE 15 - What happens to the event sequence numbers on Shutdown to 'suspend'
926 versus 'power-down'? Are they started over or do they continue? What about a
927 power failure? Are subscriptions automatically Unsubscribed on power up? What
928 about Restart-Printer operation? Or are subscriptions kept across power cycles?
929 Subscription Id shouldn't be re-used on power up, if possible. Or is either behavior
930 implementation dependent? Any recommendations for which?

931

932 ~~ISSUE 7—Should each subscription have a running event counter that increments by 1 so~~
933 ~~that a notification recipient can detect events that arrive out of order? Should we put~~
934 ~~that counter into the 16-bit "request-id" field in the report?~~
935

936 Operation attributes:

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

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

942 Unsupported Attributes Group:

943 Is not sent.

944 Job Object Attributes Group and Printer Object Attributes Group:

945 See section 7.2 and 7.3, respectively.
946

947 'text/plain' - human consumable ~~event report~~notification content type. The text message SHOULD
948 include information about the attributes in section 7.2 for job events or in section 7.3 for
949 ~~device~~printer events. If the charset to be used in the mail message is other than US-ASCII, the
950 /charset parameter must be included in the value of this content-type header and in the ~~event~~
951 ~~report~~notification content [RFC2046].

952 **5.17.2 Basic Job ~~event report~~notification content**

953 This section lists the parameters and attributes that are included in the Basic Job ~~event report~~notification
954 content. Additional job event ~~definitions~~ can be registered which use the Basic Job ~~Event~~
955 ~~report~~Notification content. If additional attributes are needed, additional Job ~~Event Report~~Notification
956 content formats will be defined and assigned a new status code to be used in the report in order to
957 distinguish each report format. For example of another Job ~~Event Report~~Notification content format,
958 see [ipp-prog] for 'job-progress-events'.

959 Each Basic Job notification content contains a single job event, whether that event was subscribed using
960 the Job Submission Subscription mechanism or the Explicit Subscription (Subscribe-Job or Subscribe-
961 Printer). If either kind of subscription subscribed to both job and printer events, then they will be send
962 as separate Basic Job notification content and Basic Printer notification contents (see section 7.3) to the
963 same Notification Recipients.

964 If notification is supported, -the implementation MUST support the following REQUIRED job object
965 attributes, MUST support the following CONDITIONAL job object attributes, if the condition is true,
966 and MAY support the following OPTIONAL job object attributes. Any of the following Job
967 Description attributes that are supported MUST be included in an ~~event report~~notification. All job ~~event~~
968 ~~report~~notifications MUST use the Get-Job-Attributes response syntax.

969 **ISSUE 16 - Should a notification have a response that the Notification Recipient returns to the**
970 **Notification Source like Jini, i.e., a notification is like an operation that has a request and a response,**
971 **instead of just being a one way transfer of information? Should that depend on the URL scheme or a**
972 **URL scheme parameter? Is having responses a Quality of Service that the subscriber can specify?**

973 The Basic Job ~~Event Report~~Notification MUST include the following response parameters and job
974 object attributes. The Job Attributes MAY be in any order:

975	+-----+-----+-----+
976	Job object parameter/attribute REQUIRED reference
977	IN REPORT?
978	+-----+-----+-----+
979	version-number REQUIRED [ipp-mod] 3.1.1
980	+-----+-----+-----+
981	status-code (with the value: REQUIRED [ipp-mod] 3.1.1
982	basic-job-event(600))
983	+-----+-----+-----+
984	request-id (with a 0 value <u>used as sequence number</u> REQUIRED
985	[ipp-mod] 3.1.1
986	<u>see section 7.1</u>
987	+-----+-----+-----+
988	job-printer-uri (uri) REQUIRED [ipp-mod] 4.3.3
989	+-----+-----+-----+
990	job-id (integer(1:MAX)) REQUIRED [ipp-mod] 4.3.2
991	+-----+-----+-----+
992	job-trigger-events REQUIRED 8.3
993	
994	(1setOf type2 keyword)
995	
996	+-----+-----+-----+
997	job-trigger-message* (text(255)) CONDITIONAL 8.4
998	+-----+-----+-----+
999	job-trigger-time (integer(1:MAX)) REQUIRED 8.5
1000	+-----+-----+-----+
1001	job-trigger-date-time (dateTime) RECOMMENDED 8.6
1002	+-----+-----+-----+
1003	job-state (type1 enum) REQUIRED [ipp-mod] 4.3.7
1004	+-----+-----+-----+
1005	previous-job-state (type1 enum) REQUIRED 8.7
1006	+-----+-----+-----+
1007	job-state-reasons REQUIRED [ipp-mod] 4.3.8
1008	(1setOf type2 keyword)
1009	+-----+-----+-----+
1010	previous job-state-reasons <u>added</u> REQUIRED 8.8
1011	
1012	(1setOf type2 keyword)
1013	+-----+-----+-----+
1014	<u>job-state-reasons-deleted</u> REQUIRED 8.9
1015	(<u>1setOf type2 keyword</u>)
1016	+-----+-----+-----+
1017	subscription-id** CONDITIONAL 6
1018	(integer(1:MAX))
1019	+-----+-----+-----+
1020	

Figure 4 - Basic Job ~~Event Report~~ Notification Content

Conditional attributes in the ~~event report~~ notification:

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

1025 ** If ~~Job Independent Subscriptions~~ the Subscribe-Job or Subscribe-Printer operation [ipp-sub] is
1026 implemented and the ~~event-report~~ notification is caused by an ~~independent~~ explicit subscription request,
1027 the "subscription-id" MUST be supplied in the ~~event-report~~ notification content.

1028 If the values of any of the attributes sent in an ~~event-report~~ notification content are not known, the value
1029 sent in the report content is the out-of-band 'unknown' value, rather than omitting the attribute. See [ipp-
1030 mod] section 4.1.

1031 **ISSUE 17 - Should we copy in the [ipp-prog] Job Progress notification content into this Event**
1032 **Notification specification?**

1033 **5.27.3 Basic DevicePrinter ~~event-report~~ notification content**

1034 This section lists the parameters and attributes that are included in the Basic ~~DevicePrinter~~ event
1035 ~~report~~ notification content. Additional ~~deviceprinter~~ events can be registered which use the Basic Job
1036 ~~Event-report~~ Notification content. If additional attributes are needed, additional ~~DevicePrinter~~ Event
1037 ~~report~~ Notification content formats will be registered and assigned a new status code to be used in the
1038 report in order to distinguish each report format.

1039 Each Basic Printer notification content contains a single printer event, whether that event was subscribed
1040 using the Job Submission Subscription mechanism or the Explicit Subscription (Subscribe-Job or
1041 Subscribe-Printer). If either kind of subscription subscribed to both job and printer events, then they
1042 will be send as separate Basic Job notification content (see section 7.2) and Basic Printer notification
1043 contents to the same Notification Recipients.

1044 If notification is supported, the implementation -MUST supported the following REQUIRED attributes,
1045 MUST supported the following CONDITIONAL job object attributes, if the condition is true, and MAY
1046 supported the following OPTIONAL Printer object attributes in any ~~deviceprinter~~ event
1047 ~~report~~ notification. Any of the following Printer Description attributes that are supported MUST be
1048 included in an ~~event-report~~ notification. All ~~deviceprinter~~ event-report notifications MUST use the Get-
1049 Printer-Attributes response syntax. The Basic ~~DevicePrinter~~ Event-Report Notification MUST include
1050 the following response parameters and Printer object attributes. The Printer Attributes MAY be in any
1051 order:

1052	+	-----+	+	-----+
1053		Printer object paramater/attribute		REQUIRED reference
1054				IN REPORT?
1055	+	-----+	+	-----+
1056		version-number		REQUIRED [ipp-mod] 3.1.1
1057	+	-----+	+	-----+
1058		status-code (with the value:		REQUIRED [ipp-mod] 3.1.1
1059		basic- device printer-event(601))		
1060				
1061	+	-----+	+	-----+
1062		request-id (with a 0 value used as sequence number		REQUIRED
1063		[ipp-mod] 3.1.1		
1064		<u>see section 7.1</u>		
1065	+	-----+	+	-----+
1066		printer-uri-supported (uri)		REQUIRED [ipp-mod] 4.4.1
1067	+	-----+	+	-----+
1068		device printer-trigger-events		REQUIRED 9.1
1069		(1setOf -type2 keyword)		
1070				
1071				
1072	+	-----+	+	-----+
1073		device printer-trigger-message*(text(255))		CONDITIONAL 9.2
1074				
1075	+	-----+	+	-----+
1076		device printer-trigger-time		REQUIRED 9.3
1077				
1078		(integer(1:MAX))		
1079	+	-----+	+	-----+
1080		device printer-trigger-date-time(dateTime)		OPTIONAL RECOMMENDED
1081		9.4		
1082	+	-----+	+	-----+
1083		printer-state (type1 enum)		REQUIRED [ipp-mod] 4.4.10
1084	+	-----+	+	-----+
1085		previous-printer-state (type1 enum)		REQUIRED 9.5
1086	+	-----+	+	-----+
1087		printer-state-reasons		REQUIRED [ipp-mod] 4.4.11
1088		(1setOf type2 keyword)		
1089	+	-----+	+	-----+
1090		previous printer-state-reasons- added		REQUIRED 9.6
1091				
1092		(1setOf type2 keyword)		
1093	+	-----+	+	-----+
1094		printer-state-reasons-deleted		REQUIRED 9.6
1095		(1setOf type2 keyword)		
1096	+	-----+	+	-----+
1097		subscription-id** (integer(1:MAX))		CONDITIONAL 6
1098	+	-----+	+	-----+
1099				

Figure 5 - Basic ~~DevicePrinter~~ Event Report~~Notification~~ Content

1101 Conditional attributes in the ~~event report~~notification:

1102 * If "status-message" is supported as an Operation attribute in operation responses, then "~~device~~printer-
1103 trigger-message" MUST be supported in the ~~event-report~~notification content.

1104 ** If ~~Job Independent Subscriptions~~the ~~Subscribe-Printer operation~~ [ipp-sub] is implemented and the
1105 ~~event-report~~notification is caused by an ~~independent-explicit~~ subscription request, the "subscription-id"
1106 MUST be supplied in the ~~event-report~~notification content.

1107 If the values of any of the attributes sent in an ~~event-report~~notification content are not known, the value
1108 sent in the report content is the out-of-band 'unknown' value, rather than omitting the attribute. See [ipp-
1109 mod] section 4.1.

1110 8 Job Description Attributes

1111 The following Job Description attributes are defined for use with notification:

1112 ~~4.18.1~~ **notify-recipients (1setOf uri)**

1113 This REQUIRED **READ-ONLY** attribute describes both where (the address) and how (the delivery
1114 method) ~~event-report~~notifications are to be delivered when any of the events specified in the "notify-
1115 events" attribute occur. The Printer object MUST populate this Job Description attribute from the
1116 corresponding Operation attribute supplied by the client in the create request. See section 5.1.1 for more
1117 description of this attribute.

1118 Note: There is no way to query the recipients that have been subscribed using the Subscribe-Job
1119 operation.

1120 **ISSUE 18 - How many individuals, recipients can be established to be notified of a particular event?**
1121 **The number of recipients should have a minimum number required for support. We did not agree on a**
1122 **such a number. This needs more discussion. If the maximum number required is 1, then clients might**
1123 **not bother supporting more than one recipient in a subscription.**

1124 ~~4.28.2~~ **notify-events (1setOf type2 keyword)**

1125 This REQUIRED **READ-ONLY** attribute identifies the events for which a notification ~~event~~
1126 ~~report~~notification is desired for this job. The Printer object MUST populate this Job Description
1127 attribute from the corresponding Operation attribute supplied by the client in the create request. If the
1128 client does not supply this attribute in a create request, but does supply the "notify-recipients" attribute,
1129 the Printer object populates this attribute with the notify-events-default' event value. See section 5.1.2
1130 for more description of this attribute.

1131 Note: There is no way to query the events that have been subscribed using the Subscribe-Job operation.

1132 ~~4.38.3~~ **job-trigger-events (1setOf type2 keyword)**

1133 This REQUIRED **READ-ONLY** attribute indicates the most recent job event(s) that occurred for this
1134 job. ~~Multiple values MAY be used when more than one event occurs at the same time.~~ In order to
1135 claim conformance to this notification specification, the Printer object MUST support this Job
1136 Description attribute. The Printer object supplies this attribute in every job ~~event-report~~notification that
1137 it sends to a Notification Recipient. This attribute is also available to any client using a Get-Job-

1138 Attributes or Get-Jobs operation for this job. The first job event for a job is the 'job-created' event, so
1139 this Job Description attribute always has a value.

1140 The following events are defined to be disjoint. Therefore, the "job-trigger-event" attribute is single
1141 valued, since two events cannot be sent in the same notification content.

1142 A Printer MUST support the events indicated as "REQUIRED". The standard keyword values are:

1143 **'none'**: REQUIRED - no notifications of any events (an IPP object can use this value to indicate
1144 that it is configured not to support event notification; a client would not subscribe to this event).

1145 **'job-created'**: REQUIRED - the Printer object has accepted the create operation and the job's "job-
1146 time-at-creation" attribute value is set (i.e., when the job is created no matter whether it puts the
1147 job in the 'pending' or 'pending-held' or 'processing' states). The IPP Printer MUST record this
1148 event.

1149 Note: This event is separate from the 'job-state-changed' event so that it can be subscribed to
1150 without having to get every job state change event, for a Notification Recipient that is only
1151 interested in when the job is first created.

1152 **'job-completed'**: REQUIRED - the job has reached one of the completed states, i.e., the value of the
1153 job's "job-state" attribute has changed to: 'completed', 'aborted', or 'canceled'. The job's "time-at-
1154 completed" and/or "date-time-at-completed" attributes are set. The IPP Printer MUST record
1155 this event.

1156 Note: This event is separate from 'job-state-changed' so that it can be subscribed to without
1157 having to get every job state change event, for a Notification Recipient that is only interested in
1158 when the job is completed.

1159
1160 **ISSUE 19** - Should there be more job attributes in the 'job-completed' notification content, such as
1161 "impressions-completed" and "sheets-completed"?

1162
1163 **'job-state-changed'**: the job has changed from any state or state-reason to any other state or state-
1164 reason, except when the job is created or when the job moves to any of the "completed" job
1165 states, i.e., the value of the job's "job-state" attribute changes to any value, except 'completed',
1166 'aborted', or 'canceled'. ~~Therefore, this event include neither the 'job-created' nor the 'job-~~
1167 ~~completed' event.~~

1168
1169 This event also indicates that one or more values have been added to or removed from the Job's
1170 "job-state-reasons" attribute, such as 'job-queued' or 'job-printing', whether or not the job's state
1171 has changed. If job state reasons are added when the job is created, only the 'job-created' event is
1172 generated, in order to keep the events disjoint. If job state reasons are added or removed when
1173 the job is completed, only the 'job-completed' event is generated, in order to keep the events
1174 disjoint. This event is REQUIRED to be recorded if the job-state-reason is an error.

1175
1176 A client that wants to subscribe to all job state changes, including creation and completion,
1177 includes the 'job-created', 'job-state-changed', and 'job-completed' in the notification subscription.
1178 When a job is finally removed from the Job History (see [ipp-mod] 4.3.7.1) no event is
1179 generated, i.e., neither a 'job-state-changed' event nor a 'job-purged' event is generated.

1180 **ISSUE 20** - Should 'job-state-changed' event be REQUIRED to support, since 'printer-state-
1181 changed' is?

1182

1183 ~~'job-state-reasons-changed': one or more values have been added to or removed from the Job's~~
1184 ~~"job-state-reasons" attribute, such as 'job-queued' or 'job-printing'. This event often happens at~~
1185 ~~the same time as a 'job-state-changed' or 'job-completed' event, but can also happen when there is~~
1186 ~~no change in job state. This event is REQUIRED to be recorded if the job-state-reason is an~~
1187 ~~error.~~

1188 'job-config-changed' – when the configuration of a job has changed, i.e., the value of the "job-
1189 message-from-operator" or any of the non-READ-ONLY Job attributes have changed, such as
1190 any of the job template attributes or the "job-name" attribute. The client would have to perform
1191 a Get-Job-Attributes to find out the new values of the changed attributes. This event would be
1192 useful for GUI clients and drivers to update the job information to the user.

1193 **'job-purged'**: when a 'not-completed' job was purged from the printer using the Purge-Jobs
1194 operation. No event, including this event, is generated when a job is aged out of the Job History.

1196 ISSUE 21 - any other job events to be defined and added?

1197 ISSUE 22 - should any more events be REQUIRED to be supported?

1198

1199 1.48.4 ***job-trigger-message (text(255))***

1200 This OPTIONAL **READ-ONLY** attribute provides a short textual description of the most recent job
1201 event(s). The "job-trigger-events" attribute is intended for use by automata, and the "job-trigger-
1202 message" is intended for the human end user. If job-trigger-events is multi-valued, then it is left up to
1203 the implementation if it concatenates event messages or combines the events to provide a single
1204 message.

1205 If the Printer object supports the "job-trigger-message" Job Description attribute, the Printer object
1206 MUST be able to generate this message in any of the natural languages identified by the Printer object's
1207 "generated-natural-language-supported" attribute (see the "attributes-natural-language" operation
1208 attribute specified in [ipp-mod] section 3.1.4.1). As described in [ipp-mod] section 3.1.4.1 for any
1209 returned 'text' attribute, if there is a choice for generating this message, the Printer object uses the natural
1210 language indicated by the value of the "attributes-natural-language" in the client create request if
1211 supported, otherwise the Printer object uses the value in the Printer object's own "natural-language-
1212 configured" attribute.

1213 1.58.5 ***job-trigger-time (integer(MIN:MAX))***

1214 This REQUIRED **READ-ONLY** attribute indicates the point in time specified in seconds since the
1215 **deviceprinter** was last started at which the most recent job event occurred for this job. In order to
1216 populate this attribute, the Printer object uses the value in its "printer-up-time" attribute at the time the
1217 event occurred. Since the **deviceprinter** could support persistent jobs, a value of zero or less is available
1218 to show that the last event occurred before the last **deviceprinter** restart.

1219 In order to claim conformance to this notification specification, the Printer object MUST support this
1220 Job Description attribute. The Printer object MUST supply -this attribute in every **event**
1221 **reportnotification** that it sends to a notification recipient. This attribute is also available to any client
1222 using a Get-Job-Attributes or Get-Jobs operation for this job. The first job event for a job is the 'job-
1223 received' event when the job is created. Therefore, this job attribute always has a value.

1224 If IPP Printers relay jobs to other IPP Printers, the time of the event is intended to be at the IPP Printer
1225 object at which the event occurred, not subsequent times of relaying jobs in the forward direction or
1226 relaying notification ~~event reports~~ in the reverse direction. Therefore, each Printer along the
1227 request/response path MUST adjust the values of the time tick attributes accordingly.

1228 **4.68.6 *job-trigger-date-time (dateTime)***

1229 This OPTIONAL **READ-ONLY** attribute indicates the point in time at which the most recent job event
1230 occurred for this job. In order to claim conformance to this notification specification, the Printer object
1231 MUST support this Job Description attribute if it also supports the "printer-current-time" Printer
1232 Description attribute (which also requires a date). The Printer object MUST supply ~~this~~ attribute in
1233 every ~~event report~~ **notification** that it sends to a notification recipient, if it supports this attribute. This
1234 attribute is also available to any client using a Get-Job-Attributes or Get-Jobs operation for this job. The
1235 first job event for a job is the 'job-received' event when the job is created. Therefore, this job attribute
1236 always has a value.

1237 If IPP Printers relay jobs to other IPP Printers, the time of the event is intended to be at the IPP Printer
1238 object at which the event occurred, not subsequent times of relaying jobs in the forward direction or
1239 relaying notification ~~event reports~~ in the reverse direction. However, since the date and time are
1240 absolute, each Printer does not need to change the values of the dateTime attributes as they are passed
1241 along the request/response path.

1242 **4.78.7 *previous-job-state (type1 enum)***

1243 This REQUIRED **READ-ONLY** attribute contains the previous state of the job, i.e., the value of the
1244 job's "job-state" attribute before the event occurred. See [ipp-mod] section 4.3.7 for the description of
1245 the values for this attribute. In an ~~event report~~ **notification**, the "job-state" attribute contains the current
1246 state of the job, i.e., the state of the job after the event occurred. This attribute is also available to any
1247 client using a Get-Job-Attributes or Get-Jobs operation for this job.

1248 **6.88.8 *job-state-reasons-added (1setOf type2 keyword)***

1249 This REQUIRED **READ-ONLY** attribute contains the ~~previous~~ values of the job's "job-state-reasons"
1250 attribute ~~which were added since the last 'job-state-change' event for this job~~ **job state or state reason**
1251 **notification, i.e., the values before the event occurred.** See [ipp-mod] section 4.3.8 for the description of
1252 the values for this attribute. In an ~~event report~~ **notification**, the "job-state-reasons" attribute contains the
1253 current values of the job's "job-state-reasons" attribute, i.e., the values after the event occurred. This
1254 attribute is also available to any client using a Get-Job-Attributes or Get-Jobs operation for this job.

1255 **ISSUE 23 - What meaning do the -added and -deleted job state reason attributes have for the 'job-**
1256 **completed' notification? Is that a problem? What about other events, besides 'job-config-change'?**

1257 **4.98.9 *job-state-reasons-deleted (1setOf type2 keyword)***

1258 **This REQUIRED READ-ONLY attribute contains the values of the job's "job-state-reasons" attribute**
1259 **which were deleted since the last 'job-state-change' event for this job** **job state or state reason**
1260 **notification. See [ipp-mod] section 4.3.8 for the description of the values for this attribute. In a**
1261 **notification, the "job-state-reasons" attribute contains the current values of the job's "job-state-reasons"**

1262 attribute, i.e., the values after the event occurred. This attribute is also available to any client using a
 1263 Get-Job-Attributes or Get-Jobs operation for this job.

1264 **ISSUE 24 - Should we copy in the [ipp-prog] Job Progress Job Description attributes and notification**
 1265 **format into this Event Notification specification?**

1266 9 Printer Description Attributes

1267 The following Printer Description attributes are defined for use with notification:

1268 7.19.1 printerdevice-trigger-events (~~1setOf~~ type2 keyword)

1269 This **REQUIRED READ-ONLY** attribute indicates the most recent `deviceprinter` event(s) that occurred
 1270 for this `devicePrinter`. ~~Multiple values MAY be used when more than one event occurs at the same time.~~
 1271 In order to claim conformance to this notification specification, the Printer object **MUST** support this
 1272 Printer Description attribute. The Printer object supplies- this attribute in every `deviceprinter event`
 1273 ~~reportnotification~~ that it sends to a notification recipient. This attribute is also available to any client
 1274 using a Get-Printer-Attributes request for this Printer object. The first `deviceprinter` event for a
 1275 `devicePrinter` is 'powered-up', so this printer attribute always has a value. When all the Job Submission
 1276 Subscriptions from a particular Notification Recipient on a `deviceprinter` expire, and that recipient has
 1277 no ~~Job-Independent-Explicit~~ Subscriptions on this `devicePrinter`, the `deviceprinter event`
 1278 ~~reportnotification~~s are no longer sent to that Notification Recipient.

1279 The following events are defined to be disjoint. Therefore, the "printer-trigger-event" attribute is single
 1280 valued, since two events cannot be sent in the same notification content.

1281 A Printer **MUST** support the events indicated as "REQUIRED". The standard keyword values are:

1282 `DevicePrinter`-report events include:

1283 'none' - REQUIRED - no notification of any events (an IPP object can use this value to indicate
 1284 that it is configured not to support event notification; a client would not subscribe to this
 1285 event.

1286 '~~deviceprinter-restarted~~**powered-up**' - when the `deviceprinter` is powered up or the Restart-
 1287 Printer operation is performed (see [ipp-adm]). The IPP Printer MUST record this event.
 1288 Note: This event is separate from the 'printer-state-changed' event so that it can be
 1289 subscribed to without having to get every printer state change event, for a Notification
 1290 Recipient that is only interested in when the Printer first comes up.

1291 ~~ISSUE 11: Need to add restarted job state reason to combine this event with printer state-~~
 1292 ~~change.~~

1293 '~~device-powering-down~~**printer-shutdown**' - when the device is being powered down or the
 1294 Shutdown-Printer operation has been performed with either power-off or standby options
 1295 (see [ipp-adm]).

1296 Note: This event is separate from 'printer-state-changed' so that it can be subscribed to
 1297 without having to get every Printer state change event, for a Notification Recipient that is
 1298 only interested in when the Printer is powered down or shutdown. ~~(Moved to printer state-~~
 1299 ~~change with printer state reason of shutdown)~~

1300 '**deviceprinter-state-changed**' - REQUIRED - the `devicePrinter` changed state, i.e., the value of
 1301 the Printer's "printer-state", "printer-state-reasons", and/or "printer-is-accepting-jobs"
 1302 attributes changed, except when the Printer starts up or is shutdown. If the "printer-state-

1303 reasons" changed, then one or more values have been added to or removed from the Printer's
1304 "printer-state-reasons" attribute, such as 'moving-to-paused' or 'connecting-to-printer'.

1305
1306 This event also indicates that one or more values have been added to or removed from the
1307 Printer's "printer-state-reasons" attribute, such as 'moving-to-paused', 'toner-low', or 'media-
1308 jam', whether or not the Printer's state has changed. If printer state reasons are added when
1309 the Printer is started up, only the 'printer-restarted' event is generated, in order to keep the
1310 events disjoint. If printer state reasons are added or removed when the printer is powered-
1311 down or shutdown, only the 'printer-shutdown' event is generated, in order to keep the events
1312 disjoint. This event is REQUIRED to be recorded if the printer-state-reason is an error.

1313
1314 A client that wants to subscribe to all printer state changes, including restart and power-
1315 down/shutdown, includes the 'printer-restarted', 'printer-state-changed', and 'printer-
1316 shutdown' in the notification subscription.

1317 ~~'device-state-reason-changed'~~ one or more values have been added to or removed from the
1318 Printer's "printer-state-reasons" attribute, such as 'moving-to-paused' or 'connecting-to-
1319 device'. This event is REQUIRED to be recorded if the job-state-reason is an error

1320 **'deviceprinter-media-changed'** – when the media loaded on a **deviceprinter** has been changed.
1321 The client must check the "media-ready" Printer attribute (see [ipp-mod] section 4.2.11)
1322 separately to find out what new media was loaded.

1323 **'deviceprinter-config-changed'** – when the configuration of a **devicePrinter** has changed,
1324 e.g.i.e., the value of the "printer-message-from-operator" or any non-READ-ONLY Printer
1325 attribute has changed, except for "media-ready" (which has its own event), whether through
1326 the Set-Printer-Attributes operation or by other means and whether initiated by a human or
1327 not. For example, any "xxx-supported", "xxx-default", "printer-message-from-operator", etc.
1328 values or the Printer's "printer-is-accepting-jobs" attribute value has yes changed. The client
1329 would have to perform a Get-Printer-Attributes to find out the new values of these changed
1330 attributes. This event would be useful for GUI clients and drivers to update the available
1331 deviceprinter capabilities to the user.

1332 **'ready-for-jobprinter-no-longer-full'** – when there is more than one client feeding a
1333 printer/server (fan-in), and the Printer may still printing but has acquired more buffer space
1334 to accept jobs. This event only occurs when the Printer did not have room to accept jobs
1335 previously and rejected a Print-Job, Print-URI, Create-Job, Send-Document, or Send-URI
1336 operation.

1337 **'ready-for-just-in-time-jobprinter-almost-idle'** – when a spooler is feeding more than one
1338 printer/server (fan-out), and the spooler holds jobs until a Printer requests them, rather than
1339 committing jobs to ~~devices-IPP Printers~~ before it is necessary. This event MAY be used for a
1340 printer to request a new job from any subscribers sufficiently ahead of time so that the device
1341 does not run out of work between jobs.

1342 7.29.2 printerdevice-trigger-message (text(255))

1343 This OPTIONAL READ-ONLY attribute provides a short textual description of the most recent
1344 **deviceprinter** event(s). The "deviceprinter-trigger-events" attribute is intended for use by automata, and
1345 the "deviceprinter-trigger-message" is intended for the human end user. If **deviceprinter-trigger-events** is
1346 multi-valued, then it is left up to the implementation if it concatenates event messages or combines the
1347 events to provide a single message.

1348 ~~ISSUE 10—Ok if "device-trigger-message" stays as a single value while "device-trigger-event" is multi-~~
1349 ~~valued? When there are multiple codes, the message contains the concatenation of the messages or is a~~
1350 ~~combined message, depending on implementation.~~

1351 If the Printer object supports the "[deviceprinter](#)-trigger-message" Printer Description attribute, the
1352 Printer object MUST be able to generate this message in any of the natural languages identified by the
1353 Printer object's "generated-natural-language-supported" attribute (see the "attributes-natural-language"
1354 operation attribute specified in [ipp-mod] section 3.1.4.1). As described in [ipp-mod] section 3.1.4.1 for
1355 any returned 'text' attribute, if there is a choice for generating this message, the Printer object uses the
1356 natural language indicated by the value of the "attributes-natural-language" in the client create request if
1357 supported, otherwise the Printer object uses the value in the Printer object's own "natural-language-
1358 configured" attribute.

1359 **7.39.3 [printerdevice-trigger-time](#) (integer(MIN:MAX))**

1360 This REQUIRED [READ-ONLY](#) attribute indicates the point in time specified in seconds since the
1361 [deviceprinter](#) was last started at which the most recent printer event occurred for this [deviceprinter](#). In
1362 order to populate this attribute, the Printer object uses the value in its "printer-up-time" attribute at the
1363 time the event occurred. Since the [deviceprinter](#) could possibly store its most recent event(s), a value of
1364 zero or less is available to show that the last event occurred before the last [deviceprinter](#) restart.

1365 In order to claim conformance to this notification specification, the Printer object MUST support this
1366 Printer Description attribute. The Printer object MUST supply this attribute in every [event](#)
1367 [reportnotification](#) that it sends to a notification recipient. This attribute is also available to any client
1368 using a Get-Printer-Attributes request for this Printer object. The first printer event for a Printer is when
1369 it is powered up. Therefore, this printer attribute always has a value.

1370 If IPP Printers relay jobs to other IPP Printers, the time of the event is intended to be at the IPP Printer
1371 object at which the event occurred, not subsequent times of relaying jobs in the forward direction or
1372 relaying notification [event reports](#) in the reverse direction.

1373 **7.49.4 [printerdevice-trigger-date-time](#) (dateTime)**

1374 This OPTIONAL [READ-ONLY](#) attribute indicates the point in time at which the most recent printer
1375 event occurred for this [deviceprinter](#). In order to claim conformance to this notification specification,
1376 the Printer object MUST support this Printer Description attribute if it also supports the "printer-current-
1377 time" Printer Description attribute (which also requires a date). The Printer object MUST supply this
1378 attribute in every [event-reportnotification](#) that it sends to a notification recipient, if it supports this
1379 attribute. This attribute is also available to any client using a Get-Printer-Attributes request for this
1380 Printer object. The first printer event for a Printer is when it is powered up. Therefore, this printer
1381 attribute always has a value.

1382 If IPP Printers relay jobs to other IPP Printers, the time of the event is intended to be at the IPP Printer
1383 object at which the event occurred, not subsequent times of relaying jobs in the forward direction or
1384 relaying notification [event reports](#) in the reverse direction.

1385 **7.59.5 [previous-printer-state](#) (type1 enum)**

1386 This REQUIRED [READ-ONLY](#) attribute contains the previous state of the [deviceprinter](#), i.e., the value
1387 of the Printer's "printer-state" attribute before the event occurred. See [ipp-mod] section 4.4.11 for the

1388 description of the values for this attribute. In an [event-report-notification](#), the "printer-state" attribute
1389 contains the current state of the [device-printer](#), i.e., the state of the [device-printer](#) after the event occurred.

1390 **1.69.6 printer-state-reasons-added~~previous-printer-state-reasons~~ (1setOf type2**
1391 **keyword)**

1392 This REQUIRED **READ-ONLY** attribute contains the [previous](#)-values of the [job's-printer's](#) "[job-printer-](#)
1393 [state-reasons](#)" attribute [that were added since the last 'printer-state-changed' event for this](#)
1394 [Printer-notification, i.e., the values of the Printer's "printer-state-reasons" attribute before the event](#)
1395 [occurred.](#) See [ipp-mod] section 4.4.12 for the description of the values for this attribute. In an [event](#)
1396 [report-notification](#), the "printer-state-reasons" attribute contains the current values of the [device-Printer's](#)
1397 "printer-state-reasons" attribute, i.e., the values after the event occurred.

1398 **ISSUE 25 - What meaning do the -added and -deleted job state reason attributes have for the 'printer-**
1399 **shutdown' notification? Is that a problem? What about other events, besides 'printer-config-change'?**

1400 **1.79.7 printer-state-reasons-deleted (1setOf type2 keyword)**

1401 [This REQUIRED READ-ONLY attribute contains the values of the printer's "printer-state-reasons"](#)
1402 [attribute that were deleted since the last 'printer-state-changed' event notification. See \[ipp-mod\] section](#)
1403 [4.4.12 for the description of the values for this attribute. In a notification, the "printer-state-reasons"](#)
1404 [attribute contains the current values of the printer's "printer-state-reasons" attribute, i.e., the values after](#)
1405 [the event occurred.](#)

1406 **1.89.8 notify-recipients-schemes-supported (1setOf uriScheme)**

1407 This **REQUIRED** attribute describes the notification delivery methods supported by this Printer object.
1408 Standard values are defined in Section 5.1.1). In order to claim conformance to this notification
1409 specification, the Printer object MUST support this Printer Description attribute.

1410 **1.99.9 notify-events-default (1setOf type2 keyword)**

1411 This **REQUIRED** attribute identifies the event values if the client does not supply the "notify-events"
1412 operation attribute. All the values in this attribute must also appear in the notify-events-supported
1413 attribute.

1414 **1.109.10 notify-events-supported (1setOf type2 keyword)**

1415 This **REQUIRED** attribute identifies the events supported by this Printer object. In order to claim
1416 conformance to this notification specification, the Printer object MUST support this Printer Description
1417 attribute. Standard values are defined in Section 5.1.2.

1418 **1.119.11 notify-lease-time-supported (rangeOfInteger(0:MAX))**

1419 [This Printer attribute specifies the range of values in seconds that are supported for the "notify-lease-](#)
1420 [time" operation attribute. A Printer MUST support this attribute if it supports the Subscribe-Printer](#)
1421 [operation. See section 6.2.2 for the behavior if the client-supplied value is outside this range.](#)

1422 **4.129.12 notify-lease-time-default (integer(0:MAX))**

1423 This Printer attribute specifies the value of the lease time that the Printer object has been configured to
1424 assume if the client does not supply a "notify-lease-time" operation attribute in the Subscribe-Printer or
1425 Renew-Subscription operations. A Printer MUST support this attribute if it supports the Subscribe-
1426 Printer operation.

1427 **4.139.13 number-of-subscriptions-supported (integer(1:MAX))**

1428 This OPTIONAL attribute identifies the number of explicit subscriptions using the Subscribe-Printer
1429 operation that this Printer object can handle at once. The Printer object MUST support this Printer
1430 Description attribute, if it supports the Subscribe-Printer operation.

1431 NOTE: An event for subscription expiration is not defined. It is the client's responsibility to set up a
1432 renew timer. Such a timer will not depend on the reliability of notification delivery, and so will be more
1433 reliable.

1434 **10 Conformance Requirements**

1435 This section further enhances the Conformance Requirements detailed in [IPP-MOD] section 5.
1436 Extensions made to the events herein must be made such that new events or event attributes are
1437 backward compatible to clients who implemented early versions of this notification specification.

1438 It is OPTIONAL to implement this Event Notification specification. If implemented, IPP objects MUST
1439 support all of the REQUIRED object attributes as defined in this document in the indicated sections.

1440 If an object supports an attribute, it MUST support only those values specified in this document or
1441 through the extension mechanism described in [IPP-MOD] section 5.2.4.

1442 If IPP Notification is implemented, it is OPTIONAL to support the "Explicit Subscriptions" operations.
1443 If "Explicit Subscriptions" is implemented, the operations described in this document must be supported
1444 as described below:

1445 Subscribe-Job (section 6.1) OPTIONAL
1446 Subscribe-Printer (section 6.2) REQUIRED
1447 Renew-Subscription (section 6.3) REQUIRED
1448 Unsubscribe-Printer (section 6.4) REQUIRED

1449
1450 **ISSUE 26 - Can there be registered event extensions as well as private event extensions?**
1451

1452 **11 Security Considerations**

1453 **ISSUE 27 - Waiting for security requirements in the IPP/1.1 Notification Requirements, such as**
1454 **authorization and authentication for Renew-Subscription and Unsubscribe.**

1455 **12 Status Codes**

1456 Add the following status codes ~~s~~ for handling the error in the "notify-recipients" operation attribute:

1457 **4.12.1 client-error-uri-scheme-not-supported (0x04??)**

1458 The scheme of the client-supplied URI in a "notify-recipients" operation attribute in a create [job](#),
1459 [Subscribe-Job](#), or [Subscribe-Printer](#) operation is not supported. See [ipp-mod] section 3.1.7.

1460 **4.212.2 server-error-too-many-subscriptions (0x04??)**

1461 [The bounded set of concurrent subscriptions on the Printer object using Subscribe-Printer has been](#)
1462 [exceeded.](#)

1463 **13 References**

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1501

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1549 15 Appendix A: Registration Forms to be filled out and submitted to IANA

1550 15.1 Registration of *ipp-tcp-notify* scheme for use with IPP

1551 This appendix contains the information that IANA requires for registering a URL scheme for use with
1552 the "application/ipp" MIME media type. The information following this paragraph will be forwarded to
1553 IANA to register 'ipp-tcp-notify' whose contents are defined in Section 5.1.1 "notify-recipients (1setOf
1554 uri)" in this document:

1555 **TBD**

1556

1557 **Required parameters:** none

1558 **Optional parameters:** none

1559 **Encoding considerations:**

1560 **Security considerations:**

1561 IPP/1.0 protocol requests/responses do not introduce any security risks not already inherent in the
1562 underlying transport protocols. Protocol mixed-version interworking rules in [ipp-mod] as well as
1563 protocol encoding rules in [ipp-pro] are complete and unambiguous.

1564 **Interoperability considerations:**

1565 **TBD**

1566

1567 **Published specification:**

1568 [ipp-not] Isaacson, S., Martin, J., deBry, R., Hastings, T., Shepherd, M., "Internet Printing Protocol/1.0
1569 & 1.1: IPP Event Notification" draft-ietf-ipp-notification-020.txt, May, 1999.

1570 **Applications which use this URL scheme:**

1571 **TBD**

1572 **Person & email address to contact for further information:**

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1581 **4.215.2 Registration of ipp-udp-notify scheme for use with IPP**

1582 This appendix contains the information that IANA requires for registering a URL scheme for use with
1583 the "application/ipp" MIME media type. The information following this paragraph will be forwarded to
1584 IANA to register 'ipp-udp-notify' whose contents are defined in Section 5.1.1 "notify-recipients (1setOf
1585 uri)" in this document:

1586 **TBD**

1587

1588 **Required parameters:** none

1589 **Optional parameters:** none

1590 **Encoding considerations:**

1591 **Security considerations:**

1592 IPP/1.0 protocol requests/responses do not introduce any security risks not already inherent in the
1593 underlying transport protocols. Protocol mixed-version interworking rules in [ipp-mod] as well as
1594 protocol encoding rules in [ipp-pro] are complete and unambiguous.

1595 **Interoperability considerations:**

1596 **TBD**

1597

1598 **Published specification:**

1599 [ipp-not] Isaacson, S., Martin, J., deBry, R., Hastings, T., Shepherd, M., "Internet Printing Protocol/1.0
1600 & 1.1: IPP Event Notification" draft-ietf-ipp-notification-020.txt, May, 1999.

1601 **Applications which use this URL scheme:**

1602 **TBD**

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1611 Email: hastings@cp10.es.xerox.com1612 **15.3 Registration of multipart/report type, 'print-notification'**

1613 We may have to register a particular report sub-type for use with 'multipart/report' [RFC 1892]. See
1614 RFC 2298 for a similar kind of registration. **The use of 'multipart/report' needs more understanding and**
1615 **work.**

1616 **16 Appendix B: Change History**

1617 Changes are listed in reverse chronological order:

1618 **16.1 Changes to the July 21, 1999 to make the July 22, 1999 (T Hastings)**

1619 1. Added the REQUIRED "initial-sequence-numbers" (1setOf integer(1:MAX)) to the Subscribe-
1620 Printer response to indicate the sequence number to be used in the first notification for each event
1621 subscribed.

1622 2. Added a number of issues and renumbered.

1623 **~~4.1~~16.2 Changes to the July 20, 1999 to make the July 21, 1999 (T Hastings)**1624 The following changes were made to the July 20, 1999 to make the July 21, 1999 version:

1625 1. Changed the "job-trigger-events (1setOf type2 keyword)" Job Description attribute "job-trigger-
1626 event (type2 keyword), since events cannot be batched in a notification.

1627 2. Changed the "printer-trigger-events (1setOf type2 keyword)" Printer Description attribute "printer-
1628 trigger-event (type2 keyword), since events cannot be batched in a notification.

1629 3. Changed Subscribe-Job from REQUIRED to OPTIONAL if implementing "Explicit Subscription".

1630 4. Clarified that events are defined to be disjoint, since the job-trigger-event is now single-valued.
1631 Thus only the 'job-created' event is generated even if job state reasons are added. Similarly, only the
1632 'job-completed' event is generated even if job state reasons are added or removed.

1633 5. Indicated which Job Description and Printer Description attributes are READ-ONLY, i.e., MUST
1634 NOT be settable with Set-Job-Attributes or Set-Printer-Attributes operations.

1635 6. Clarified which Job attributes cause 'job-config-changed' event: "job-message-from-operator" and
1636 any non-READ-ONLY Job attributes.

- 1637 7. Clarified which Printer attributes cause 'printer-config-changed' event: "printer-message-from-
1638 operator" and any non-READ-ONLY Printer attributes, except "media-ready" which has its own
1639 event.
- 1640 8. Renamed 'ready-for-job' event to 'printer-is-no-longer-full' and clarified that it is generated only
1641 when a previous Print-Job, Print-URI, Create-Job, Send-Document, or Send-URI operation had been
1642 rejected due to no more room.
- 1643 9. Renamed 'ready-for-just-in-time-job' to 'printer-almost-idle', to make it clearer how this event differs
1644 from 'printer-is-no-longer-full'.
- 1645 10. Kept 'printer-shutdown' and 'printer-restarted' as separate and disjoint from 'printer-state-changed'
1646 event, so that they can be subscribed without having to get all state change events. Also parallel
1647 with 'job-created', 'job-state-change', and 'job-completed'. Also clarified that shutdown means either
1648 using the Shutdown-Printer operation with 'standby' or 'power-down' options or power-down by
1649 other means. Same for 'printer-restarted' being with the Restart-Printer operation or a power-up
1650 sequence.

1651 **16.3 Changes to the May 18, 1999 to make the July 20, 1999 (M Shepherd)**

1652 The following changes were made to the May 18, 1999 to make the July 20, 1999 version:

- 1653 1. Added new section Conformance Requirements
- 1654 2. Changed 'event report' to 'notification'
- 1655 3. Changed 'request-id' to be used as a sequence number inside each notification.
- 1656 4. Combined job-state-changed and job-state-reason-change into one notification trigger-event.
- 1657 5. Combined printer-state-changed and printer-state-reason-change into one notification trigger event.
- 1658 6. Added "job-config-changed" event
- 1659 7. Moved "device-powering-down" event to be encompassed by "printer-state-change"
- 1660 8. Combined this spec with the Job Independent Subscriptions spec (which was renamed to Explicit
1661 Subscriptions).
- 1662 9. Added operation Subscribe-Job.
- 1663 10. Added server-error-too-many-subscriptions to Status Codes.

1664 **4.216.4 Changes to the May 17, 1999 to make the May 18, 1999 (T Hastings, R Bergman)**

- 1665 1. Removed concept of event groups. Subscribe to individual events. Much simpler. The event
1666 determines what data is sent in the event report. Also allows the client to query the [deviceprinter](#) to
1667 see what events are supported, rather than which groups.
- 1668 2. Replaced all of the job state transition events with a single 'job-state-changed' event. The report
1669 contains the old job state and the new job state.
- 1670 3. Removed the notification-format attribute to keep the proposal simple.
- 1671 4. Added the 'client-error-notify-uri-scheme-not-supported' status code.

- 1672 5. Added REQUIRED "previous-job-state", "previous-job-state-reasons", previous-printer-state", and
1673 "previous-printer-state-reasons" Job Description attributes.
- 1674 6. Removed the "job-impressions-completed" from the Basic Job Event Report Content. Bring it back
1675 with the "job-progress" events.
- 1676 7. Removed the "printer-is-accepting-jobs" from the Basic Printer Event Report Content. Its changing
1677 is part of the "config-change" event.
- 1678 8. Changed the 'job-state-changed' event, so that it doesn't include 'job-created', 'job-completed', or 'job-
1679 purged' events.
- 1680 9. Made the event names mostly consistent by being in the past tense to reflect the fact that events
1681 reports happen after the internal event has completed.
- 1682 10. Combined the 'job-state-reasons-added' and 'job-state-reasons-removed' into a single event: 'job-
1683 state-reasons-changed'. Same for '~~device~~printer-state-reasons-changed'.
- 1684 11. Changed 'mailto' notification method to REQUIRE 'multipart/report' which all mail agents
1685 understand, at least the text part.
- 1686 12. Deleted the 'job-warning' and 'job-error' events, since they are covered by the 'job-state-reasons-
1687 changed, 'job-state-changed' and/or 'job-completed' events.

1688 **12.216.5 Changes to the January 20, 1999 to make the May 17, 1999 version (M**
1689 **Shepherd)**

- 1690 1. Changed references to IPP 1.0 to IPP 1.1
- 1691 2. Implementing the notification specification is optional.
- 1692 3. Refined the definition of Event
- 1693 4. Changed 'notification report' to 'event report' for consistent terminology
- 1694 5. Changed the terminology of an 'active' job to 'not-complete'. Included the 'pending-held' state in the
1695 'not-complete' super-state.
- 1696 6. Introduced notify-event-groups-default.
- 1697 7. Changed job-trigger-message and job-impressions-completed to be CONDITIONAL in the event
1698 report, job-trigger-date-time to be RECOMMENDED, and job-state-reasons to be REQUIRED.
- 1699 8. Changed ~~device~~printer-trigger-message to be CONDITIONAL in the event report, and printer-state-
1700 reasons to be REQUIRED.
- 1701 9. Created a table to map job-trigger-events keywords to event-groups and required status.
- 1702 10. Modified job-continued to be job-resumed-processing, and job-received to be job-created. Added
1703 job-purged, job-state-reason-removed, and job-state-reason-added keywords.
- 1704 11. Modified job-trigger-time and ~~device~~printer-trigger-time to use values less than zero.
- 1705 12. Created a table to map ~~device~~printer-trigger-events keywords to event-groups and their required
1706 status.
- 1707 13. Added ready-for-job and ~~device~~printer-state-reason-added to ~~device~~printer-trigger-events keywords.

- 1708 14. Updated References section
- 1709 15. Added notify-format and notify-format-supported attributes.
- 1710 16. Added subscription-id to the event report attributes of job and [deviceprinter](#).
- 1711 17. Made job-errors-basic and [deviceprinter](#)-errors-basic REQUIRED to be supported.
- 1712 18. Added [deviceprinter](#)-media-changed, [deviceprinter](#)-config-changed, and ready-for-just-in-time-job
- 1713 to [deviceprinter](#) events.
- 1714 19. Added Author's Addresses.

1715 **12-316.6 Changes to the January 18, 1999 to make the January 20, 1999 version**

1716 The following changes were made to the January 18, 1999 to make the January 20, 1999 version:

- 1717 1. Made this an INTERNET-DRAFT.
- 1718 2. Indicated that a new default port is needed for the delivery methods.
- 1719 3. Added Appendices in which to put the registration information for the URL schemes for each
- 1720 delivery method.
- 1721 4. Clarified which parameters, Operation attributes, and Job/Printer attributes are supplied in an event
- 1722 content: the request-id is 0, the status-code is new 'job-event' 0x600 or '[deviceprinter](#)-event' 0x601.
- 1723 5. Changed "job-trigger-event" and "[deviceprinter](#)-trigger-event" to be 1setOf so that multiple events
- 1724 that occur at the same time MAY be send as one event content.
- 1725 6. Added "job-trigger-time" as a REQUIRED Job Description and event content attribute which is in
- 1726 seconds since power up.
- 1727 7. Changed "job-trigger-date-time" and "job-state-reasons" to OPTIONAL.
- 1728 8. Changed "status-message" to be an OPTIONAL "job-trigger-message" event content attribute and
- 1729 also made it a Job Description attribute.
- 1730 9. Added "[deviceprinter](#)-trigger-time" as a REQUIRED Printer Description and event content attribute
- 1731 which is in seconds since power up.
- 1732 10. Changed "[deviceprinter](#)-trigger-date-time" and "printer-state-reasons" to OPTIONAL.
- 1733 11. Changed "status-message" to be an OPTIONAL "[deviceprinter](#)-trigger-message" event content
- 1734 attribute and also made it a Printer Description attribute.
- 1735 12. Removed the "job-id" attribute from the [deviceprinter](#) event content.

1736 **12-416.7 Changes to the December 10, 1998 to make the January 18, 1999 version**

1737 The following changes were made to the December 10, 1998 to make the January 18, 1999 version:

- 1738 1. Changed the names of the REQUIRED notify-recipient keywords from: 'ipp-tcp-socket' and 'ipp-
- 1739 udp-socket' to 'ipp-tcp-notify' and 'ipp-udp-notify'.
- 1740 2. Added '-notify' to the OPTIONAL 'snmpv1', 'snmpv2', and 'snmpv3' delivery method names.
- 1741 3. Changed the OPTIONAL 'sense-datagram' to 'sense-notify' to be consistent.

- 1742 4. Added 'ndps-notify' as an OPTIONAL keyword.
- 1743 5. Deleted the 'all-basic', 'all-job-events-basic', and 'all-~~device~~printer-events-basic'. Clients should be
1744 explicit about which groups they want. If new groups are added, the clients won't know what to do
1745 with them, if they had subscribed to 'all-xxx' groups.
- 1746 6. Changed the names of "job-last-event" and "job-last-date-time-of-event" to "job-trigger-event" and
1747 "job-trigger-date-time" events, since the events trigger the notification delivery, but the attribute
1748 values remain after the event has been delivered.
- 1749 7. Added "status-message" as an OPTIONAL event report content attribute.
- 1750 8. Changed "job-impressions-completed" to OPTIONAL.
- 1751 9. Indicated that OPTIONAL attributes are not sent in the event report content if they are not
1752 supported.
- 1753 10. Required that "status-message" and/or "job-impressions-completed" be sent in an event report
1754 content if they are supported as an Operation attribute and a Job Description attribute, respectively.
- 1755 11. Added REQUIRED "~~device~~printer-trigger-event", REQUIRED "job-id", and OPTIONAL "status-
1756 message" to the ~~device~~printer event report content.
- 1757 12. Specified the "~~device~~printer-trigger-event" Printer Description attribute, naming each event.
- 1758 13. Deleted the 'sheet-completed' and 'collated-copy-completed', since these events are not part of any
1759 'xxx-basic' event group. They can be added back when we have an event group that uses them.

1760 **12.516.8 Changes to the July 1, 1998 to make the December 10, 1998 version**

1761 The following changes made from the July 1, 1998 to make the December 10, 1998 version:

- 1762 1. Clarified the terminology so that an "event" doesn't necessarily mean that a notification report is
1763 delivered.
- 1764 2. Removed many of the job and printer attributes for being sent in a notification event report, so that
1765 we can get agreement on a basic set of event report content. Only attributes really needs are
1766 included, including what may be needed for FAX. Changed the names of the event groups by
1767 adding the suffix '-basic' to indicate that these event groups return only basic information.
1768 Additional event groups can be registered in order to get more attributes as needed for accounting
1769 and more detailed job monitoring purposes.
- 1770 3. Deleted the "job-progress" event group. We can bring it back when we agree to all of the extra
1771 attributes. Its not very useful with only the basic attributes.
- 1772 4. The printer events are indicted using the "printer-state-reasons" values, instead of the Printer MIB
1773 alert codes. Since most of the Printer MIB alert codes, except for the generic ones, have equivalent
1774 IPP keyword reason values, this should be a problem and makes IPP more readably implemented in
1775 a server that doesn't have the Printer MIB.
- 1776 5. Added the "job-last-event" job description attribute to give the job event some persistence.
- 1777 6. Changed the job's "time-at-event (integer)" to "job-last-date-time-of-event (dateTime)" to give an
1778 absolute date and time, in case events are being relayed back through multiple servers, such as in
1779 FAX. Also made it a Job Description attribute to give it persistence.

- 1780 7. Changed the printer's "time-at-event(integer)" to "printer-last-date-time-of-event(dateTime)" to give
1781 an absolute date and time, in case events are being relayed back through multiple servers, such as in
1782 FAX. Also made it a Printer Description attribute to give it persistence.
- 1783 8. Added the IPP/1.0 "printer-is-accepting-jobs" to the event report, since changes in its value are really
1784 ~~device~~printer state changes.
- 1785 9. Added the complete semantics for each job event under the "last-job-event" Job Description
1786 attribute.

1787 **1317 Appendix C: Full Copyright Statement**

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