Internet Printing Protocol/1.0 & 1.1: Exception Attributes for Documents and Pages
<pwg-ipp-exceptions-model-31.doc, .pdf>

Status of this Memo

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Abstract

This document specifies an extension to the Internet Printing Protocol/1.0 (IPP) [RFC2565, RFC2566] and IPP/1.1 [ipp-mod, ipp-pro]. This extension relaxes the restriction that each attribute value is the same for all pages and all documents within a job. For example, with this extension, page 1 of a job could have a different media from the other pages in the job or document 2 of a job could be stapled while the other documents of the job are not.

This extension supports document exceptions and page exceptions by adding two new Job Template attributes: "document-exceptions" and "page-exceptions" -- both have a syntax type of "1setOf collection". Each 'collection' value for "document-exceptions" contains an attribute that identifies the exception documents, namely "input-documents" or "output-documents". The 'collection' value also contains one or more attributes that are exceptions for the identified documents, e.g. "document-format", "finishings", and "media". Each 'collection' value for "page-exceptions" contains two attributes that identify the exception pages, namely "input-documents" or "output-documents" plus "pages". The 'collection' value also contains one or more attributes that are exceptions for the identified pages, e.g. "sides" and "media".

This extension also supports subset finishing by adding a new Job Template attribute "pages-per-subset", which specifies the number of pages per subset. The extension allows finishing and other document attributes to be applied to such subsets of pages.

The full set of IPP documents includes:
-   Design Goals for an Internet Printing Protocol [RFC2567]

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

-   Internet Printing Protocol/1.1: Model and Semantics (this document)

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

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

40   -   Mapping between LPD and IPP Protocols [RFC2569]

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

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

50   The "Internet Printing Protocol/1.1: Encoding and Transport" document is a formal mapping of the abstract
51   operations and attributes defined in the model document onto HTTP/1.1 [RFC2616]. It defines the
52   encoding rules for a new Internet MIME media type called "application/ipp". This document also defines
53   the rules for transporting over HTTP a message body whose Content-Type is "application/ipp". This
54   document defines a new scheme named 'ipp' for identifying IPP printers and jobs.

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

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

62 **Table of Contents**

148   1. Introduction

149   The Internet Printing Protocol (IPP) is an application level protocol for distributed printing using Internet
150   tools and technologies. IPP version 1.1 (IPP/1.1) requires that each attribute value be the same for all
151   documents and all pages in a job. This document defines OPTIONAL extensions to the IPP/1.1 model
152   which relax this restriction and allow documents and pages to have attributes that are exceptions. For
153   example, with this extension, page 1 of a job could have a different media or different value of "sides" from
154   the other pages in the job, or document 2 of a job could be stapled while the other documents of the job are
155   not. This document is a proposal for an extension to IPP/1.0 and IPP/1.1.
156
157   This extension supports document exceptions and page exceptions by adding two new Job Template
158   attributes: "document-exceptions" and "page-exceptions" -- both have a syntax type of "1setOf collection".
159   Each 'collection' value for "document-exceptions" contains an attribute that identifies the exception
160   documents, namely "input-documents" or "output-documents". The 'collection' value also contains one or
161   more attributes that are exceptions for the identified documents, e.g. "document-format", "finishings", and
162   "media". Each 'collection' value for "page-exceptions" contains two attributes that identify the exception
163   pages, namely "input-documents" or "output-documents" plus "pages". The 'collection' value also
164   contains one or more attributes that are exceptions for the identified pages, e.g. "sides" and "media".
165
166   This extension also supports subset finishing with a new Job Template attribute "pages-per-subset", which
167   specifies the number of pages per subset. The extension allows finishing and other document attributes to
168   be applied to such subsets of pages.

169   2. Terminology

170   This section defines the following additional terms that are used throughout this document:

171   2.1 REQUIRED

172   If an implementation supports the extensions described in this document, it MUST support a
173   REQUIRED feature.

174   2.2 OPTIONAL

175   If an implementation supports the extensions described in this document, it MAY support an
176   OPTIONAL feature.

177   2.3 Exception-Extension

178   The Exception-Extension is the extension proposed in this document that adds attribute exceptions
179   for documents and pages. This extension supports Document-Exceptions, Page-Exceptions and
180   Subset-Finishing, which are all defined later in this section.

2.4 Sheet

A Sheet is the unit of media that a printer puts marks on. It is the most basic unit of output from a printer. A printer may mark on one side or on both sides of a sheet.

2.5 Output-Page

An Output-Page is the set of all markings that the author intended to be placed on one side of a Sheet, including, but not limited to, text, drawings, images, footers and headers.

2.6 Impression:

An impression is the set of all markings that the Job submitter intended to be placed on one side of a Sheet. Each impression contains one or more Output-Pages. Generally a Job submitter prints each Output-Page as the author intended, namely one Output-Page per Impression. Sometimes, a Job submitter prints several Output-Pages per Impression, perhaps to save paper or money. The IPP attribute "number-up" specifies the number of Output-Pages per impression. When "number-up" is greater than 1, an impression contains multiple Output-Pages.

2.7 Input-Page

An Input-Page is a sequence of bytes that describe how to mark a single Output-Page. IPP 1.1 [ipp-mod] uses the term "print-stream-pages" to refer to both Input-Pages and Output-Pages. There is a one to one relationship between Input-Pages and Output-Pages and they are in the same order. Both Input-Pages and Output-Pages are numbered sequentially (see section 4.1) starting from 1 at the beginning of each Input-Document or Output-Document, respectively. When the first Input-Page of an Input-Document coincides with the first Output-Page of an Output-Document, the numbering of Input-Pages and Output-Pages coincides; otherwise it doesn't.

2.8 Input-Document

An Input-Document is the entire sequence of bytes transmitted as the Document Content in the Print-Job and Send-Document operations or referenced by the "document-uri" operation attribute in the Print-URI and Send-URI operations. This sequence of bytes consists of one or more Input-Pages.

2.9 Output-Document

An Output-Document is a set of one or more Sheets which either are permanently bound into a single unit, e.g. with a staple, or are intended to be treated by an end-user as a single unit, e.g. for a loose leaf binder. If an Output-Document is bound, it is uniformly bound; if it is not bound, no subset of sheets within it are bound. The Output-Pages that comprise an Output-Document may come from

a) all the Input-Pages of an Input-Document or
b) a proper subset of the Input-Pages of the Input-Document or

216   c)   all the Input-Pages of several Input-Documents.

217

218   An Output-Document is *not* a set of sheets that are bound temporarily for shipping, e.g. with
219   banding.

220   2.10   Relationship between Input-Document and Output-Documents

221   Each relationship is named and defined below. The cases are derived from an analysis of possible
222   tree structures (see section 4.2). A client selects the desired case with the number of submitted
223   Input-Documents and the specific values of three attributes: the existing Job Template "multiple-
224   document-handling" and two new attributes "pages-per-subset" and "documents-per-subset". The
225   latter two attributes describe how the stream of Input-Pages or Input-Documents and are partitioned
226   into Output-Documents, respectively.

227

228

229   The table below summarizes the relationship of Input-Documents to Output-Document in the five
230   cases:

231

Case	Number of	
	Input-Documents	**Output-Documents**
Degenerate	1	1
Separate-Documents	n	n
Single-Document	n	1
Page-Subset Documents	n	m (m >n)
Document-Subset Documents	n	m (m < n)

232

233   When n = 1 for the "Separate-Documents" and "Single-Document" become the "Degenerate" case.

234

235   The table below summarizes the attribute values that control the cases.

236

237   -   The "separate" value means that "multiple-document-handling" is 'separate-documents-
238   collated-copies' or 'separate-documents-uncollated-copies'.
239   -   The "single" value means that "multiple-document-handling" is 'single-document' or 'single-
240   document-new-sheet'.
241   -   The "ignored" value means that the attribute need not be present and is ignored if it is present,
242   -   The "present" value means that the attribute must be present. A different case is implied if it is
243   not present.
244   -   The "not present" value means that the attribute must not be present. A different case is implied
245   if it is present.

246

Case	"multiple-document-handling"	"pages-per-subset"	"documents-per-subset"
Separate-Documents	separate	not present	not present
Single-Document	single	ignored	ignored

Case	"multiple-document-handling"	"pages-per-subset"	"documents-per-subset"
Page-Subset Documents	separate	present	not present
Document-Subset Documents	separate	not present	present

247
248   The Degenerate row is omitted because it follows the rules for the "Separate-Documents" and
249   "Single-Documents" rules when the number of Input-Documents is 1.
250   There is an error if both "page-per-subset" and "document-per-subset" are present in the "separate"
251   case.

252   2.10.1 Degenerate Case:

253   In the Degenerate Case, the Job consists of exactly one Output-Document and exactly one
254   Input-Document. The single Input-Document produces the single Output-Document. This
255   case represents the most common case of printing. For example, if a user is Printing a single
256   MS Word file, the MS Word file is the Input-Document and the printed pages are the
257   Output-Document. This case is the degenerate case of Separate-Documents and Single-
258   Document. It occurs when the number of Input-Documents is 1 and either
259
260   a) "multiple-document-handling" is 'separate-documents-collated-copies' or 'separate-
261   documents-uncollated-copies' and neither "pages-per-subset" nor "documents-per-
262   subset" are present or.
263   b) "multiple-document-handling" is 'single-document' or 'single-document-new-sheet', and
264   both "pages-per-subset" and "documents-per-subset" are ignored if present

265   2.10.2 Separate Documents Case

266   In the Separate Documents Case, the Job consists of one or more Output-Documents where
267   each Input-Document produces one Output-Document. For example, if a user prints 10 Java
268   files in one Job and wants 10 separately stapled Output-Documents, each of the 10 Java files
269   is an Input-Document, and the printed Output-Pages from each of the 10 Java files is a
270   separate Output-Document that is stapled separately. This case occurs when "multiple-
271   document-handling" is 'separate-documents-collated-copies' or 'separate-documents-
272   uncollated-copies' and the new attributes "pages-per-subset" and "documents-per-subset" are
273   not present.

274   2.10.3 Single Document Case

275   In the Single Document Case, the job consists of a single Output-Document produced from
276   one or more Input-Documents. For example, if a user prints 10 Java files in one Job and
277   wants all Output-Pages of the 10 Java files to be produced as 1 stapled Output-Document,
278   then each of the 10 Java files is an Input-Document, and all printed Output-Pages from all of
279   the 10 Java files is a single Output-Document that is stapled. This case occurs when
280   "multiple-document-handling" is 'single-document' or 'single-document-new-sheet'; the
281   value of "pages-per-subset" and "documents-per-subset" are both ignored if present.

282   2.10.4 Page-Subset Document Case:

283   In the Page-Subset Case, the Job consists of one or more Output-Documents and one or
284   more Input-Documents. The new attribute "pages-per-subset" contains a sequence of
285   integers which specifies how to partition the stream of Input-Pages into subsets, each of
286   which produces an Output Document. For example, if a user prints 1 PostScript file with
287   1000 pages, where each 4 Output-Pages represents an insurance policy, then the PostScript
288   file is the Input-Document and each group of 4 Output-Pages is an Output-Document. The
289   resulting Output-Documents would be the same if the same 1000 Input-Pages were spread
290   across 2 or more PostScript files. This case occurs when "multiple-document-handling" is
291   'separate-documents-collated-copies' or 'separate-documents-uncollated-copies' and the new
292   attribute "pages-per-subset" contains 1 or more integer values. The new attribute
293   "documents-per-subset" is not present.

294   2.10.5 Document-Subset Document Case:

295   This case is defined here for completeness, but it is not supported by this extension.
296
297   In the Document-Subset Document Case, the Job consists of one or more Output-Documents
298   and one or more Input-Documents. The new attribute "documents-per-subset" contains a
299   sequence of integers which specifies how to partition Job's Input-Documents into subsets,
300   each of which produces an Output Document. For example, if a user prints 25 Java files in
301   one Job and wants 2 separately stapled Output-Documents, one with 15 Java files and one
302   with 10 Java files, then each of the Java files is an Input-Document, and the printed Output-
303   Pages from the first 15 Java files and next 10 Java files are two separate Output-Documents
304   that are stapled separately. This case occurs when "multiple-document-handling" is
305   'separate-documents-collated-copies' or 'separate-documents-uncollated-copies' and
306   "documents-per-subset" contains 1 or more integer values. The new attribute "pages-per-
307   subset" is not present.
308

309   2.11 Document-Exceptions

310   In IPP/1.1 each attribute value is the same for the entire Job. When an attribute is a "Document-
311   Exceptions" attributes, it is different for identified Input-Documents or Output-Documents.

312   2.12 Page-Exceptions

313   In IPP/1.1 each attribute value is the same for the entire Job. When an attribute is a "Page-
314   Exceptions" attributes, it is different for identified Input-Pages or Output-Pages.

315   2.13 Subset-Finishing

316   Subset-Finishing is the ability to subdivide the stream of Input-Pages from one or more Input-
317   Documents into multiple Output-Documents and to apply the same or different finishing to each
318   individual Output-Document.

319   2.14 Affects

320   Each attribute is said to 'affect' some part of a job. For example, "media" affects a sheet,
321   "finishings" affects an Output-Document, "page-ranges" affects an Input-Document and "job-
322   priority" affects a job. This nuance must be explicit in the Exceptions-Extension because the parts
323   of a job that an attribute affects limit the parts of a job that an attribute can be associated with (see
324   the next section for a definition of "associates"). For example, "job-priority" affects a job; so it can
325   be associated with a Job, but not an Input-Document or Input-Page. Likewise, "finishings" affects
326   and Output-Document; so it can be associated with a Job or an Output-Document, but not with an
327   Output-Page.

328   2.15 Associates

329   The word "associates" combines the meaning of the two terms in subsections of this section, namely
330   "directly associates" and "effectively associates". When an attribute is either directly associated or
331   effectively associated with some part of a job, it is said to be "associated" with that part of a job.

332   2.15.1 Directly Associates

333   When an attribute is said to be 'directly associated' with some part of a job, it affects that
334   part or some other part. The part that it affects depends on the attribute and what the attribute
335   is directly associated with. For example if "media" is directly associated with a job, it affects
336   all sheets in the job. If "media" is directly associated with an Output-Document, it affects all
337   sheets in that Output-Document. If "media" is directly associated with an Output-Page, it
338   affects the sheet containing that Output-Page.

339   2.15.2 Effectively Associates

340   When an attribute is said to be directly associated with some part of a job 'A' that is
341   semantically connected with another part 'B', the attribute is said to be "effectively
342   associated" with 'B'. For example, in the Separate-Documents Case, when an attribute is
343   directly associated with an Input-Document, it is effectively associated with the
344   corresponding Output-Document.

345   2.16 Job-Submission Operations:

346   The Job-Submission Operations are the IPP operations that create jobs and send document content,
347   namely Print-Job, Print-URI, Create-Job, Send-Document and Send-URI.

348   3. Requirements

349   The following is a list of requirements for the Exceptions-Extension.
350
351   1. The Exception-Extension MUST contain a mechanism for specifying Job attributes that are
352   exceptions for particular Input-Documents or Output-Documents. A Printer and a client
353   OPTIONALLY support this mechanism.

354   2. There MUST be a mechanism for specifying Job attributes that are exceptions for particular Input-
355   Pages or Output-Pages. A Printer and a client OPTIONALLY support this mechanism.
356   3. The mechanism for exceptions MUST be supported by all Job-Submission operations and Validate-
357   Job.
358   4. The extension MUST support the four relationships of Input-Documents and Output-Documents:
359   Degenerate Case, Separate-Documents Case, Single-Document Case and Page-Subset Document
360   Case.
361   5. The extension MUST support Subset-Finishing.

362   4. Overview

363   In IPP 1.1 all attributes that a client includes with job creation operations affect the entire Job in a uniform
364   way. That is, there is no way for one Output-Document in a given Job to be stapled and another drilled.
365   Also, there is no way for the first sheet of each Output-Document to be on a different media or to have a
366   different value of "sides" from the other Sheets in the Output-Document. An IPP/1.1 client can specify
367   features, such as finishing, media and sides only at the job level.
368
369   The Exception Extension defined in this document allows some Output-Pages, some Output-Documents
370   and some Input-Documents to be affected by attribute values that are exceptions to those specified for the
371   Job as a whole. For example, the first Output-Page of an Output-Document has a different media from the
372   rest, or the second Output-Document is stapled and the rest are not, or the page-ranges of the first Input-
373   Document selects a few Input-Pages and the rest of the Input-Documents are printed in full.

374   4.1 Numbering of Components

375   The Exception Extension defines a system for numbering of components.
376
377   -   Each Input-Document has a number. The single Input-Document that a client sends with Print-Job
378   or Print-URI and the first Input-Document that a client sends with Send-Document or Send-URI has
379   a number of 1. Each subsequent Input-Document that a clients sends has a number that is one
380   higher than the previous.

381   -   Each Input-Page in an Input-Document is numbered sequentially, starting at 1 for the first Input-
382   Page. If a Job has several Input-Documents, the first Input-Page of each Input-Document has the
383   number of 1, which is relative to that Input-Document.

384   -   Each Output-Document has a number. The first Output-Document has a number of '1', and each
385   subsequent Output-Document has a number that is one higher than the previous Output-Document.
386   The Output-Documents are numbered as if the value of "copies" were 1, i.e. if an Input-Document
387   produces multiple copies, each copy of a particular Output-Document has the same number.

388   -   Each Output-Page in an Output-Document is numbered sequentially, starting at 1 for the first
389   Output-Page. If a Job has several Output-Documents, the first Output-Page of each has the number
390   of 1, which is relative to that Output-Document

391   4.2 Relationship of Numbered Components

392   The previous section described how to number Input-Documents, Output-Documents, Input-Pages and
393   Output-Pages. This section describes the relationship between the number on each of these four
394   components. The relationship differs for each of the five cases defined in section 2.10. The following
395   diagrams of tree structure show each of the five cases and the relationship of the numbers in those cases.
396
397   Degenerate Case:
398
```
399                                    Job &
400                              Input-Document 1 &
401                              Output-Document 1
402                                      |
403                        ---------------------
404                        |         ...        |
405                 Input-Page 1 &      Input-Page n &
406                 Output-Page 1       Output-Page n
```
407
408
409   Conditions that define this case:
410
411   -   Job contains exactly 1 Input-Document
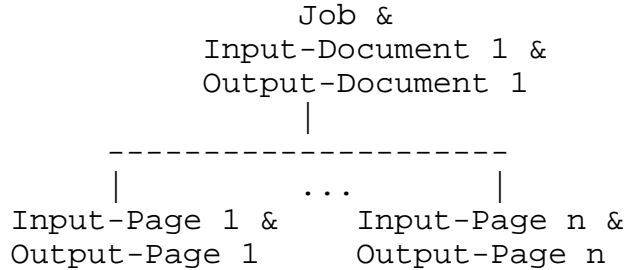
412   -   Either conditions for "Separate-Documents" or "Single-Documents" are met.

413   Observations about this case:
414
415   -   Job coincides with Output-Document 1 and Input-Document 1

416   -   Output-Page i coincides with Input-Page i

417   Separate-Documents Case:
418
```
419                                     Job
420                                      |
421              -------------------------------------------------------
422              |                               |                     |
423        Input-Document 1 &              Input-Document 2 &     ...
424        Output-Document 1              Output-Document 2
425              |                               |
426        --------------------           ---------------------
427        |         ...       |           |         ...        |
428 Input-Page 1 &    Input-Page n &    Input-Page 1 &      Input-Page p
429 Output-Page 1     Output-Page n     Output-Page 1       Output-Page p
```
430
431   Conditions that define this case:
432
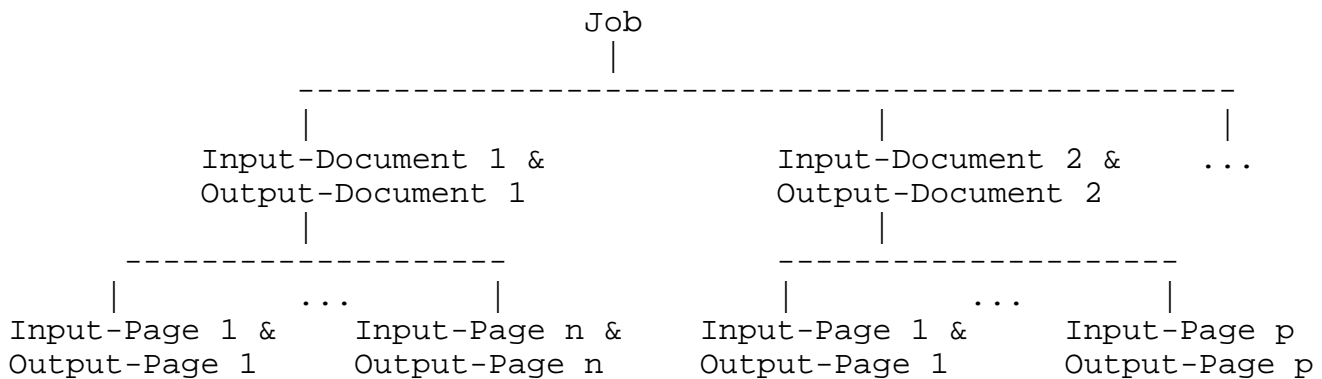
433   -   Job contains more than one or more Input-Documents, though one Input-Document is technically
434   the Degenerate Case.

435   -   "multiple-document-handling" is 'separate-documents-collated-copies' or 'separate-documents-
436   uncollated-copies'

437   -   "pages-per-subset" is not present

438   -   "documents-per-subset" is not present

439   Observations about this case:
440
441   -   Output-Document i coincides with Input-Document i

442   -   Output-Page i coincides with Input-Page i

443
444   Single-Document Case:
445
```
446                   Job & Output Document 1
447                              |
448         ------------------------------------------------
449         |                           |                  |
450    Input-Document 1            Input-Document 2    ...
451         |                           |
452    --------------------        --------------------
453    |        ...        |       |        ...        |
454 Input-Page 1 &    Input-Page n &    Input-Page 1 &    Input-Page p
455 Output-Page 1     Output-Page n     Output-Page n+1   Output-Page n+p
```
456
457   Conditions that define this case:
458
459   -   Job contains more than one or more Input-Documents, though one Input-Document is technically
460   the Degenerate Case.
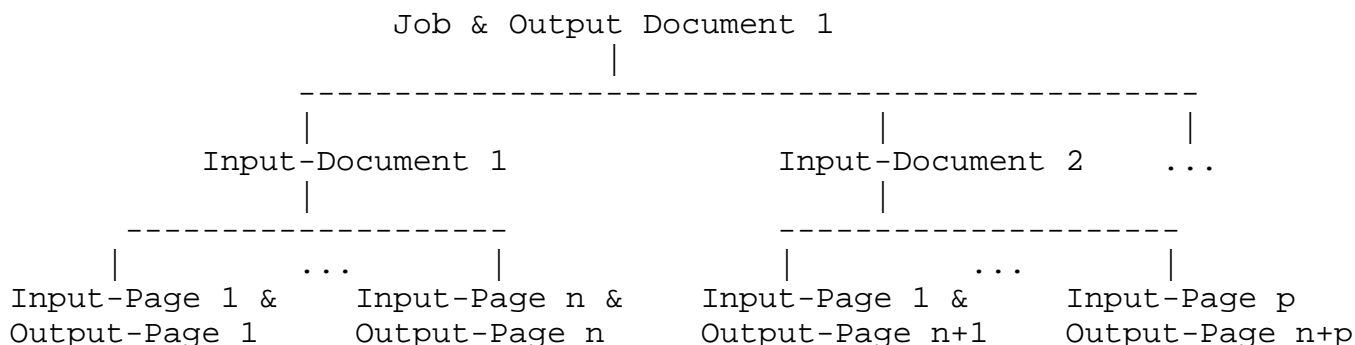
461   -   "multiple-document-handling" is 'single-document' or 'single-document-new-sheet';

462   Observations about this case:
463
464   -   Output-Document 1 coincides with the Job

465   -   The numbering of Output-Pages is continuous through all Input-Documents, but the numbering of
466   Input-Pages starts at 1 in each Input-Document. That is, Input-Page i in Input-Document m
467   coincides with Output-Page i + k, where k is the number of Input-Pages in all previous Input-
468   Documents, i.e. Input-Documents 1 through m-1.

469   -   "pages-per-subset" is ignored if present

470   -   "documents-per-subset" is ignored if present

471

472 Page-Subset Document Case:

473

```
474                                  Job
475                                   |
476            --------------------------------
477            |                 ...            |
478       Input-Document 1              Input-Document q
479            |                              |
480            |                              |
481       ----------------------------      -----------
482       |            ...         |         |    ...
483   Output-Document 1      Output-Document m    Output-Document r
484       |                        |                |
485   --------------------      ---------------      similar
486   |        ...        |     |       ...   |
487 Input-Page 1 &    Input-Page n &   Input-Page 1+k &   Input-Page p+k
488 Output-Page 1     Output-Page n    Output-Page 1      Output-Page p
```

489
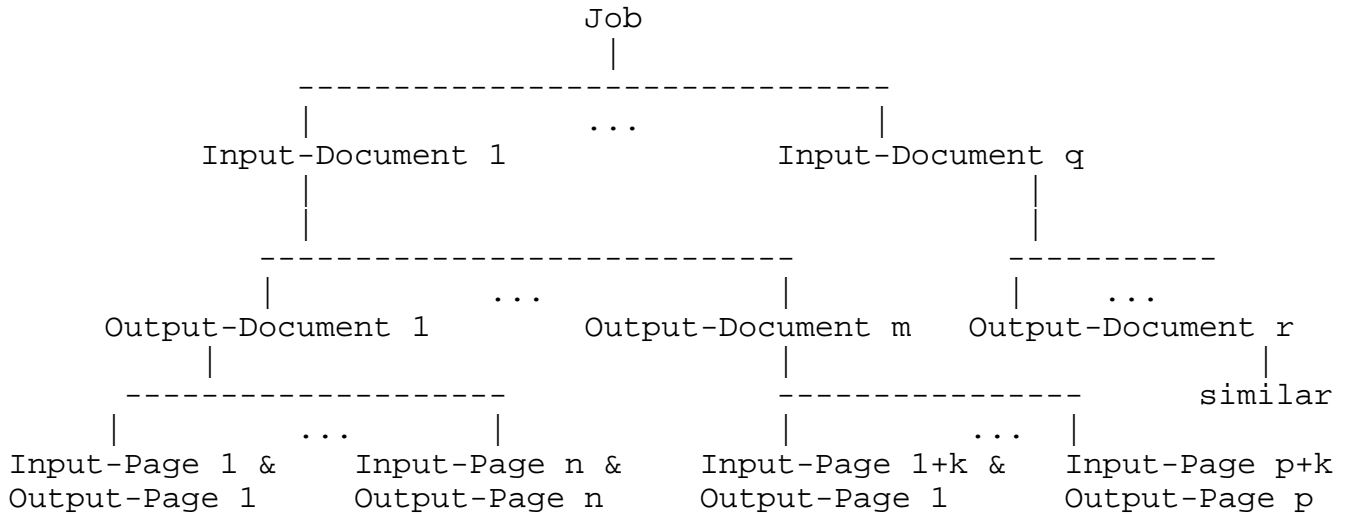
490 Conditions that define this case:

491

492   -   Job contains one or more Input-Documents

493   -   "multiple-document-handling" is 'separate-documents-collated-copies' or 'separate-documents-
494   uncollated-copies'

495   -   "pages-per-subset" is present.

496   -   "documents-per-subset" is not present

497 Observations about this case:

498

499   -   The diagram shows that Output-Documents 1 through m are contained in Input-Document 1, and
500   Output-Documents m+1 through t are contained in Input-Document 2 and so on. However, this
501   diagram is not completely accurate. The Input-Pages from all Input-Documents are more accurately
502   viewed as a continuous stream of Input-Pages that are partitioned into Output-Documents as
503   specified by the attribute "pages-per-subset". For example, an Output-Document could come from
504   the last 3 Input-Pages of an Input-Document and the first 4 Input-Pages of the next Input-Document.

505   -   The Input-Pages in each Input-Document are numbered sequentially starting from 1 and the Output-
506   Pages in each Output-Document are numbered sequentially starting from 1. For the first Output-
507   Document, the numbers of the Input-Pages and Output-Pages coincide. For subsequent Output-
508   Documents, the numbers differ. For example, the first Output-Page of the second Output-Document

509 coincides with Input-Page w, where w is the number of Output-Pages in the first Output-Document.
510 To be specific, Output-Page i in Output-Document m coincides with Input-Page i + k of the Job,
511 where k is the number of Output-Pages in all previous Output-Documents of the job, e.g. Output-
512 Documents 1 through m-1.

513 - "pages-per-subset" specifies the number of pages in each Output-Document.

514

515 Document-Subset Document Case:

516

517 NOTE: this case is here for completeness and is not supported by the Exceptions-Extension.

518

```
519                                  Job
520                                   |
521                   ------------------------------
522               |                ...              |
523         Output-Document 1                 Output-Document q
524               |                                 |
525               |                              similar
526          ------------------------------
527          |                           |
528      Input-Document 1            Input-Document m
529          |                           |
530     --------------------        ---------------------
531     |         ...       |       |         ...       |
532  Input-Page 1 &   Input-Page n &    Input-Page 1 &    Input-Page p
533  Output-Page 1    Output-Page n     Output-Page 1+k   Output-Page p+k
```

534

535 Conditions that define this case:

536

537 - Job contains one or more Input-Documents

538 - "multiple-document-handling" is 'separate-documents-collated-copies' or 'separate-documents-
539   uncollated-copies'

540 - "pages-per-subset" is not present.

541 - "documents-per-subset" is present

542 Observations about this case:
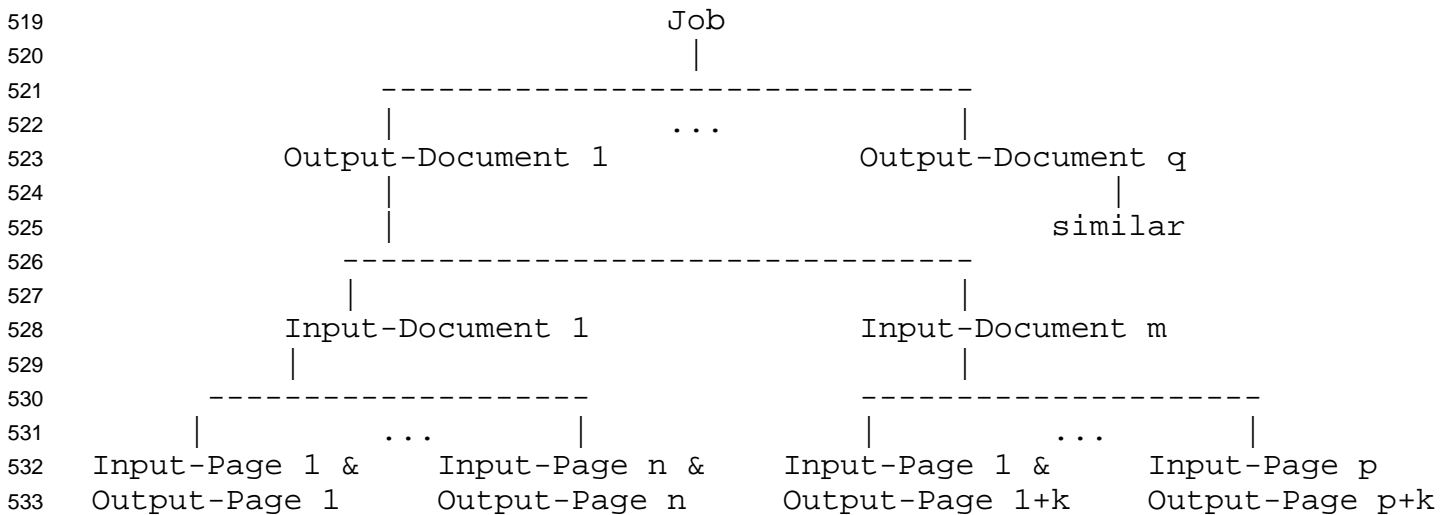
543

544 - Input-Documents 1-m are contained in Output-Document 1, and Input-Documents m+1 through t
545   are contained in Output-Document 2 and so on.

546 - Input-Page i in Input-Document m coincides with Output-Page i + k of Output-Document j, where k
547   is the number of Input-Pages in all previous Input-Documents of Output-Document j, e.g. Input-
548   Documents 1 through m-1.

549   -   "documents-per-subset" has the number of Input-Documents in each Output-Document.

550   4.3 Association of Attributes

551   The Exception Extension allows attribute associations with Input-Pages, Output-Pages, Input-Documents
552   and Output-Documents, and it continues to allow associations with Jobs. The Exception Extension specifies
553   rules for associations, and it categorizes attributes according to what they affect. The categories of attributes
554   and the members in the Exceptions-Extension are:
555
556   -   Input Documents: "page-ranges", "document-format", "document-name", "compression" and
557   "document-natural-language".

558   -   Output-Documents: "finishings"

559   -   Sheets: "media" and "sides"

560   The table below shows what each of the three categories of attributes can be associated with:
561

	Category of attribute		
Associates with:	Input-Document	Output-Document	Sheets
Input-Document	yes	yes	yes
Output-Document	no	yes	yes
Input-Page	no	no	yes
Output-Page	no	no	yes

562
563   The meaning of these associations and their limitation is specified in section 15.
564
565   The Exception-Extension mechanism seems to be general enough to add new Document-Exceptions and
566   Page-Exceptions attributes without changing or extending the general mechanism. That is, an existing or
567   new Job attribute becomes a Document-Exceptions or Page-Exceptions attribute when a description of that
568   attributes says so, but no changes need be made to the ways exceptions work. If the new attribute belongs
569   to one of the three above categories, it follows the rules of that category. If it belongs to a new categories,
570   the rules of association must be defined.

571   4.4 Subset Finishing

572   In IPP/1.1 a Printer applies the "finishings" attribute to all Output-Documents in a given job. This proposal
573   supports "Subset Finishing" which we define as the ability to partition the Input-Pages of an Input-
574   Document into one or more Output-Documents and to apply different types of finishing to each of the
575   individual Output-Documents contained within a single job.
576
577   This model supports subset finishing with the new attribute "pages-per-subset" which specifies the number
578   of Input-Pages per Output-Document. This model treats Subset-Finishing as a Job level sub-setting of the
579   Input-Documents into Output-Documents and as a Document Exception attribute rather than a Page
580   Exception attribute for two reasons.

581
582   - Page-Exceptions, as their name suggests, are exceptions for a few Input-Pages or Output-Pages that
583   differ from the rest of the Input-Pages or Output-Pages in the Job. With Subset-Finishing, all Input-
584   Pages belong to some subset. So, sub-setting is not an exception; it encompasses the entire Job.
585   Only the finishing part of Subset-Finishing can have exceptions and those exceptions apply to a
586   subset, much like they apply to Output-Documents. Because subsets behave like Output-
587   Documents, it is easiest to describe the sub-setting operation as creating Output-Documents.

588   - If the attributes "media", "sides" and "finishings" were all treated as Page-Exception attributes, then
589   there would have to one rule for splitting and merging groups when "finishings" is associated with
590   the group and another rule when it is not associated with the group. If a Page-Exception specifies
591   "sides" is duplex for pages 1-10 and "media" is added to pages 5 and 6, there can be three Page-
592   Exception groups, one for pages 1-4 with "sides", one for pages 5 and 6 with "sides" and "media"
593   and one for pages 7-10 with sides. If "media" is removed, the groups can be merged back to the
594   original single group. If "finishings = staple" had been present in the original group of pages 1-10,
595   such a split would change finishing from one staple in pages 1-10 to 3 staples, one in pages 1-6, one
596   in page 5-6 and one in pages 7-10.

597
598   The remainder of this document describes the changes necessary to support the Exceptions Extension.

599   5. New Job Template Attributes

600   The Exception Extension adds three new Job Template attributes: "document-exceptions", "page-
601   exceptions" and "pages-per-subset". The first two attributes support exception attributes, and the third
602   supports subset finishing.
603

```
+=================+=====================+=====================+
| Job Attribute   |Printer: Default Value|  Printer: Supported |
|                 |     Attribute       |   Values Attribute  |
+=================+=====================+=====================+
| document-       |        none         |document-exceptions- |
|    exceptions   |                     |    supported        |
|(1setOf collection)|                   |(1setOf type1 keyword)|
+=================+=====================+=====================+
| page-exceptions |        none         |  page-exceptions-   |
|                 |                     |    supported        |
|(1setOf collection)|                   |(1setOf type1 keyword)|
+=================+=====================+=====================+
| page-per-subset |        none         |  pages-per-subset   |
|                 |                     |    supported        |
|(1setOf integer) |                     |    (Boolean)        |
+=================+=====================+=====================+
```
620

621   5.1 document-exceptions (1setOf collection)

622   This OPTIONAL Job Template attribute contains attributes that are associated with Input-Documents and
623   Output-Documents and that are treated as document exceptions. Such attributes are called "Document-
624   Exceptions" attributes.
625
626   If this attribute is not present in a Job, there are no Document-Exceptions within the Job. If it is present, the
627   value consists of one or more 'collection' values, where each 'collection' value identifies one or more
628   Input-Documents or Output-Documents and contains one or more Job Template attributes which act as
629   exceptions to the corresponding Job Template attribute values for the specified Input-Documents or Output-
630   Documents.
631
632   The first attribute of each 'collection' value MUST be either "input-documents" or "output-documents" and
633   this attribute identifies Input-Documents or Output-Documents, respectively. The remaining attributes in
634   the 'collection' value are the one or more Job Template attributes that are exceptions for the specified
635   Input-Documents or Output-Documents. The allowed attributes are listed in section 5.1.7

636   There may be more than one way for a client to arrange Document-Exceptions attributes in 'collection'
637   values. For example, if a job contains 10 Output-Documents to be printed 1-sided on letter paper with no
638   stapling and Output-Document 1 is to be two sided with stapling and Document 2 is to be two sided with
639   no stapling, there are two possible ways to group the exceptions. The client could specify the two
640   exceptions for Output-Document 1 in one 'collection' value and the single exception for Output-Document
641   2 in a second 'collection' value, or it could specify "two-sided" for Output-Documents 1 and 2 in one
642   'collection' value and "stapled" for Output-Document 1 in another 'collection' value.

643   If the "input-documents" or "output-documents" identify Input-Documents or Output-Documents that don't
644   exist, the Printer silently ignores them and associates the Document-Exceptions with those Input-
645   Documents or Output-Documents that do exist. A client MUST NOT allow two 'collection' values to be
646   associated with the same Input-Document or Output-Document and to contain the same Document-
647   Exceptions attribute with different values. If the client violates the preceding rule, the Printer can use either
648   value, and it MUST issue a warning. It does so by adding 'job-warnings-detected' to the "job-state-reasons"
649   and by increasing the value of the "job-warnings-count" Job Description attribute by 1. If the Printer
650   detects this conflict while it is processing a Job-Submission operation, it MUST return the ignored values in
651   the Unsupported attributes.

652   When a Client receives this attribute in a Get-Jobs or Get-Job-Attributes, the value MUST contain the same
653   'collection' values received in Job-Submission operations, except for those 'collection' values the Printer
654   returned in the Unsupported Attributes.

655   Each 'collection' value of this attribute has either of the two forms as defined below. The 'collection'
656   values NEED NOT all be of the same form.

657   For the first form, the client MUST supply "input-documents" as the first. The client OPTIONALLY
658   supplies the remaining attributes in any order.

Attribute name	syntax	In request	Printer Support

Attribute name	syntax	In request	Printer Support
input-documents	rangeOfInteger(MAX)	MUST	MUST
document-format	mimeMediaType	MAY	MUST
document-name	name (MAX)	MAY	MUST
compression	type3 keyword	MAY	MUST
document-natural-language	naturalLanguage	MAY	MAY
page-ranges	1setOf rangeOfInteger (1:MAX)	MAY	MAY
finishings	1setOf type2 enum	MAY	MAY
sides	type2 keyword	MAY	MAY
media	type3 keyword	name(MAX	MAY	MAY

659   For the second form, the client MUST supply "output-documents" as the first attribute. The client
660   OPTIONALLY supplies the remaining attributes in any order.

Attribute name	syntax	In request	Printer Support
output-documents	rangeOfInteger(MAX)	MUST	MUST
finishings	1setOf type2 enum	MAY	MAY
sides	type2 keyword	MAY	MAY
media	type3 keyword	name(MAX)	MAY	MAY

661   The following sections describe each attribute in the above table.

662   5.1.1 input-documents (rangeOfInteger (1:MAX))

663   This attribute identifies one or more Input-Documents by specifying a range of numbers (see section
664   4.1 for the rules on associating a number with each Input-Document). The Document-Exceptions
665   apply to the identified Input-Documents.
666
667   A Printer MUST support this attribute. A client MUST supply this attribute in each 'collection'
668   value and it MUST be the first attribute of each 'collection' value. If this attribute is present, then
669   the client MUST NOT supply "output-documents". If this attribute is not the first attribute in a
670   'collection' value, a Printer, depending on implementation, MUST either
671
672   a) ignore the "input-documents" attribute or
673   b) reject all attributes in the 'collection' value and treat the 'collection' values, but not other
674   sibling 'collection' values, as unsupported.
675
676   When a client supplies this attribute in a "document-exceptions" attribute of a Send-Document or
677   Send-URI request, this attribute MUST NOT identify Input-Documents which were sent in an
678   earlier operation. If a Printer receives such a value in a 'collection' value, it MUST treat all
679   attribute values in such a 'collection' value, but not other sibling 'collection' values, as unsupported
680   values and return the entire collection value in the Unsupported Attributes group.
681
682   See section 5 for details of usage of this attribute.

683

5.1.2 output-documents (rangeOfInteger (1:MAX))

This attribute identifies one or more Output-Documents by specifying a range of numbers (see section 4.1 for the rules on associating a number with each Output-Document). The Document-Exceptions apply to the identified Output-Documents.

A Printer MUST support this attribute. A client MUST supply this attribute in each 'collection' value and it MUST be the first attribute of each 'collection' value. If this attribute is present, then the client MUST NOT supply "input-documents". If this attribute is not the first attribute in a 'collection' value, a Printer, depending on implementation, MUST either

a) ignore the "output-documents" attribute or
b) reject all attributes in the 'collection' value and treat the 'collection' values, but not other sibling 'collection' values, as unsupported.

When a client supplies this attribute in a "document-exceptions" attribute of a Send-Document or Send-URI request, this attribute MUST NOT identify Output-Documents whose first Input-Page was sent in an earlier operation. If a Printer receives such a value in a 'collection' value, it MUST treat all attribute values in such a 'collection' value, but not other sibling 'collection' values, as unsupported values and return the entire collection value in the Unsupported Attributes group.

5.1.3 document-format (mimeMediaType)

This attribute has the same meaning as in IPP/1.1. It indicates the document-format for one or more specified Input-Documents. The Printer MUST support this attribute. A client OPTIONALLY supplies it.

5.1.4 document-name (name (MAX))

This attribute has the same meaning as in IPP/1.1. It indicates the document-name for one or more specified Input-Documents. The Printer MUST support this attribute. A client OPTIONALLY supplies it.

5.1.5 compression (type3 keyword)

This attribute has the same meaning as in IPP/1.1. It indicates the compression for one or more specified Input-Documents. The Printer MUST support this attribute. A client OPTIONALLY supplies it.

5.1.6 document-natural-language (naturalLanguage)

This attribute has the same meaning as in IPP/1.1. It indicates the document-natural-language for one or more specified Input-Documents. The Printer MAY support this attribute. A client OPTIONALLY supplies it.

718   5.1.7 page-ranges (1setOf rangeOfInteger (1:MAX))

719   This attribute has the same meaning as in IPP/1.1. It redefines each Input-Document to contain only
720   the specified Input-Pages. See section 5.2.3 for how this attribute interacts with "pages".. The
721   "multiple-document-handling" attribute affects the algorithm for numbering Input-Pages when this
722   attribute is a Job attribute but when it is a Document-Exception attribute. When this attribute is a
723   Document-Exception attribute, the values of the "page-ranges" attribute specify the Input-Pages to
724   select from each of the identified Input-Documents separately, For example, if this attribute has the
725   value "3:5" and is associated with two Input-Documents A and B, Input-Document A redefined to
726   contain just two pages: 3 and 5, and Input-Document B also contains just pages 3 and 5. The Printer
727   MAY support this attribute. A client OPTIONALLY supplies it.

728   5.1.8 finishings (1setOf type2 enum)

729   This attribute has the same meaning as in IPP/1.1. It indicates the finishings for one or more
730   specified Output-Documents. As a Job Template attribute, it affects each Output-Document
731   produced by the Job. For example, all the sheets of each Output-Document are stapled together. As
732   a Document-Exceptions attributes, it affects only the specified Output-Documents. The Printer
733   MAY support this attribute. A client OPTIONALLY supplies it.

734   The next section gives further information about this attribute, but this information is the same for
735   all Output-Document attributes that might be added later.

736   5.1.8.1 Common Behavior for Output-Document Attributes

737   This attribute is directly associated with an Input-Document or Output-Document. This means that it
738   is effectively associated with one or more Output-Documents according to the rules of section 15,
739   and this attribute affects those Output-Documents.

740   5.1.9 sides (type2 keyword)

741   This attribute has the same meaning as in IPP/1.1. It indicates the sides for one or more specified
742   Output-Pages. As a Job Template attribute, it affects each Sheet produced by the Job. As a
743   Document-Exceptions attributes, it affects only the specified Sheets. The Printer MAY support this
744   attribute. A client OPTIONALLY supplies it.

745   The next section gives further information about this attribute, but this information is the same for
746   all Sheet attributes, including "media" which is discussed in section 5.1.10

747   5.1.9.1 Common Behavior for Sheet Attributes

748   This attribute is directly associated with an Input-Document or Output-Document. This means that it
749   is effectively associated with one or more Output-Pages according to the rules of section 15, and this
750   attribute affects the Sheets containing the specified Output-Pages.

751   Because this attribute affects a Sheet, but is effectively associated with an Output-Page, a Sheet that
752   contains two or more Output-Pages may have conflicting values of this attribute. This observation

753   leads to two rules, one for the first Output-Page that this attribute is effectively associated with and
754   one for the last Output-Page that this attribute is effectively associated with.

755   a) For the first Output-Page: if the value of this attribute is effectively associated with Output-
756   Page i, and if Output-Page i is not the first Output-Page contained on a Sheet and if the value
757   of this attribute differs from the value of this attribute for the preceding Output-Page i-1,
758   then Output-Page i MUST start a new Sheet and the Printer MUST issue a warning by
759   adding 'job-warnings-detected' to the "job-state-reasons" and by increasing the value of the
760   "job-warnings-count" Job Description attribute by 1.

761   b) For the last Output-Page: if the value of this attribute is effectively associated with Output-
762   Page i, and if Output-Page i is not the last Output-Page contained on a Sheet and if the value
763   of this attribute differs from the value of this attribute for the following Output-Page i+1,
764   then Output-Page i+1 MUST start a new Sheet and the Printer MUST issue a warning by
765   adding 'job-warnings-detected' to the "job-state-reasons" and by increasing the value of the
766   "job-warnings-count" Job Description attribute by 1.

767   ### 5.1.10 media (type3 keyword | name(MAX))

768   This attribute has the same meaning as in IPP/1.1. It indicates the media for one or more specified
769   Output-Pages. As a Job Template attribute, it affects each Sheet produced by the Job. As a
770   Document-Exceptions attributes, it affects only the specified Sheets. The Printer MAY support this
771   attribute. A client OPTIONALLY supplies it.

772   See section 5.1.9.1 for additional information. The section describes the common behavior of all
773   Sheet attributes.

774   ### 5.1.11 Why not "document-exceptions-default"

775   There is no "document-exceptions-default" attribute because it adds complicated rules for a Printer
776   to implement. The problems are best illustrated with examples.

777   If there were a "document-exceptions-default" and it contained a "sides" and "media" exception for
778   the first Output-Page, and if a client submitted a Job with no "sides" attribute and with "media" as a
779   Job attribute with no exceptions, a possible meaning is that the Printer uses the client's requested
780   media for the entire Job and the sides specified by the "sides-default" and the "sides" value in
781   "document-exceptions-default". So in this example, the Printer ignores the "document-exceptions-
782   default" attribute for "media", but uses it for "sides" because the Printer uses it for an attribute
783   "xxx" only when it uses "xxx-default".

784   ### 5.1.12 document-exceptions-supported (1setOf type1 keyword)

785   This attribute specifies the supported values of the "document-exceptions" attribute. A client can
786   use this attribute to determine what Document-Exceptions attributes the Printer supports.

787 This attribute contains the name of each attribute that the Printer supports in a 'collection' value of
788 the "document-exceptions" attribute. This attribute MUST contain the keywords "input-
789 documents" and "output-documents" because a Printer MUST support these attributes. This
790 attribute MUST also contain the name of each attribute that can be a document-exception. For
791 example, this attribute contains the keyword "sides" if and only if the Printer supports "sides" in a
792 'collection' value of the "document-exceptions" attribute.

793 Standard keyword values are:
794
795 - 'none': no attributes are supported in the "document-exceptions" attribute

796 - 'input-documents': the "input-document" attribute is supported

797 - 'output-documents': the "output-document" attribute is supported

798 - 'document-format': The "document-format" attribute is supported

799 - 'document-name': The "document-name" attribute is supported

800 - 'compression': The "compression" attribute is supported

801 - 'document-natural-language': The "document-natural-language" attribute is supported

802 - 'page-ranges': The "page-ranges" attribute is supported

803 - 'finishings': The "finishing" attribute is supported

804 - 'sides': The "sides" attribute is supported

805 - 'media': The "media" attribute is supported

806 5.2 page-exceptions (1setOf collection)

807 This OPTIONAL Job Template attribute contains attributes that are associated with Input-Pages and
808 Output-Pages and that are treated as page exceptions. Such attributes are called "Page-Exceptions"
809 attributes.
810
811 If this attribute is not present in a Job, there are no Page-Exceptions attributes within the Job. If it is present,
812 the value consists of one or more 'collection' values, where each 'collection' value identifies one or more
813 Input-Pages or Output-Pages and contains one or more Job Template attributes which act as exceptions to
814 the corresponding Job Template attributes for the specified Input-Pages or Output-Pages.
815
816 The first attribute of each 'collection' value MUST be either "input-documents" or "output-documents".
817
818 The second attribute MUST be "pages" and this attribute identifies either
819

820   -   the Input-Pages relative to the Input-Document specified by "input-documents" or

821   -   the Output-Pages relative to the Output-Document specified by "output-documents".

822   The Page-Exceptions attributes applies to the identified Input-Pages or Output-Pages, which need not be
823   contiguous.

824

825   The remaining attributes in the 'collection' value are the Job Template attributes that are exceptions for the
826   specified Input-Pages or Output-Pages.

827   There may be more than one way for a client to arrange Page-Exception attributes in 'collection' values.
828   For example, if an Output-Document contains 10 Output-Pages to be printed 1-sided on white letter paper
829   and Output-Page 1 is to be two sided with blue letter paper and Document 2 is to be two sided with white
830   letter paper, there are two possible ways to group the exceptions. The client could specify the two
831   exceptions for Output-Page 1 in one 'collection' value and the single exception for Output-Page 2 in second
832   'collection' values, or it could specify "two-sided" for Output-Pages 1 and 2 in one 'collection' value and
833   "blue letter paper" for Output-Document 1 in another 'collection' value.

834   If the "pages" and the "input-documents" or "output-documents" identify Input-Pages or Output-Pages that
835   don't exist, the Printer silently ignores them and associates the Page-Exceptions with those Input-Pages or
836   Output-Pages that do exist. A client MUST not allow two 'collection's values to be associated with the
837   same Input-Page or Output-Page and to contain the same Page-Exception attribute with different values. If
838   there is such a conflict, the Printer can use either value, and it MUST issue a warning. It does so by adding
839   'job-warnings-detected' to the "job-state-reasons" and by increasing the value of the "job-warnings-count"
840   Job Description attribute by 1. If the Printer detects this conflict while it is processing a Job-Submission
841   operation, it MUST return the ignored value in the Unsupported attributes.

842   When a Client receives this attribute in a Get-Jobs or Get-Job-Attributes, the value MUST contain the same
843   'collection' values received in Job-Submission operations, except for those 'collection' values the Printer
844   returned in the Unsupported Attributes.

845   Each 'collection' value of this attribute has either of the two forms as defined below. The 'collection'
846   values NEED NOT all be of the same form.

847   For the first form, the client MUST supply "input-documents" as the first attribute and the "pages" attribute
848   as the second attribute. The client OPTIONALLY supplies the remaining attributes in any order.

Attribute name	syntax	In request	Printer Support
input-documents	rangeOfInteger(MAX)	MUST	MUST
pages	rangeOfInteger(MAX)	MUST	MUST
sides	type2 keyword	MAY	MAY
media	type3 keyword	name(MAX	MAY	MAY

849   For the second form, the client MUST supply "output-documents" as the first attribute and the "pages"
850   attribute as the second attribute. The client OPTIONALLY supplies the remaining attributes in any order.

Attribute name	syntax	In request	Printer Support
output-documents	rangeOfInteger(MAX)	MUST	MUST
pages	rangeOfInteger(MAX)	MUST	MUST
sides	type2 keyword	MAY	MAY
media	type3 keyword | name(MAX)	MAY	MAY

851   The following sections describe each attribute in the above table.

852   5.2.1 input-documents (rangeOfInteger (1:MAX))

853   See section 5.1.1 for details of this attribute.

854   5.2.2 output-documents (rangeOfInteger (1:MAX))

855   See section 5.1.2 for details of this attribute.

856   5.2.3 pages (1setOf rangeOfInteger(1:MAX))

857   This attribute identifies one or more Input-Pages or Output-Pages by specifying one or more ranges
858   of numbers (see section 4.1 for the rules on associating a number with each Input-Page or Output-
859   Page). The "1setOf" allows noncontiguous Input-Page or Output-Pages. The Page-Exceptions apply
860   to the identified Input-Pages or Output-Pages.

861   If the "page-ranges" attribute (see section 5.1.7) is associated with an Input-Document, the Input-
862   Pages identified by this attribute are the same as when "page-ranges" is not present. However, this
863   attribute may identify pages that are deselected for printing by the "page-ranges" attribute. For
864   example, if the value of "page-ranges" is "5:10" and this attribute identifies Input-Pages "3:6", this
865   attribute identifies two Input-Pages (3 and 4) that are not printed and two that are (5 and 6)

866   If a Printer support the "page-exceptions" attribute, it MUST support this attribute. A client MUST
867   supply this attribute in each 'collection' value of the "page-exceptions" attribute and it MUST be
868   the second attribute of each 'collection' value. If this attribute is not the in the correct position in a
869   'collection' value (i.e. first or second as defined above), a Printer, depending on implementation,
870   MUST either

872   c) ignore the "pages" attribute or
873   d) reject all attributes in the 'collection' value and treat the 'collection' values, but not other
874   sibling 'collection' values, as unsupported.

876   When a client supplies this attribute in a Send-Document or Send-URI request, this attribute MUST
877   NOT identify Output-Pages sent in an earlier operation. If a Printer receives such a value in a
878   'collection' value, it MUST treat all such values, but not other sibling 'collection' values, as
879   unsupported values.

881   See section 5 for details of usage of this attribute.

882   5.2.4   sides (type2 keyword)

883   This attribute has the same meaning as in IPP/1.1. It indicates the sides for one or more specified
884   Output-Pages. As a Job Template attribute, it affects each Sheet produced by the Job. As a Page-
885   Exceptions attributes, it affects only the specified Sheets. The Printer MAY support this attribute. A
886   client OPTIONALLY supplies it.

887   See section 5.1.9.1 for additional information. The section describes the common behavior of all
888   Sheet attributes.

889   5.2.5   media (type3 keyword | name(MAX))

890   This attribute has the same meaning as in IPP/1.1. It indicates the media for one or more specified
891   Output-Pages. As a Job Template attribute, it affects each Sheet produced by the Job. As a Page-
892   Exceptions attributes, it affects only the specified Sheets. The Printer MAY support this attribute. A
893   client OPTIONALLY supplies it.

894   See section 5.1.9.1 for additional information. The section describes the common behavior of all
895   Sheet attributes.

896   5.2.6   Why not "page-exceptions-default"

897   There is no "page-exceptions-default". See section 5.1.11 for the reasons.

898   5.2.7   page-exceptions-supported (1setOf type1 keyword)

899   This attribute specifies the supported values of the "page-exceptions" attribute. A client can use this
900   attribute to determine what exception attributes the Printer supports.

901   This attribute contains the name of each attribute that the Printer supports in a 'collection' value of
902   the "page-exceptions" attribute. This attribute MUST contain the keywords "input-documents",
903   "output-documents" and "pages" because a Printer MUST support these attributes. This attribute
904   MUST also contain the name of each attribute that can be a page-exception. For example, this
905   attribute contains the keyword "sides" if and only if the Printer supports "sides" in a 'collection'
906   value of the "page-exceptions" attribute.

907   Standard keyword values are:
908
909   -   'none': no attributes are supported in the "page-exceptions" attribute

910   -   'input-documents': the "input-document" attribute is supported

911   -   'output-documents': the "output-document" attribute is supported

912   -   'pages': The "pages " attribute is supported

913   -   'sides': The "sides" attribute is supported

914   -   'media': The "media" attribute is supported

915   5.3   pages-per-subset (1setOf integer)

916   A client OPTIONALLY supplies this attribute, and a Printer OPTIONALLY supports this attribute.
917   If a Printer supports the Page-Subset Document Case, it MUST support this attribute.
918
919   When this attribute is present, it effectively partitions one or more Input-Documents into
920   contiguous subsets of Input-Pages. Each subset is defined to be an Output-Document
921
922   The value of the attribute is a set of one or more integers, where each integer specifies the number
923   of Input-Pages in a subset, and the set is treated as a repeating sequence of integers. Thus, when the
924   attribute contains a single integer, the integer specifies the number of Input-Pages in each subset, as
925   a repeating sequence of the single integer. When the number of integers in this attribute exceeds 1,
926   the first integer specifies the number of Input-Pages in the first subset, the second integer specifies
927   the number of Input-Pages in the second subset and so on. If numbers in this attribute are exhausted
928   before partitioning all of the Input-Pages, the Printer starts at the beginning of the sequence again
929   and continues until all Input-Pages are partitioned.
930
931   If the job contains more than one Input-Document, the Input-Pages are treated as a single stream of
932   Input-Pages which are partitioned into contiguous subsets with some subsets possibly belonging to
933   more than one Input-Document.
934
935   If the number of Input-Pages available for the last subset is less than the number specified by this
936   attribute, the Printer MUST treat the last subset as an Output-Document and MUST issue a warning
937   by adding 'job-warnings-detected' to the "job-state-reasons" and by increasing the value of the
938   "job-warnings-count" Job Description attribute by 1.

939   5.3.1 Why not "pages-per-subset-default"

940   There is no "pages-per-subset-default" because there is no mechanism for a client to specify that
941   there are no Input-Page subsets except to omit this attribute, which would cause the Printer to use
942   the "pages-per-subset-default" attribute and create the default subsets. Without this attribute, a
943   client can achieve subsets only by including the "pages-per-subset" attribute in the Job and the
944   default is no subsetting. Also, if there were a defaulting mechanism, it isn't clear that customers
945   would use the same partitioning over and over..

946   5.3.2 pages-per-subset-supported (Boolean)

947   This attribute specifies whether the Printer supports the Page-Subset Document Case. If the
948   attribute is present and has a value of "true", the Printer supports the Page-Subset Document Case.
949   Otherwise, the Printer doesn't support the Page-Subset Document Case

950   6. New Job Description attributes

951   6.1.1 job-warnings-count (integer)

952   This OPTIONAL attribute specifies the total number of warnings that a Printer has generated while
953   processing and printing the Job. At the beginning of a Job, the value MUST be 0. It MUST increase
954   by 1, each time the Printer generates a warning.

955   7. New Job Description Values

956   7.1.1 job-warnings-detected value for job-state-reasons (1setOf type2 keyword)

957   If the Printer supports the value 'job-warnings-detected', the Printer MUST add it to "job-state-
958   reasons" when it generates the first warning message. That is, a single occurrence of this value is
959   present in the "job-state-reasons" if the Printer has generated one or more warnings.

960   8. Extended Role of Some Operation Attributes

961   In IPP/1.1, the following attributes are operation attributes in all Job-Submission operations except Create-
962   Job, but the Printer doesn't put their values into the Job object.
963
964   -   document-format

965   -   document-name

966   -   compression

967   -   document-natural-language

968
969   With the Exception Extension, these attributes also become:
970
971   -   Operation attributes in the Create-Job and Validate-Job operation when all or most Input-
972   Documents have the same attribute value.

973   -   Job Template attributes, so their values are accessible to a client via the Get-Job-Attributes and Get-
974   Jobs operation.

975   -   Job Description attributes, for legacy reasons so their values are accessible to a client via the Get-
976   Job-Attributes and Get-Jobs operation via the Job Description group name.

977   -   Document-Exceptions attributes, so the values are associated with one Input-Document (possible in
978   IPP/1.1) and a client can query the attributes via Get-Job-Attributes and Get-Jobs operation (not
979   possible in IPP/1.1).

980 If a Printer supports the Exception Extension and if it supports an attribute in this section, it MUST support
981 the attribute in the three contexts above. In IPP/1.1, a Printer MUST support all attributes in this section
982 except the "document-natural-language" attribute. This effectively means that if a Printer supports this
983 extension, it MUST support all of the attributes in this section except "document-natural-language" in the
984 three contexts described above.
985
986 When one of the attributes in this section is an operation attribute in Print-Job, Print-URI or Create-Job, it
987 becomes a Job Template attribute in the newly created Job object. If one of these attributes is a Document-
988 Exceptions attribute, that attribute overrides the Job level attribute for the specified Input-Document.
989
990 When one of the attributes in this section is an operation attribute in Validate-Job, it is validated as if it
991 were an operation attribute of Create-Job.
992
993 When one or more of the attributes in this section is an operation attribute in Send-Document or Send-URI
994 request, they are put into a 'collection' value that is added to the "document-exceptions" attribute. See
995 section 5.1~~0~~ for a discussion of possible conflicts.

996 9. Extensions to Printer Operations

997 The sections below specify the extensions to the groups within IPP 1.1 operations. If an operation or a
998 group within an operation is not mentioned, this extension does not change that operation or group,
999 respectively.
1000

1001 9.1 Create-Job and Validate-Job Operation Requests

1002   Attributes are added to the operation attributes group.
1003

1004   Group 1: Operation Attributes
1005

1006   Add the attributes specified in section 6: "document-format", "document-name",
1007   "compression" and "document-natural-language", so that a client can specify these
1008   attributes, at the job level.

1009   9.2 Send-Document and Send-URI Operation Requests

1010   Attributes are added to the Operation Attributes group.
1011
1012   Group 1: Operation Attributes
1013
1014   "input-document-number" (integer):
1015
1016   The client OPTIONALLY supplies this attribute in order to inform the printer about the
1017   order of documents when the printer is sending the Input-Documents asynchronously.
1018   The first Input-Document is 1, and subsequent Input-Documents are numbered
1019   sequentially. If the value of "last-document" is 'true', then the value of this attribute is
1020   also the total number of Input-Documents in the Job. If a client supplies this attribute in
1021   one Send-Document or Send-URI operation in a Job, it MUST send it in all such
1022   operations. A Printer deals with missing Input-Documents in the same way as without
1023   this attribute except that a time-out can occur with Input-Documents anywhere in the
1024   Job. For example, a Printer could receive Input-Documents 1 and 3 and not 2.
1025
1026   "document-exceptions" (1setOf collection):
1027
1028   The client OPTIONALLY supplies this attribute. See section 5.1 for details. The Printer
1029   MUST support this attribute if it supports the "document-exceptions" Job Template
1030   attribute. If the job doesn't contain a "document-exceptions" attribute, this attribute is
1031   added to the Job. Otherwise, the 'collection' values from this attribute are appended to
1032   the existing "document-exceptions" attribute. See section 5.1 for rules of resolving
1033   conflicts. Also the "input-documents" attribute is added to any 'collection' value that
1034   contains neither an "input-documents" nor "output-documents" attribute.
1035
1036   "page-exceptions" (1setOf collection):
1037
1038   The client OPTIONALLY supplies this attribute. See section 5.2 for details. The Printer
1039   MUST support this attribute if it supports the "page-exceptions" Job Template attribute.
1040   If the job doesn't contain a "page-exceptions" attribute, this attribute is added to the Job.
1041   Otherwise, the 'collection' values from this attribute are appended to the existing "page-
1042   exceptions" attribute. See section 5.2 for rules of resolving conflicts. Also the "input-
1043   documents" attribute is added to any 'collection' value that contains neither an "input-
1044   documents" nor "output-documents" attribute.

1045   10. Examples

1046   This section currently contains 3 examples for various relationships of Input-Documents and Output-
1047   Documents.. The first example is for the Degenerate Case only. The second and third cases are for the
1048   Separate-Document Case, the Single-Documents Case and the Page-Subset Documents Case.
1049

1050   Brackets are used to delimit the beginning and end of each Collection value.

1051   10.1 First Page of Single Document is Letterhead

1052   In the first example, the Printer produces 1 copy of a single Output-Document. It is printed on letter-
1053   paper using Print-Job. The first Output-Page of the Output-Document is letterhead paper.
1054

1055   10.1.1 Degenerate Case.

1056   There is one Input-Document A which produces one Output-Document.
1057
1058   Print-Job
1059   job attributes group
1060   media: letter
1061   page-exceptions: {
1062   output-documents: 1:1   (I could have used input-documents: 1:1 as well)
1063   pages: 1:1
1064   media: letterhead }
1065   end-of-attributes
1066   Input-Document A
1067

1068   10.2 First Page of Several Documents is Blue

1069   In the second example, the Printer produces 3 copies of each Output-Document. Each is stapled and
1070   printed on letter-paper, two-sided using Create-Job. The first Output-Page of each Output-Document is
1071   blue-letter paper and one-sided. All Input-Documents are PostScript.
1072

1073   Attributes that differ between cases are in bold. The values for the attribute "input-documents" changes
1074   with each example, but could be "1:100" for all.

1075   10.2.1 Separate-Documents Case.

1076   There are two Input-Documents A and B which produce two Output-Documents.
1077
1078   Create-Job
1079   operations attributes group
1080   document-format: application/PostScript
1081   job attributes group
1082   *   **multiple-document-handling: separate-documents-collated-copies**
1083   sides: two-sided-long-edge
1084   media: letter
1085   copies: 3
1086   finishings: stapling
1087   page-exceptions: {
1088   output-documents: 1:2   (I could have used input-documents: 1:2 as well)
1089   pages: 1:1
1090   sides: one-sided
1091   media: blue-letter }
1092   end-of-attributes

```
1093        Send-Document
1094            end-of-attributes
1095                Input-Document A
1096        Send-Document
1097            end-of-attributes
1098                Input-Document B
1099
```

1100   ### 10.2.2   Single-Documents Case

1101   There are two Input-Documents A and B and only one Output-Document.

```
1102
1103    Create-Job
1104        operations attributes group
1105            document-format: application/PostScript
1106        job attributes group
1107            multiple-document-handling: single-document
1108            sides: two-sided-long-edge
1109            media: letter
1110            copies: 3
1111            finishings: stapling
1112            page-exceptions: {
1113                output-documents: 1:1              (I could have used input-documents: 1:1)
1114                pages: 1:1
1115                sides: one-sided
1116                media: blue-letter }
1117        end-of-attributes
1118    Send-Document
1119        end-of-attributes
1120            Input-Document A
1121    Send-Document
1122        end-of-attributes
1123            Input-Document B
1124
```

1125   ### 10.2.3   Page-Subset Documents Case

1126   There are two Input-Documents A and B. . The first Input-Document contains 10 Pages and the second
1127   one 15 pages. There are 7 Output-Documents with 3 pages, 5 pages, 4 pages, 2 pages, 3 pages, 5 pages
1128   and 3 pages. The " pages-per-subset" attributes wraps after the first four Output-Documents and starts
1129   with "3" again. After consuming 22 Input-Pages, the next number is "4", but only 3 pages remain. So
1130   the last Output-Document is short. These value show two boundary cases.

```
1131
1132    Create-Job
1133        operations attributes group
1134            document-format: application/PostScript
1135        job attributes group
1136            multiple-document-handling: separate-documents-collated-copies
1137            pages-per-subset: 3, 5, 4, 2
1138            sides: two-sided-long-edge
1139            media: letter
1140            copies: 3
1141            finishings: stapling
```

```
1142              page-exceptions: {
1143                  output-documents: 1:7              (I could have used output-documents: 1:100 to be safe)
1144                  pages: 1:1
1145                  sides: one-sided
1146                  media: blue-letter }
1147          end-of-attributes
1148     Send-Document
1149          end-of-attributes
1150              Input-Document A
1151     Send-Document
1152          end-of-attributes
1153              Input-Document B
```

10.3 First Page is Blue and First Document is not stapled

In the third example, the Printer produces 3 copies of each Output-Document. Each is stapled and printed on letter-paper, two-sided using Create-Job. The third and fourth Output-Pages of each Output-Document is blue-letter paper and one-sided. The second Output-Document is not stapled. All files are PostScript except the second which is html.

Attributes that differ between cases are in bold. The values for the attribute "input-documents" changes with each example, but could be "1:100" for all.

10.3.1 Separate-Documents Case

There are two Input-Documents A and B which produce two Output-Documents.

There are three version presented here in order to show three different places to put the attributes associated with an Input-Document. The differences are in ***bold-italic***.

First solution:

```
1170     Create-Job
1171          operations attributes group
1172              document-format: application/PostScript
1173          job attributes group
1174              multiple-document-handling: separate-documents-collated-copies
1175              sides: two-sided-long-edge
1176              media: letter
1177              copies: 3
1178              finishings: stapling
1179              document-format: application/PostScript
1180              document-exceptions: {
1181                  output-documents: 2:2              (I could have used input-documents: 2:2 & merged with next)
1182                  finishings: none }
1183                              {
1184                  input-documents: 2:2              next value of multi-value
1185                  document-format:  text/html}
1186              page-exceptions: {
1187                  output-documents: 1:2              (I could have used  input-documents: 1:2 as well)
1188                  pages: 3:4
```

```
1189                    sides: one-sided
1190                    media: blue-letter }
1191            end-of-attributes
1192        Send-Document
1193            end-of-attributes
1194                Input-Document A
1195        Send-Document
1196            end-of-attributes
1197                Input-Document B
1198
1199    Second solution:
1200
1201    Create-Job
1202        operations attributes group
1203            document-format: application/PostScript
1204        job attributes group
1205            multiple-document-handling: separate-documents-collated-copies
1206            sides: two-sided-long-edge
1207            media: letter
1208            copies: 3
1209            finishings: stapling
1210            document-format: application/PostScript
1211            document-exceptions: {
1212                output-documents: 2:2
1213                finishings: none }
1214            page-exceptions: {
1215                output-documents: 1:2                    (I could have used  input-documents: 1:2 as well)
1216                pages: 3:4
1217                sides: one-sided
1218                media: blue-letter }
1219        end-of-attributes
1220        Send-Document
1221            end-of-attributes
1222                Input-Document A
1223        Send-Document
1224            Operation attributes group
1225                document-format:  text/html
1226            end-of-attributes
1227                Input-Document B
1228
1229    Third solution:
1230
1231    Create-Job
1232        operations attributes group
1233            document-format: application/PostScript
1234        job attributes group
1235            multiple-document-handling: separate-documents-collated-copies
1236            sides: two-sided-long-edge
1237            media: letter
1238            copies: 3
1239            finishings: stapling
1240            document-format: application/PostScript
1241            page-exceptions: {
```

1242	output-documents: 1:2	(I could have used input-documents: 1:2 as well)
1243	pages: 3:4	
1244	sides: one-sided	
1245	media: blue-letter }	
1246	end-of-attributes	
1247	Send-Document	
1248	end-of-attributes	
1249	Input-Document A	
1250	Send-Document	
1251	***Operation attributes group***	
1252	***document-exceptions: {***	
1253	***input-documents: 2:2***	
1254	***document-format: text/html***	
1255	***finishings: none }***	
1256	end-of-attributes	
1257	Input-Document B	
1258		

1259   10.3.2 Single-Documents Case

1260   There are two Input-Documents A and B and only one Output-Document.

1261

1262   There are three solutions. The Page-Exception attributes are in Create-Job in the first solution and in
1263   Send-Document in the last two solutions. The Document-Exception attribute is directly in the operation
1264   attributes of Send-Document in the first two solutions and in the document-exceptions attributes of
1265   Send-Document in the third solution. The differences are in ***bold-italic***.

1266

1267   First solution:

1268

1269	Create-Job	
1270	operations attributes group	
1271	document-format: application/PostScript	
1272	job attributes group	
1273	**multiple-document-handling: single-document**	
1274	sides: two-sided-long-edge	
1275	media: letter	
1276	copies: 3	
1277	finishings: stapling	
1278	document-exceptions: {	
1279	output-documents: 2:2	(This is ignored because there is no 2nd document)
1280	finishings: none }	
1281	***page-exceptions: {***	
1282	***input-documents: 1:1***	***(I could have used output-documents: 1:1)***
1283	***pages: 3:4***	
1284	***sides: one-sided***	
1285	***media: blue-letter }***	
1286	end-of-attributes	
1287	Send-Document	
1288	end-of-attributes	
1289	Input-Document A	
1290	Send-Document	
1291	Operation attributes group	

```
1292                document-format:  text/html
1293            end-of-attributes
1294                Input-Document B
1295
1296    Second solution:
1297
1298    Create-Job
1299        operations attributes group
1300            document-format: application/PostScript
1301        job attributes group
1302            multiple-document-handling: single-document
1303            sides: two-sided-long-edge
1304            media: letter
1305            copies: 3
1306            finishings: stapling
1307            document-exceptions: {
1308                output-documents: 2:2          (This is ignored because there is no 2nd document)
1309                finishings: none }
1310        end-of-attributes
1311    Send-Document
1312        Operation attributes group
1313            page-exceptions: {
1314                input-documents: 1:1          (I could have used output-documents: 1:1)
1315                pages: 3:4
1316                sides: one-sided
1317                media: blue-letter }
1318        end-of-attributes
1319            Input-Document A
1320    Send-Document
1321        Operation attributes group
1322            document-format:  text/html          (this can be here or in the document-exceptions)
1323        end-of-attributes
1324            Input-Document B
1325
1326    Third solution:
1327
1328    Create-Job
1329        operations attributes group
1330            document-format: application/PostScript
1331        job attributes group
1332            multiple-document-handling: single-document
1333            sides: two-sided-long-edge
1334            media: letter
1335            copies: 3
1336            finishings: stapling
1337            document-exceptions: {
1338                output-documents: 2:2          (This is ignored because there is no 2nd document)
1339                finishings: none }
1340        end-of-attributes
1341    Send-Document
1342        Operation attributes group
1343            page-exceptions: {
1344                input-documents: 1:1                    (I could have used output-documents: 1:1)
```

1345   *pages: 3:4*
1346   *sides: one-sided*
1347   *media: blue-letter }*
1348   end-of-attributes
1349   Input-Document A
1350   Send-Document
1351   Operation attributes group
1352   *document-exceptions: {*
1353   *input-documents: 2:2*
1354   *document-format: text/html }*
1355   end-of-attributes
1356   Input-Document B

1357   10.3.3 Page-Subset Documents Case

1358   There are two Input-Documents A and B. . The first Input-Document contains 10 Pages and the second
1359   one 15 pages. There are 7 Output-Documents with 3 pages, 5 pages, 4 pages, 2 pages, 3 pages, 5 pages
1360   and 3 pages. The "pages-per-subset" attributes wraps after the first four Output-Documents and starts
1361   with "3" again. After consuming 22 Input-Pages, the next number is "4", but only 3 pages remain. So
1362   the last Output-Document is short.

1363
1364   Create-Job
1365   operations attributes group
1366   document-format: application/PostScript
1367   job attributes group
1368   **multiple-document-handling: separate-documents-collated-copies**
1369   **pages-per-subset: 3, 5, 4, 2**
1370   sides: two-sided-long-edge
1371   media: letter
1372   copies: 3
1373   finishings: stapling
1374   document-exceptions: {
1375   output-documents: 2:2
1376   finishings: none }
1377   page-exceptions: {
1378   output-documents: 1:7   (I could have used input-documents: 1:100 to be safe)
1379   pages: 3:4
1380   sides: one-sided
1381   media: blue-letter }
1382   end-of-attributes
1383   Send-Document
1384   end-of-attributes
1385   Input-Document A
1386   Send-Document
1387   Operation attributes group
1388   document-format: text/html   (this can be here or in the document-exceptions)
1389   end-of-attributes
1390   Input-Document B

1391   11. IANA Considerations

1392

1393 IANA will be called on to register the Job Template attributes defined in this document, using the
1394 procedures outlined in [ipp-mod].

1395 12. Internationalization Considerations

1396 The IPP extensions defined in this document require the same internationalization considerations as any of
1397 the Job Template attributes defined in IPP/1.1 [ipp-mod].

1398 13. Security Considerations

1399 The IPP extensions defined in this document require the same security considerations as any of the Job
1400 Template attributes defined in IPP/1.1 [ipp-mod].

1401 14. References

1402 [ipp-mod]
1403   R. deBry, T. Hastings, R. Herriot, S. Isaacson, P. Powell, "Internet Printing Protocol/1.0: Model and
1404   Semantics", <draft-ietf-ipp-model-v11-04.txt>, June 23, 1999.

1405 [RFC2566]
1406   R. deBry, T. Hastings, R. Herriot, S. Isaacson, P. Powell, "Internet Printing Protocol/1.0: Model and
1407   Semantics", RFC 2566, April 1999.

1408 15. Author's Addresses

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1425   16. Appendix A: Rules for Attribute Association

1426   For each category of attribute, there is a rule:
1427

1428   -   Input-Documents: such an attribute

1429   -   cannot be directly associated with Input-Pages, Output-Pages, or Output-Documents.
1430   -   can be directly associated with an Input-Document, and it affects the Input-Document it is
1431   associated with.
1432   -   can be associated with a Job and it affects all Input-Documents that don't have the attribute
1433   associated with it.
1434

1435   -   Output-Documents: such an attribute

1436   -   can never be directly associated with an Input-Page or Output-Page.
1437   -   can be directly associated with an Output-Document, and it affects the Output-Document it is
1438   associated with.
1439   -   can be directly associated with an Input-Document. If that Input-Document produces a first
1440   Output-Page for one or more Output-Documents, the attribute is effectively associated with each
1441   such Output-Document that doesn't have the attribute directly associated with it. If that Input-
1442   Document doesn't produce any first Output-Pages of an Output-Document, it is ignored and the
1443   Printer produces a warning message.
1444   -   can be associated with a Job and it affects all Output-Documents that don't have the attribute
1445   associated with it.
1446

1447   -   Sheets: such attributes

1448   -   can be directly associated with an Output-Page, and it affects the Output-Page it is associated
1449   with.
1450   -   can be directly associated with an Input-Page, and it is effectively associated with the Output-
1451   Page determined by the relationship described for the four cases in section 4.2 if that Output-
1452   Page doesn't have the attribute directly associated with it
1453   -   can be directly associated with an Output-Document, and it affects all Output-Pages in the
1454   specified Output-Document that don't have the attribute associated directly with it or the
1455   corresponding Input-Page.
1456   -   can be directly associated with an Input-Document, and it is effectively associated with all Input-
1457   Pages in the specified Input-Document that don't have the attribute associated directly with it.
1458   By transitivity, the attribute is effectively associated with all corresponding Output-Pages (see
1459   section 4.2) that don't have the attribute associated directly with the them or the containing
1460   Output-Document.
1461   -   can be associated with a Job and it affects all Output-Pages that don't have the attribute
1462   associated with it.
1463

1464   17. Appendix B: Change History

1465   This section summarizes the changes to the document. Each sub-section is in reverse chronological order.
1466   Adding or removing ISSUES that don't change the document are not listed here.

1467   17.1 Changes to the January 3, 2000 version to make the January 31, 2000 version

1468   The following changes to the January 3, 2000 version to make the January 31, 2000 version:

1469   1. Changed the format to be a PWG-DRAFT. No technical content changed.

1470   18. Appendix C: Description of the IEEE-ISTO PWG

1471   The Printer Working Group (or PWG) is a Program of the IEEE Industry Standards and Technology
1472   Organization (ISTO) and is an alliance among printer manufacturers, print server developers, operating
1473   system providers, network operating systems providers, network connectivity vendors, and print
1474   management application developers chartered to make printers and the applications and operating systems
1475   supporting them work together better. All references to the PWG in this document implicitly mean "The
1476   Printer Working Group, a Program of the IEEE ISTO." In order to meet this objective, the PWG will
1477   document the results of their work as open standards that define print related protocols, interfaces,
1478   procedures and conventions. Printer manufacturers and vendors of printer related software will benefit from
1479   the interoperability provided by voluntary conformance to these standards.
1480   In general, a PWG standard is a specification that is stable, well understood and is technically competent,
1481   has multiple, independent and interoperable implementations with substantial operational experience, and
1482   enjoys significant public support. The PWG may issue a standard as a PWG standard and/or when
1483   appropriate submit the standard to other standards organizations, such as the IETF, ISO, ITU, IEEE, or
1484   ECMA.

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