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17 Internet Printing Protocol/1.0 & 1.1: **IPP Event Notification**  
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19  
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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 subscription is called a "Job  
33 Submission Subscription".

34 A subscription includes:

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

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

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

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

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

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

46  
47 The full set of IPP documents includes:

- 48 Design Goals for an Internet Printing Protocol [IPP-REQ]
- 49 Rationale for the Structure and Model and Protocol for the Internet Printing Protocol [IPP-RAT]
- 50 Internet Printing Protocol/1.1: Model and Semantics [IPP-MOD]
- 51 Internet Printing Protocol/1.1: Encoding and Transport [IPP-PRO]
- 52 Internet Printing Protocol/1.0: Implementer's Guide [IPP-IIG]
- 53 Mapping between LPD and IPP Protocols [IPP LPD]

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

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

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

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

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

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

81

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127

## 128 1 Summary of the Event Notification specification

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

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

133 <b>attribute name</b>	<b>Syntax</b>
134 -----	-----
135 "notify-recipients"	1setOf uri
136 "notify-events"	1setOf type2 keyword

137

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

146

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

150 A subscription does *not* include:

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

154

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

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

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

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

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

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

168 printer-state" and "previous-printer-state-reasons" that store the device state and device state reasons  
169 before the event occurred.

170 8. OPTIONAL Printer Description attribute: "device-trigger-date-time"

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

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

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

183

## 184 2 Terminology

185

186 Capitalized terms, such as MUST, MUST NOT, REQUIRED, SHOULD, SHOULD NOT, MAY,  
187 NEED NOT, and OPTIONAL, have special meaning relating to conformance. These terms are  
188 defined in [ipp-mod section 13.1 on conformance terminology, most of which is taken from RFC  
189 2119 [RFC2119].

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

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

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

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

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

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

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

205 **Event** - An event is some occurrence (either expected or unexpected) within the printing system. A  
206 property of an event is that it only occurs at one instant in time and does not span the time the  
207 physical event takes place. For instance, jam-occurred and jam-cleared are two distinct events.  
208 The jam-occurred event is reported only when the jam initially occurs. Each event is recorded

209 internally when it occurs. In addition the event is reported externally if there is one or more  
210 event subscriptions outstanding for that event.

211  
212 Events can be classified along two dimensions:

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

215  
216 A Job event is some interesting state change in the Job object, and a Device event is some  
217 interesting change in the Printer object.

218  
219 A report event is purely informational, such as 'job-completed' or 'accepting-jobs'. A warning is  
220 not serious and processing continues. An error is serious and either the job is aborted or the  
221 device stops. These are typical uses of the terms report, warning, and error, although the actual  
222 usage is implementation dependent.

223  
224 An event occurs for a job or device whether any entity is registered to be notified for that event  
225 or not. The most recent event(s) of all possible events are recorded in a job object and a device  
226 object, and an event report is only generated depending on the set of subscriptions outstanding.

227  
228 **Event Report** - When an event occurs, an event report is generated that fully describes the event  
229 (what the event was, where it occurred, when it occurred, etc.). Event reports are delivered to all  
230 the notification recipients that are subscribed to that event, if any. The event report is delivered  
231 to the address of the notification recipient using the notification delivery method defined in the  
232 subscription. However, an Event Report is sent ONLY if there is a corresponding subscription.

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

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

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

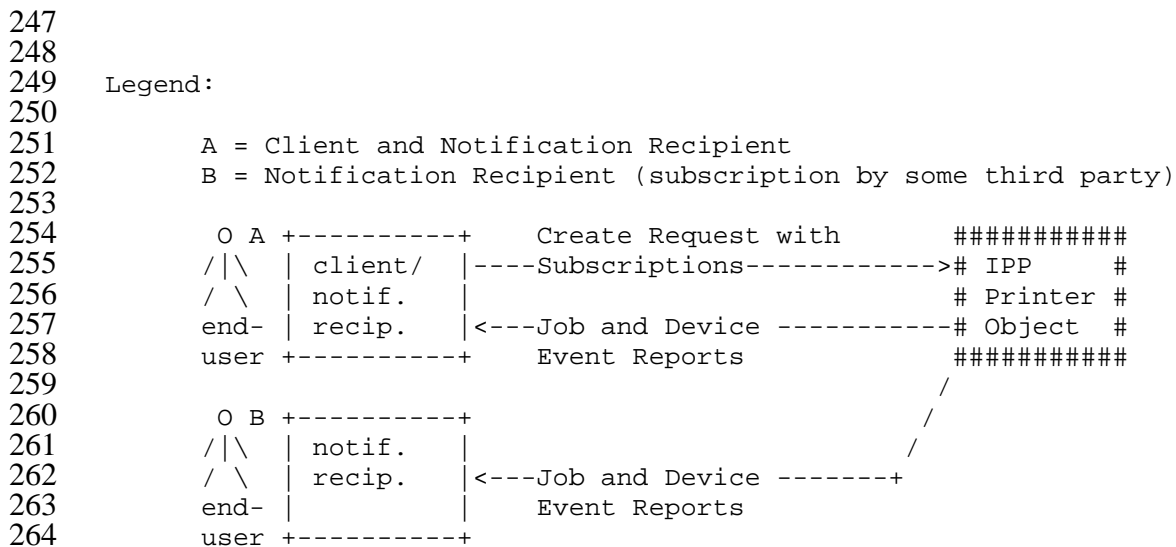
239 **Human Consumable Event Report** - Event reports that are intended to be consumed by human end  
240 users only.

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

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

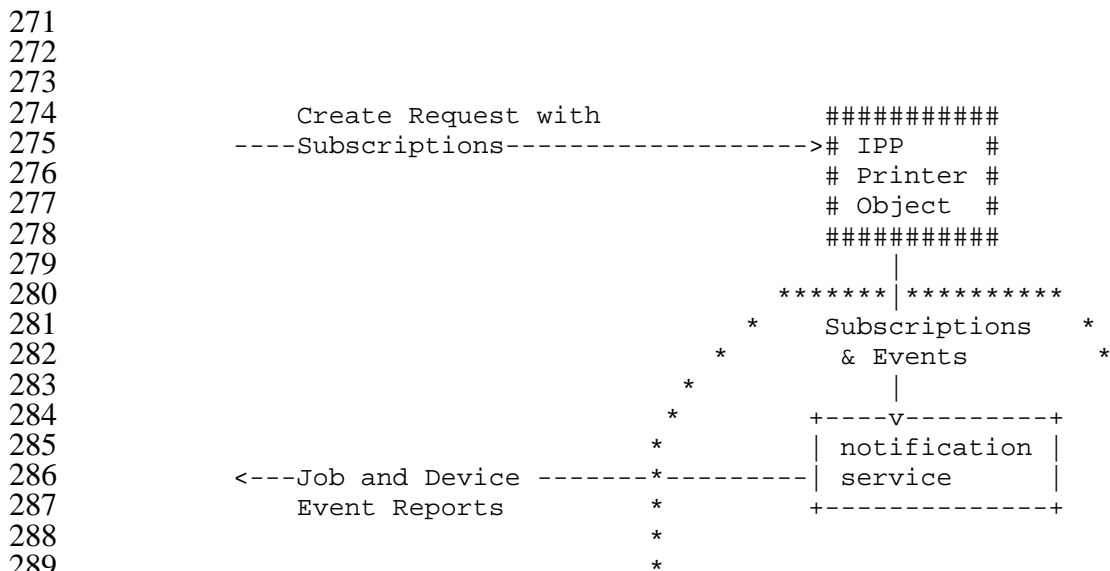
### 245 3 Model for Job and Device Event Notification

246 [Figure 1](#) shows the model.



267 **Figure 1 - Model for Job and Device Notification**

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



291 \*\*\* = Implementation configuration opaque boundary

294 **Figure 2 - Opaque Use of a Notification Service**



## 295 **4 New subscription Operation attributes**

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

301 The following rules apply:

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

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

### 322 **4.1 Subscription operation attributes**

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

#### 326 **4.1.1 notify-recipients (1setOf uri)**

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

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

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

339 Standard uriScheme values are:

340 '**mailto**': a 'multipart/report' [RFC1892] message is sent via email to the specified email address. It  
341 MUST consist of both a "text/plain" part for display to a user and an 'application/ipp' part which  
342 is an event report that a program can process (see Section 5). This delivery method ignores the  
343 supplied values of the "notify-events" attribute and implies the 'job-completed' event (new state  
344 is 'completed', 'aborted', or 'canceled'). The notification recipient does not acknowledge receipt  
345 of the mail message.

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

347

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

351

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

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

356 If the port is omitted, the default port is TBD (see Registration of ipp-tcp-notify scheme for use  
357 with IPP). The "application/ipp" event report content format is used for this method (see Section  
358 5).

359 The event recipient does not respond or acknowledge the event report.

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

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

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

369 **ISSUE 3 - Is SNMP support even necessary?**

370

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

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

375 If the port is omitted, the default port is TBD (see Registration of ipp-udp-notify scheme for use  
376 with IPP). The UDP datagram contains the "application/ipp" event report content format (see

377 Section 5). The notification recipient does not acknowledge receipt of the notification event  
378 report.

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

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

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

387

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

390

391 If the client specifies a "notify-recipients" URI scheme that is not supported by the device, the Printer  
392 MUST return the [new] 'client-error-notify-uri-scheme-not-supported' in the IPP response in reply to the  
393 create request.

394

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

396

397

#### 398 **4.1.2 notify-events (1setOf type2 keyword)**

399 The client OPTIONALLY supplies this operation attribute in a create request. In order to claim  
400 conformance to this notification specification, the Printer object MUST support this attribute. This  
401 attribute identifies the events for which a notification event report is desired. If the client does not  
402 supply this attribute in a create request, but does supply the "notify-recipients", the Printer object uses  
403 the "notify-events-default" event value.

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

406 Standard event keyword values are:

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

### 409 **5 Event Report Content**

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

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

417

418 Event reports are generated using the following content formats:

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

426 Response Parameters:

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

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

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

431

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

435

436 Operation attributes:

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

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

442 Unsupported Attributes Group:

443 Is not sent.

444 Job Object Attributes Group and Printer Object Attributes Group:

445 See section 5.1 and 5.2, respectively.

446

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

## 451 **5.1 Basic Job event report content**

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

457 If notification is supported, the implementation MUST support the following REQUIRED job object  
458 attributes, MUST support the following CONDITIONAL job object attributes, if the condition is true,  
459 and MAY support the following OPTIONAL job object attributes. Any of the following Job  
460 Description attributes that are supported MUST be included in an event report. All job event reports

461 MUST use the Get-Job-Attributes response syntax. The Basic Job Event Report MUST include the  
 462 following response parameters and job object attributes. The Job Attributes MAY be in any order:

463	+	-----+	+	-----+
464		Job object parameter/attribute		REQUIRED   reference
465				IN REPORT?
466	+	-----+	+	-----+
467		version-number		REQUIRED   [ipp-mod] 3.1.1
468	+	-----+	+	-----+
469		status-code (with the value: basic-job-event(600))		REQUIRED   [ipp-mod] 3.1.1
470				
471	+	-----+	+	-----+
472		request-id (with a 0 value)		REQUIRED   [ipp-mod] 3.1.1
473	+	-----+	+	-----+
474		job-printer-uri (uri)		REQUIRED   [ipp-mod] 4.3.3
475	+	-----+	+	-----+
476		job-id (integer(1:MAX))		REQUIRED   [ipp-mod] 4.3.2
477	+	-----+	+	-----+
478		job-trigger-events (1setOf type2 keyword)		REQUIRED   6.1
479				
480	+	-----+	+	-----+
481		job-trigger-message* (text(255))		CONDITIONAL   6.4
482	+	-----+	+	-----+
483		job-trigger-time (integer(1:MAX))		REQUIRED   6.5
484	+	-----+	+	-----+
485		job-trigger-date-time (dateTime)		RECOMMENDED   6.6
486	+	-----+	+	-----+
487		job-state (type1 enum)		REQUIRED   [ipp-mod] 4.3.7
488	+	-----+	+	-----+
489		previous-job-state (type1 enum)		REQUIRED   6.7
490	+	-----+	+	-----+
491		job-state-reasons (1setOf type2 keyword)		REQUIRED   [ipp-mod] 4.3.8
492				
493	+	-----+	+	-----+
494		previous-job-state-reasons (1setOf type2 keyword)		REQUIRED   6.8
495				
496	+	-----+	+	-----+
497		subscription-id** (integer(1:MAX))		CONDITIONAL   [ipp-sub] 4.2
498				
499	+	-----+	+	-----+

500

### 501 **Figure 22 - Basic Job Event Report Content**

502 Conditional attributes in the event report:

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

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

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

## 510 **5.2 Basic Device event report content**

511 This section lists the parameters and attributes that are included in the Basic Device event report content.  
 512 Additional device events can be registered which use the Basic Job Event report content. If additional  
 513 attributes are needed, additional Device Event report content formats will be registered and assigned a  
 514 new status code to be used in the report in order to distinguish each report format.

515 If notification is supported, the implementation **MUST** supported the following **REQUIRED** attributes,  
 516 **MUST** supported the following **CONDITIONAL** job object attributes, if the condition is true, and **MAY**  
 517 supported the following **OPTIONAL** Printer object attributes in any device event report. Any of the  
 518 following Printer Description attributes that are supported **MUST** be included in an event report. All  
 519 device event reports **MUST** use the Get-Printer-Attributes response syntax. The Basic Device Event  
 520 Report **MUST** include the following response parameters and Printer object attributes. The Printer  
 521 Attributes **MAY** be in any order:

522	+-----+-----+-----+			
523	Printer object paramater/attribute	REQUIRED	reference	
524		IN REPORT?		
525	+-----+-----+-----+			
526	version-number	REQUIRED	[ipp-mod] 3.1.1	
527	+-----+-----+-----+			
528	status-code (with the value:	REQUIRED	[ipp-mod] 3.1.1	
529	basic-device-event(601))			
530	+-----+-----+-----+			
531	request-id (with a 0 value)	REQUIRED	[ipp-mod] 3.1.1	
532	+-----+-----+-----+			
533	printer-uri-supported (uri)	REQUIRED	[ipp-mod] 4.4.1	
534	+-----+-----+-----+			
535	device-trigger-events	REQUIRED	7.1	
536	(1setOf type2 keyword)			
537	+-----+-----+-----+			
538	device-trigger-message* (text(255))	CONDITIONAL	7.2	
539	+-----+-----+-----+			
540	device-trigger-time	REQUIRED	7.3	
541	(integer(1:MAX))			
542	+-----+-----+-----+			
543	device-trigger-date-time (dateTime)	OPTIONAL	7.4	
544	+-----+-----+-----+			
545	printer-state (type1 enum)	REQUIRED	[ipp-mod] 4.4.10	
546	+-----+-----+-----+			
547	previous-printer-state (type1 enum)	REQUIRED	7.5	
548	+-----+-----+-----+			
549	printer-state-reasons	REQUIRED	[ipp-mod] 4.4.11	
550	(1setOf type2 keyword)			
551	+-----+-----+-----+			
552	previous-printer-state-reasons	REQUIRED	7.6	
553	(1setOf type2 keyword)			
554	+-----+-----+-----+			
555	subscription-id** (integer(1:MAX))	CONDITIONAL	[ipp-sub] 4.2	
556	+-----+-----+-----+			
557				

558 **Figure 33 - Basic Device Event Report Content**

559 Conditional attributes in the event report:

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

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

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

## 567 **6 Job Description Attributes**

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

### 569 **6.1 notify-recipients (1setOf uri)**

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

### 574 **6.2 notify-events (1setOf type2 keyword)**

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

### 580 **6.3 job-trigger-events (1setOf type2 keyword)**

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

588

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

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

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

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

600  
601 **Issue 8 - Should there be more job attributes in the 'job-completed' event report, such as**  
602 **"impressions-completed" and "sheets-completed"?**

603  
604 **'job-state-changed'**: the job has changed from any state to any other state, except to any of the  
605 "completed" job states, i.e., the value of the job's "job-state" attribute changes to any value,  
606 except 'completed', 'aborted', or 'canceled'. Therefore, this event include neither the 'job-created'  
607 nor the 'job-completed' event. A client that wants to subscript to all job state changes, including  
608 creation and completion, includes the 'job-created', 'job-changed', and 'job-completed' in the  
609 notification subscription. When a job is finally removed from the Job History (see [ipp-mod]  
610 4.3.7.1) no event is generated, i.e., neither a 'job-state-changed' event nor a 'job-purged' event is  
611 generated.

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

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

619  
620 **ISSUE 9 - any other events that are REQUIRED?**

621

#### 622 **6.4 job-trigger-message (text(255))**

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

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

#### 635 **6.5 job-trigger-time (integer(MIN:MAX))**

636 This REQUIRED attribute indicates the point in time specified in seconds since the device was last  
637 started at which the most recent job event occurred for this job. In order to populate this attribute, the  
638 Printer object uses the value in its "printer-up-time" attribute at the time the event occurred. Since the



639 device could support persistent jobs, a value of zero or less is available to show that the last event  
640 occurred before the last device restart.

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

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

### 650 **6.6 job-trigger-date-time (dateTime)**

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

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

### 663 **6.7 previous-job-state (type1 enum)**

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

### 669 **6.8 previous-job-state-reasons (1setOf type2 keyword)**

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

675

## 676 7 Printer Description Attributes

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

### 678 7.1 *device-trigger-events* (1setOf type2 keyword)

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

688

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

690 Device-report events include:

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

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

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

699 **'device-powered-up'** - when the device is powered up.

700 **'device-powering-down'** - when the device is being powered down.

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

703 **'device-config-changed'** - when the configuration of a device has changed, e.g., any "xxx-  
704 supported" values or the Printer's "printer-is-accepting-jobs" attribute value has changed.

705 The client would have to perform a Get-Printer-Attributes to find out the new attributes. This  
706 would be useful for GUI clients and drivers to update the available device capabilities to the  
707 user.

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

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

716

717

718

**719 7.2 device-trigger-message (text(255))**

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

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

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

**735 7.3 device-trigger-time (integer(MIN:MAX))**

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

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

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

**749 7.4 device-trigger-date-time (dateTime)**

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

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

#### 760 **7.5 *previous-printer-state (type1 enum)***

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

#### 765 **7.6 *previous-printer-state-reasons (1setOf type2 keyword)***

766 This REQUIRED attribute contains the previous values of the job's "job-state-reasons" attribute, i.e., the  
767 values of the Printer's "printer-state-reasons" attribute before the event occurred. See [ipp-mod] section  
768 4.4.12 for the description of the values for this attribute. In an event report, the "printer-state-reasons"  
769 attribute contains the current values of the device's "printer-state-reasons" attribute, i.e., the values after  
770 the event occurred.

#### 771 **7.7 *notify-recipients-schemes-supported (1setOf uriScheme)***

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

#### 775 **7.8 *notify-events-default (1setOf type2 keyword)***

776 This attribute identifies the event values if the client does not supply the "notify-events" operation  
777 attribute. All the values in this attribute must also appear in the notify-events-supported attribute.

#### 778 **7.9 *notify-events-supported (1setOf type2 keyword)***

779 This attribute identifies the events supported by this Printer object. In order to claim conformance to  
780 this notification specification, the Printer object MUST support this Printer Description attribute.  
781 Standard values are defined in Section 4.1.2.

## 782 **8 Status Codes**

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

#### 784 **13.1.4.? client-error-uri-scheme-not-supported (0x04??)**

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

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821

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867 Email: rbergman@dpc.com  
868

## 869 **11 Appendix A: Registration Forms to be filled out and submitted to IANA**

### 870 **11.1 Registration of ipp-tcp-notify scheme for use with IPP**

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

875 **TBD**

876

877 **Required parameters:** none

878 **Optional parameters:** none

879 **Encoding considerations:**

880 **Security considerations:**

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

884 **Interoperability considerations:**

885 **TBD**

886

887 **Published specification:**

888 [ipp-not] Isaacson, S., Martin, J., deBry, R., Hastings, T., Shepherd, M., "Internet Printing Protocol/1.0  
889 & 1.1: IPP Event Notification" draft-ietf-ipp-notification-00.txt, May, 1999.

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

891 **TBD**

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

893 Thomas N. Hastings  
894 Xerox Corporation  
895 737 Hawaii St.  
896 El Segundo, CA 90245

897

898 Phone: (310) 333-6413

899 Fax: (310) 333-5514

900 Email: [hastings@cp10.es.xerox.com](mailto:hastings@cp10.es.xerox.com)

901 **11.2 Registration of ipp-udp-notify scheme for use with IPP**

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

906 **TBD**

907

908 **Required parameters:** none

909 **Optional parameters:** none

910 **Encoding considerations:**

911 **Security considerations:**

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

915 **Interoperability considerations:**

916 **TBD**

917

918 **Published specification:**

919 [ipp-not] Isaacson, S., Martin, J., deBry, R., Hastings, T., Shepherd, M., "Internet Printing Protocol/1.0  
920 & 1.1: IPP Event Notification" draft-ietf-ipp-notification-00.txt, May, 1999.

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

922 **TBD**

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

924 Thomas N. Hastings  
925 Xerox Corporation  
926 737 Hawaii St.  
927 El Segundo, CA 90245

928

929 Phone: (310) 333-6413

930 Fax: (310) 333-5514

931 Email: [hastings@cp10.es.xerox.com](mailto:hastings@cp10.es.xerox.com)



932 **11.3 Registration of multipart/report type, 'print-notification'**

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

936 **12 Appendix B: Change History**

937 Changes are listed in reverse chronological order:

938 **12.1 Changes to the May 17, 1999 to make the May 18, 1999 (T Hastings, R Bergman)**

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

962 **12.2 Changes to the January 20, 1999 to make the May 17, 1999 version (M Shepherd)**

- 963 1. Changed references to IPP 1.0 to IPP 1.1
- 964 2. Implementing the notification specification is optional.
- 965 3. Refined the definition of Event

- 966 4. Changed 'notification report' to 'event report' for consistent terminology
- 967 5. Changed the terminology of an 'active' job to 'not-complete'. Included the 'pending-held' state in the  
968 'not-complete' super-state.
- 969 6. Introduced notify-event-groups-default.
- 970 7. Changed job-trigger-message and job-impressions-completed to be CONDITIONAL in the event  
971 report, job-trigger-date-time to be RECOMMENDED, and job-state-reasons to be REQUIRED.
- 972 8. Changed device-trigger-message to be CONDITIONAL in the event report, and printer-state-reasons  
973 to be REQUIRED.
- 974 9. Created a table to map job-trigger-events keywords to event-groups and required status.
- 975 10. Modified job-continued to be job-resumed-processing, and job-received to be job-created. Added  
976 job-purged, job-state-reason-removed, and job-state-reason-added keywords.
- 977 11. Modified job-trigger-time and device-trigger-time to use values less than zero.
- 978 12. Created a table to map device-trigger-events keywords to event-groups and their required status.
- 979 13. Added ready-for-job and device-state-reason-added to device-trigger-events keywords.
- 980 14. Updated References section
- 981 15. Added notify-format and notify-format-supported attributes.
- 982 16. Added subscription-id to the event report attributes of job and device.
- 983 17. Made job-errors-basic and device-errors-basic REQUIRED to be supported.
- 984 18. Added device-media-changed, device-config-changed, and ready-for-just-in-time-job to device  
985 events.
- 986 19. Added Author's Addresses.

987 **12.3 Changes to the January 18, 1999 to make the January 20, 1999 version**

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

- 989 1. Made this an INTERNET-DRAFT.
- 990 2. Indicated that a new default port is needed for the delivery methods.
- 991 3. Added Appendices in which to put the registration information for the URL schemes for each  
992 delivery method.
- 993 4. Clarified which parameters, Operation attributes, and Job/Printer attributes are supplied in an event  
994 content: the request-id is 0, the status-code is new 'job-event' 0x600 or 'device-event' 0x601.
- 995 5. Changed "job-trigger-event" and "device-trigger-event" to be 1setOf so that multiple events that  
996 occur at the same time MAY be send as one event content.
- 997 6. Added "job-trigger-time" as a REQUIRED Job Description and event content attribute which is in  
998 seconds since power up.
- 999 7. Changed "job-trigger-date-time" and "job-state-reasons" to OPTIONAL.

- 1000 8. Changed "status-message" to be an OPTIONAL "job-trigger-message" event content attribute and  
1001 also made it a Job Description attribute.
- 1002 9. Added "device-trigger-time" as a REQUIRED Printer Description and event content attribute which  
1003 is in seconds since power up.
- 1004 10. Changed "device-trigger-date-time" and "printer-state-reasons" to OPTIONAL.
- 1005 11. Changed "status-message" to be an OPTIONAL "device-trigger-message" event content attribute  
1006 and also made it a Printer Description attribute.
- 1007 12. Removed the "job-id" attribute from the device event content.

#### 1008 **12.4 Changes to the December 10, 1998 to make the January 18, 1999 version**

1009 The following changes were made to the December 10, 1998 to make the January 18, 1999 version:

- 1010 1. Changed the names of the REQUIRED notify-recipient keywords from: 'ipp-tcp-socket' and 'ipp-  
1011 udp-socket' to 'ipp-tcp-notify' and 'ipp-udp-notify'.
- 1012 2. Added '-notify' to the OPTIONAL 'snmpv1', 'snmpv2', and 'snmpv3' delivery method names.
- 1013 3. Changed the OPTIONAL 'sense-datagram' to 'sense-notify' to be consistent.
- 1014 4. Added 'ndps-notify' as an OPTIONAL keyword.
- 1015 5. Deleted the 'all-basic', 'all-job-events-basic', and 'all-device-events-basic'. Clients should be explicit  
1016 about which groups they want. If new groups are added, the clients won't know what to do with  
1017 them, if they had subscribed to 'all-xxx' groups.
- 1018 6. Changed the names of "job-last-event" and "job-last-date-time-of-event" to "job-trigger-event" and  
1019 "job-trigger-date-time" events, since the events trigger the notification delivery, but the attribute  
1020 values remain after the event has been delivered.
- 1021 7. Added "status-message" as an OPTIONAL event report content attribute.
- 1022 8. Changed "job-impressions-completed" to OPTIONAL.
- 1023 9. Indicated that OPTIONAL attributes are not sent in the event report content if they are not  
1024 supported.
- 1025 10. Required that "status-message" and/or "job-impressions-completed" be sent in an event report  
1026 content if they are supported as an Operation attribute and a Job Description attribute, respectively.
- 1027 11. Added REQUIRED "device-trigger-event", REQUIRED "job-id", and OPTIONAL "status-message"  
1028 to the device event report content.
- 1029 12. Specified the "device-trigger-event" Printer Description attribute, naming each event.
- 1030 13. Deleted the 'sheet-completed' and 'collated-copy-completed', since these events are not part of any  
1031 'xxx-basic' event group. They can be added back when we have an event group that uses them.

#### 1032 **12.5 Changes to the July 1, 1998 to make the December 10, 1998 version**

1033 The following changes made from the July 1, 1998 to make the December 10, 1998 version:

- 1034 1. Clarified the terminology so that an "event" doesn't necessarily mean that a notification report is  
1035 delivered.
- 1036 2. Removed many of the job and printer attributes for being sent in a notification event report, so that  
1037 we can get agreement on a basic set of event report content. Only attributes really needs are  
1038 included, including what may be needed for FAX. Changed the names of the event groups by  
1039 adding the suffix '-basic' to indicate that these event groups return only basic information.  
1040 Additional event groups can be registered in order to get more attributes as needed for accounting  
1041 and more detailed job monitoring purposes.
- 1042 3. Deleted the "job-progress" event group. We can bring it back when we agree to all of the extra  
1043 attributes. Its not very useful with only the basic attributes.
- 1044 4. The printer events are indicted using the "printer-state-reasons" values, instead of the Printer MIB  
1045 alert codes. Since most of the Printer MIB alert codes, except for the generic ones, have equivalent  
1046 IPP keyword reason values, this should be a problem and makes IPP more readably implemented in  
1047 a server that doesn't have the Printer MIB.
- 1048 5. Added the "job-last-event" job description attribute to give the job event some persistence.
- 1049 6. Changed the job's "time-at-event (integer)" to "job-last-date-time-of-event (dateTime)" to give an  
1050 absolute date and time, in case events are being relayed back through multiple servers, such as in  
1051 FAX. Also made it a Job Description attribute to give it persistence.
- 1052 7. Changed the printer's "time-at-event(integer)" to "printer-last-date-time-of-event(dateTime)" to give  
1053 an absolute date and time, in case events are being relayed back through multiple servers, such as in  
1054 FAX. Also made it a Printer Description attribute to give it persistence.
- 1055 8. Added the IPP/1.0 "printer-is-accepting-jobs" to the event report, since changes in its value are really  
1056 device state changes.
- 1057 9. Added the complete semantics for each job event under the "last-job-event" Job Description  
1058 attribute.

### 1059 **13 Appendix C: Full Copyright Statement**

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