



The Printer Working Group

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Working Draft

## IPP System Service v1.0 (SYSTEM)

Status: Interim

Abstract: This document defines an IPP System Service binding of the PWG Semantic Model root System object and associated System Control Service that are defined in (PWG 5108.06) and the PWG Resource Service that is defined in (PWG 5108.03). This document defines IPP objects, operations, and attributes to support management of all configured Services, Subunits, and Resources on an Imaging System and monitoring of the current status of the Imaging System, Services, Subunits, and Resources. This document also defines IPP operations and attributes to support registration of an IPP System, through its IPP Proxy, with one or more Cloud Imaging Systems. This document is technically aligned with the abstract PWG Cloud Imaging Requirements and Model (PWG 5109.1) and concrete PWG IPP Shared Infrastructure Extensions (PWG 5100.18).

This document is a PWG Working Draft. For a definition of a "PWG Working Draft", see:

<http://ftp.pwg.org/pub/pwg/general/pwg-process30.pdf>

This document is available electronically at:

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58 technically competent, has multiple, independent and interoperable implementations with  
59 substantial operational experience, and enjoys significant public support.

60 For additional information regarding the Printer Working Group visit:

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69 About the Internet Printing Protocol Work Group

70 The Internet Printing Protocol (IPP) working group has developed a modern, full-featured  
71 network printing protocol, which is the industry standard. IPP allows a print client to query  
72 a printer for its supported capabilities, features, and parameters to allow the selection of an  
73 appropriate printer for each print job. IPP also provides job information prior to, during, and  
74 at the end of job processing.

75 For additional information regarding IPP visit:

76 <http://www.pwg.org/ipp/>

77 Implementers of this specification are encouraged to join the IPP mailing list in order to  
78 participate in any discussions of the specification. Suggested additions, changes, or  
79 clarification to this specification, should be sent to the IPP mailing list for consideration.

80

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293		
294		

## 295 **1. Introduction**

296 This document defines an IPP System Service binding of the PWG Semantic Model root  
297 System object and associated System Control Service that are defined in [PWG 5108.06]  
298 and the PWG Resource Service that is defined in [PWG5108.03]. This document defines  
299 IPP objects, operations, and attributes to support management of all configured Services,  
300 Subunits, and Resources on an Imaging System and monitoring of the current status of the  
301 Imaging System, Services, Subunits, and Resources. This document also defines IPP  
302 operations and attributes to support registration of an IPP System, through its IPP Proxy,  
303 with one or more Cloud Imaging Systems. This document is technically aligned with the  
304 abstract PWG Cloud Imaging Requirements and Model [PWG5109.1] and concrete PWG  
305 IPP Shared Infrastructure Extensions [PWG5100.18].

### 306 **1.1 Rationale for two IPP Protocol Endpoints**

307 This specification defines the IPP System object that represents the IPP System Service.  
308 Because the IPP operations on and the IPP attributes defined for this System object and  
309 those defined for the Printer object in [RFC2911] are disjoint, an IPP Imaging System that  
310 conforms to this specification supports both an IPP System object and (via a response to  
311 the Get-Printer-Attributes operation) an IPP Printer object, each with a separate Protocol  
312 Endpoint – i.e., separate values of IPP URI [RFC3510] or IPPS URI [RFC7472].

313 For the convenience of existing IPP Clients, this specification also includes the original  
314 Get-Printer-Attributes operation defined in IPP/1.1 Model and Semantics [RFC2911] with  
315 an extension to automatically select the implementation-defined or site-defined “default”  
316 IPP Printer object.  
317

## 318 2. Terminology

### 319 2.1 Conformance Terminology

320 Capitalized terms, such as MUST, MUST NOT, RECOMMENDED, REQUIRED, SHOULD,  
321 SHOULD NOT, MAY, and OPTIONAL, have special meaning relating to conformance as  
322 defined in Key words for use in RFCs to Indicate Requirement Levels [RFC2119]. The  
323 term CONDITIONALLY REQUIRED is additionally defined for a conformance requirement  
324 that applies to a particular capability or feature.

### 325 2.2 Protocol Role Terminology

326 This document defines the following protocol roles in order to specify unambiguous  
327 conformance requirements:

328 *Client*: Initiator of outgoing IPP session requests and sender of outgoing IPP operation  
329 requests (Hypertext Transfer Protocol -- HTTP/1.1 [RFC7230] User Agent).

330 *Endpoint*: Any computing device that can be connected to a network. Such devices  
331 normally are associated with a particular link layer address before joining the network and  
332 potentially an IP address once on the network. This includes: laptops, desktops, servers,  
333 cell phones, or any device that may have an IP address (or any other network layer  
334 address) [RFC5209].

335 *Infrastructure Printer*: A Printer that represents a Logical Device associated with both a  
336 Client and Proxy [PWG5100.18]. For Cloud-based implementations, the Infrastructure  
337 Printer corresponds to a Cloud Imaging Service [PWG5019.1].

338 *Infrastructure System*: A System that represents an entire Imaging System and accepts  
339 incoming requests and connections from both Clients and Proxies and contains zero or  
340 more Infrastructure Printers [PWG5100.18]. For Cloud-based implementations, the  
341 Infrastructure System corresponds to a Cloud Imaging System [PWG5019.1].

342 *Printer*: Listener for incoming IPP session requests and receiver of incoming IPP  
343 operation requests (Hypertext Transfer Protocol -- HTTP/1.1 [RFC7230] Server) that  
344 exposes a Printer object and implements an Imaging Service.

345 *Protocol Endpoint*: An application interface, typically at the transport layer or session  
346 layer, that supports: a) initiating outgoing connection requests and operation requests; b)  
347 listening for incoming connection requests and operation requests; or c) both initiating and  
348 listening. Every Client, Printer, Proxy, and System supports at least one Protocol  
349 Endpoint.

350 *Proxy*: A Client that sends configuration and status information to and retrieves and  
351 manages Jobs and Documents from an Infrastructure Printer [PWG5100.18] on behalf of

352 one or more Output Devices and also communicates internally with an Infrastructure  
353 System to register the local System and get back Infrastructure Printer URIs.

354 *System*: Listener for incoming IPP session requests and receiver of incoming IPP  
355 operation requests (Hypertext Transfer Protocol -- HTTP/1.1 [RFC7230] Server) that  
356 exposes a System object and implements a System Service.

## 357 **2.3 Printing Terminology**

358 Normative definitions and semantics of printing terms are imported IETF Printer MIB v2  
359 [RFC3805], IETF Finisher MIB [RFC3806], and IETF Internet Printing Protocol/1.1: Model  
360 and Semantics [RFC2911].

361 *Document*: An object created and managed by an Imaging Service that contains the  
362 description, processing, and status information. A Document object may have attached  
363 data and is bound to a single Job object.

364 *FaxOut Job*: An object created and managed by a FaxOut Service that contains  
365 description, processing, and status information. The FaxOut Job also contains zero or  
366 more Document objects.

367 *FaxOut Service*: An Imaging Service that accepts incoming IPP operation requests for  
368 creation of FaxOut Jobs and management of FaxOut Jobs and the service itself.

369 *IPP Binding*: The Internet Printing Protocol implementation of an abstract information  
370 model and associated set of abstract operations and data elements.

371 *Imaging Device*: A physical hardware entity (stand-alone) or logical software entity (hosted  
372 on a network server) that supports one or more Imaging Services (e.g., Print, Scan,  
373 FaxOut, etc.).

374 *Imaging Service*: A software entity that supports document or image processing (e.g.,  
375 Print, Scan, FaxOut, etc.).

376 *Imaging System*: A logical or physical system supports a System object and a System  
377 Service for monitoring and management of one or more Imaging Services (e.g., Print,  
378 Scan, FaxOut, etc.).

379 *ith*: Referring to a specific IPP '1setOf' value - the first value, the second value, and so  
380 forth.

381 *Job*: An object created and managed by an Imaging Service that contains the description,  
382 processing, and status information. A Job object also contains zero or more Document  
383 objects.

- 384 *Logical Device*: a print server, software service, or gateway that processes jobs and either  
385 forwards or stores the processed job or uses one or more Physical Devices to render  
386 output.
- 387 *Output Device*: a single Logical or Physical Device.
- 388 *Physical Device*: a hardware implementation of a endpoint device, e.g., a marking engine,  
389 a fax modem, etc.
- 390 *Print Job*: An object created and managed by a Print Service that contains description,  
391 processing, and status information. The Print Job also contains zero or more Document  
392 objects.
- 393 *Print Service*: An Imaging Service that accepts incoming IPP operation requests for  
394 creation of Print Jobs and management of Print Jobs and the service itself.
- 395 *Printer*: Synonym for Imaging Service – an object that accepts incoming IPP operation  
396 requests for creation of Imaging Jobs and management of Imaging Jobs.
- 397 *Scan Job*: An object created and managed by a Scan Service that contains description,  
398 processing, and status information. The Scan Job also contains zero or more Document  
399 objects.
- 400 *Scan Service*: An Imaging Service that accepts incoming IPP operation requests for  
401 creation of Scan Jobs and management of Scan Jobs and the service itself.
- 402 *Spooling Service*: An Imaging Service that stores all of a Job's document data so that it  
403 can be reprocessed as needed.
- 404 *Streaming Service*: An Imaging Service that stores some of a Job's document data as it is  
405 processed, output, and/or delivered.
- 406 *Subunit*: A hardware component (e.g., input tray or marker) or software component (e.g.,  
407 input channel or interpreter) of an Imaging System.
- 408 *System Service*: A software entity that supports management of all hardware and software  
409 components of an Imaging System and the System object defined in this specification.
- 410 *Transform Job*: An object created and managed by a Transform Service that contains  
411 description, processing, and status information. The Transform Job also contains zero or  
412 more Document objects.
- 413 *Transform Service*: An Imaging Service that accepts incoming IPP operation requests for  
414 creation of Transform Jobs and management of Transform Jobs and the service itself.
- 415

## 416 2.4 Abbreviations

417 *IANA*: Internet Assigned Numbers Authority, <http://www.iana.org/>

418 *IETF*: Internet Engineering Task Force, <http://www.ietf.org/>

419 *ISO*: International Organization for Standardization, <http://www.iso.org/>

420 *PWG*: Printer Working Group, <http://www.pwg.org/>

## 421 3. Requirements for the IPP System Service

### 422 3.1 Rationale for the IPP System Service

423 Existing IPP specifications define the following features and functionality:

- 424 1) IPP Version 2.0, 2.1, and 2.2 [PWG5100.12] defines:
- 425 (a) Three profiles that cover all previous IETF and PWG IPP specifications;
- 426 (b) Existing Printer and Job operations and attributes required for each profile;
- 427 (c) Standard IPP version numbers for each profile (2.0, 2.1, and 2.2); and
- 428 (d) Specific interoperability requirements, such as HTTP/1.1 support with chunking
- 429 and IPP collection attribute support;
- 430 2) IPP: Job and Printer Extensions – Set 3 [PWG5100.13] defines operations and
- 431 attributes required for mobile printing and printing with generic drivers;
- 432 3) IPP Everywhere [PWG5100.14] defines an IPP extension to support network
- 433 printing without vendor-specific driver software, including transport protocols,
- 434 various discovery protocols, and standard document formats;
- 435 4) IPP FaxOut Service [PWG5100.15] defines an IPP extension to support the PWG
- 436 Semantic Model FaxOut Service [PWG5108.05] over IPP;
- 437 5) IPP Scan Service [PWG5100.17] defines an IPP extension to support the PWG
- 438 Semantic Model Scan Service [PWG5108.02] over IPP; and
- 439 6) IPP Shared Infrastructure Extensions [PWG5100.18] defines operations and
- 440 attributes required to allow IPP Printers to interface with shared services based in
- 441 the network infrastructure, i.e., software-defined networks, and/or through Cloud-
- 442 based solutions to remotely obtain and process Jobs and Documents, and provide
- 443 state and configuration changes to those services.

444

445 Existing PWG Semantic Model specifications define the following features and

446 functionality:

- 447 1) PWG MFD Model and Common Semantics [PWG5801.01] defines:  
448 (a) A PWG System object as the root of the PWG Semantic Model (including the  
449 associated XML Schema); and  
450 (b) An extension of the original PWG Semantic Model [PWG5105.1] (abstract print  
451 service) to support all of the typical multifunction services (Print, Scan, FaxOut,  
452 etc.);
- 453 2) PWG System object and System Control Service [PWG5108.05] defines the  
454 elements of the PWG System object and system operations of the PWG System  
455 Control Service;
- 456 3) PWG Resource Service [PWG5108.3] defines the elements of the PWG Resource  
457 object and resource operations of the PWG Resource Service; and
- 458 4) PWG Cloud Imaging Requirements and Model [PWG5109.1] defines an abstract  
459 model to support Imaging Services using the Cloud, based on the PWG Semantic  
460 Model. The IPP Binding for this abstract model is described in IPP Shared  
461 Infrastructure Extensions [PWG5100.18].

462

463 Therefore, this IPP System Service specification should define:

- 464 1) An IPP binding of the PWG System object;
- 465 2) An IPP binding of the PWG System Control Service to support management and  
466 monitoring of Imaging Systems and their configured Imaging Services; and
- 467 3) An IPP binding of the PWG Resource object and the PWG Resource Service.

## 468 **3.2 Use Cases**

### 469 **3.2.1 Imaging System Service Enumeration**

470 Jane wants to determine what services are available on an Imaging System and their  
471 capabilities. After Jane initiates service enumeration by using the IPP Client on her laptop  
472 to send a query to the Imaging System for the list of available services. After receiving the  
473 response from the Imaging System, the IPP Client sends further queries to each Imaging  
474 Service for its capabilities and configuration. Finally, the IPP Client displays the list of  
475 available Imaging Services and their capabilities.

### 476 **3.2.2 Imaging System Monitoring**

477 Jane wants to monitor the usage and supply levels of an Imaging System. She uses the  
478 IPP Client on her laptop to periodically query the input trays and the supply levels of  
479 relevant components on the Imaging System and the usage counters for each Imaging  
480 Service supported by the Imaging System.

**481 3.2.3 Imaging System Management**

482 Jane needs to periodically pause and resume all of the services supported by an Imaging  
483 System in order to perform maintenance. She uses the IPP Client on her laptop to send  
484 pause and resume requests to the Imaging System as needed.

**485 3.2.4 Resource Management**

486 Jane wants to install a resource (firmware, font, logo, etc.) on an Imaging System in order  
487 to extend the functionality of the Imaging System. She uses the IPP Client on her laptop to  
488 create and upload the desired resource to the Imaging System.

**489 3.3 Exceptions**

490 There are no exceptions to the use cases defined in section 3.2.

**491 3.4 Out of Scope**

492 The out-of-scope requirements for this IPP System Service specification are:

- 493 1) Configuration of Imaging Services directly through the System Service (e.g.,  
494 defaults or assigned Subunits).
- 495 2) Pause/Resume or Enable/Disable of a sparse list of specific Imaging Services on an  
496 Imaging System (because the resulting operation status would be complicated  
497 and/or ambiguous).
- 498 3) Migration of Imaging Services and/or Jobs to another Imaging System.
- 499 4) Support for any non-IPP Cloud Imaging System.

**500 3.5 Design Requirements**

501 The design requirements for this IPP System Service specification are:

- 502 1) Follow the naming conventions defined in IPP/1.1: Model and Semantics  
503 [RFC2911], including keyword value case (lower) and hyphenation requirements.
- 504 2) Define objects, attribute groups, attributes, and values to support the System object,  
505 Resource object, and System Service.
- 506 3) Define operations to support the System Service and the use cases defined in  
507 section 3.2.

508



## 509 **4. IPP Object Model**

510 This specification extends the original IPP Model defined in section 2 of IETF IPP/1.1  
511 Model and Semantics [RFC2911] from the original print service scope to include all  
512 Imaging Services on a managed Imaging System.

### 513 **4.1 System Object**

514 This specification defines a root object called a “System” that is an IPP binding of the  
515 System object defined in PWG System object and System Control Service [PWG5108.06].

516 This object contains: (a) description (e.g., name and manufacturer) including summaries  
517 of configured services, subunits, and resources; and (b) overall status (e.g., state and  
518 counters).

### 519 **4.2 Subunit Object**

520 This specification defines a component object called a “Subunit” that is an IPP binding of  
521 the Subunit object defined in PWG MFD Model and Common Semantics [PWG5801.01]  
522 and is based on the Subunit (hardware or software component) defined in IETF Printer  
523 MIB v2 [RFC3805].

524 This object contains: (a) capabilities (e.g., max tray capacity); (b) description (e.g., name);  
525 and (c) component status (e.g., state and counters).

### 526 **4.3 Printer Object**

527 This specification extends the original IPP Printer object defined in IETF IPP/1.1 Model  
528 and Semantics [RFC2911] to represent any Imaging Service (print, scan, etc.), in order to  
529 reuse existing IPP Printer operations and attributes in the individual Imaging Services, but  
530 NOT directly in this specification.

### 531 **4.4 Job Object**

532 This specification extends the original IPP Job object defined in IETF IPP/1.1 Model and  
533 Semantics [RFC2911] to represent a Job on any Imaging Service (Print, Scan, etc.), in  
534 order to reuse existing IPP Job operations and attributes in the individual Imaging  
535 Services, but NOT directly in this specification.

### 536 **4.5 Document Object**

537 This specification extends the original IPP Document object defined in IETF IPP/1.1 Model  
538 and Semantics [RFC2911] to represent a Document contained in a Job on any Imaging

539 Service (Print, Scan, etc.), in order to reuse existing IPP Document operations and  
540 attributes in the individual Imaging Services, but NOT directly in this specification.

#### 541 **4.6 Resource Object**

542 This specification extends the original Resource object defined in PWG Network Resource  
543 Service [PWG5108.03], in order to incorporate Resource operations directly into the IPP  
544 System Service. Resources are managed by the System and each Resource has a  
545 system-wide unique status attribute “resource-id”. Resource persistence is determined  
546 directly by the System: (a) System scope Resources persist for the life of the System; (b)  
547 Printer (service) scope Resources persist for the life of the Printer; (c) Job scope  
548 Resources persist for the life of the Job document data. Activation (for use) of Resources  
549 (e.g., firmware, software, fonts, etc.) is supported via the Install-Resource operation.  
550 Resources do not have leases and expiration times (as they formerly did in  
551 [PWG5108.03]).

#### 552 **4.7 Subscription Object**

553 This specification extends the original IPP Subscription object defined in IPP Event  
554 Notifications and Subscriptions [RFC3995] to allow subscriptions to the IPP System object  
555 for event notifications.

556 **5. IPP System and Resource Objects and Operations**

557 This specification combines and maps the PWG SM System and PWG System Control  
558 Service objects [PWG5801.01] into the IPP System object, which is the target of all IPP  
559 system-level and resource-level operations. This is consistent with Print Service  
560 operations targeted at original IPP Printer object.

561 This specification maps the PWG SM Resource object [PWG5108.03] into the IPP  
562 Resource object and defines a set of resource-level operations.

563 This specification maps a summary of PWG SM SystemConfiguration group into the IPP  
564 “system-configured-subunits” attribute defined in section 5.4 System Status.

565 **5.1 System Attribute Group**

566 This document defines the system-attributes-tag (0x0A) for attribute groups.  
567

568 **5.2 System Description Attributes**

569 The READ-WRITE attributes in the IPP System Description group are listed in Table 1.

570 **Table 1 – IPP System Description Attributes**

Conformance	IPP Attribute Name	SM Element Name	Reference
REQUIRED	charset-configured	CharsetConfigured[1]	[PWG5108.06]
REQUIRED	charset-supported	CharsetSupported[1]	[PWG5108.06]
REQUIRED	ipp-versions-supported	VersionsSupported[1]	[PWG5108.06]
REQUIRED	natural-language-configured	NaturalLanguageConfigured[1]	[PWG5108.06]
REQUIRED	natural-language-supported	NaturalLanguageSupported[1]	[PWG5108.06]
REQUIRED	operations-supported	OperationsSupported[1]	[PWG5108.06]
OPTIONAL	power-calendar	PowerCalendar	[PWG5108.06]
OPTIONAL	power-event	PowerEvent	[PWG5108.06]
RECOMMENDED	power-timeout	PowerTimeout[3]	[PWG5108.06]
REQUIRED	system-default-printer-uri	<none>[5]	<none>
REQUIRED	system-device-id	DeviceId[2]	[PWG5108.06]
REQUIRED	system-geo-location	SystemGeoLocation[2]	[PWG5108.06]
REQUIRED	system-info	SystemInfo[2]	[PWG5108.06]
REQUIRED	system-location	SystemLocation[2]	[PWG5108.06]
REQUIRED	system-make-and-model	MakeAndModel[2]	[PWG5108.06]
OPTIONAL	system-message-from-operator	MessageFromOperator	[PWG5108.06]
REQUIRED	system-name	SystemName[2]	[PWG5108.06]
CONDITIONALLY REQUIRED	system-owner-uri	OwnerUri[4]	[PWG5108.06]
CONDITIONALLY REQUIRED	system-owner-vcard	OwnerVCard[4]	[PWG5108.06]
REQUIRED	system-xri-supported	XriSupported	[PWG5108.06]

571 Notes:

- 572 1) REQUIRED for a Printer per IETF IPP/1.1 Model and Semantics [RFC2911].
- 573 2) REQUIRED for a Printer per PWG IPP Everywhere [PWG5100.14].
- 574 3) REQUIRED or RECOMMENDED for a System per PWG Power Management  
575 Model [PWG5106.4].
- 576 4) CONDITIONALLY REQUIRED for a System that supports the Set-System-  
577 Attributes operation – also “owner-uri” and “owner-vcard” MUST be updated  
578 simultaneously if specified in a Set-System-Attributes operation (to preserve  
579 consistency).
- 580 5) REQUIRED for a System to support the Get-Printer-Attributes operation which uses  
581 the implementation-defined or administratively-configured “default” Printer object as  
582 a target.  
583

584 **5.3 System Status Attributes**

585 The READ-ONLY attributes in the IPP System Status group are listed in Table 2. These  
 586 attributes are inherently READ-ONLY and can only be modified indirectly as a side effect  
 587 of one or more IPP System Service operations, but NOT by a Set-System-Attributes  
 588 operation.

589 **Table 2 – IPP System Status Attributes**

Conformance	IPP Attribute Name	SM Element Name	Reference
OPTIONAL	power-counters	PowerCounters	[PWG5108.06]
RECOMMENDED	power-general	PowerGeneral[3]	[PWG5108.06]
RECOMMENDED	power-log	PowerLog[3]	[PWG5108.06]
OPTIONAL	power-meters	PowerMeters	[PWG5108.06]
RECOMMENDED	power-monitor	PowerMonitor[3]	[PWG5108.06]
OPTIONAL	power-support	PowerSupport	[PWG5108.06]
OPTIONAL	power-transition	PowerTransition	[PWG5108.06]
REQUIRED	system-config-changes	SystemConfigChangeNumber[5]	[PWG5108.06]
REQUIRED	system-configured-printers	ConfiguredServices	[PWG5108.06]
REQUIRED	system-configured-resources	ConfiguredResources	[PWG5108.06]
REQUIRED	system-configured-subunits	SystemConfiguration[4]	[PWG5108.06]
REQUIRED	system-current-time	CurrentTime[2]	[PWG5108.06]
RECOMMENDED	system-health	SystemHealth	[PWG5108.06]
OPTIONAL	system-serial-number	SerialNumber[5]	[PWG5108.06]
REQUIRED	system-state	State[1]	[PWG5108.06]
REQUIRED	system-state-message	StateMessages[2]	[PWG5108.06]
REQUIRED	system-state-reasons	StateReasons[2]	[PWG5108.06]
RECOMMENDED	system-totals	SystemTotals[6]	[PWG5108.06]
REQUIRED	system-up-time	UpTime[2]	[PWG5108.06]
REQUIRED	system-uuid	ServiceUuid[2] [7]	[PWG5108.01]

590 Notes:

591 1) REQUIRED for a Printer per IETF IPP/1.1 Model and Semantics [RFC2911].

592 2) REQUIRED for a Printer per PWG IPP Everywhere [PWG5100.14].

593 3) REQUIRED or RECOMMENDED for a System per PWG Power Management  
594 Model [PWG5106.4].595 4) Summary of SystemConfiguration group (subunits) – similar to ConfiguredServices  
596 in [PWG5108.06].

597 5) REQUIRED for a Printer per IETF Printer MIB v2 [RFC3805].

598 6) REQUIRED for a System per PWG Imaging System Counters [PWG5106.1].

599 7) The System object “system-uuid” attribute identifies the System Service. The  
600 Printer object “printer-uuid” identifies a specific Imaging Service (e.g., Print, Scan,  
601 FaxOut, etc.).

602 **5.4 System Operations**

603 The operations for an IPP System Service conforming to this specification are listed in  
 604 Table 3.

605 **Table 3 – IPP System Service Operations**

Code	IPP Operation Name	SM Operation Name	Reference
0x00nn	Cancel-Resource	DeleteResource	[PWG5108.03]
0x00nn	Cancel-Subscription	<none>	[RFC3995]
0x00nn	Create-Printer	<none>[5]	[ISO10175-3]
0x00nn	Create-Resource	StoreResource[3]	[PWG5108.03]
0x00nn	Create-Resource-Subscriptions	<none>	[RFC3995]
0x00nn	Create-System-Subscriptions	<none>	[RFC3995]
0x00nn	Delete-Printer	DeleteService	[PWG5108.06]
0x00nn	Disable-All-Printers	DisableAllServices[2]	[PWG5108.06]
0x00nn	Enable-All-Printers	EnableAllServices[2]	[PWG5108.06]
0x00nn	Get-Notifications	<none>	[RFC3995]
0x00nn	Get-Printers	ListAllServices	[PWG5108.06]
0x00nn	Get-Printer-Attributes	GetServiceElements[4]	[PWG5108.06]
0x00nn	Get-Resources	ListResources	[PWG5108.03]
0x00nn	Get-Resource-Attributes	GetResourceElements	[PWG5108.03]
0x00nn	Get-Subscriptions	<none>	[RFC3995]
0x00nn	Get-Subscription-Attributes	<none>	[RFC3995]
0x00nn	Get-System-Attributes	GetSystemElements	[PWG5108.06]
0x00nn	Install-Resource	<none>	<none>
0x00nn	Pause-All-Printers	PauseAllServices	[PWG5108.06]
0x00nn	Pause-All-Printers-After-Current-Job	PauseAllServices AfterCurrentJob[1]	[PWG5108.06]
0x00nn	Register-Output-Device	<none>[6]	[PWG5109.1]
0x00nn	Renew-Subscription	<none>	[RFC3995]
0x00nn	Restart-System	<none>	<none>
0x00nn	Resume-All-Printers	ResumeAllServices	[PWG5108.06]
0x00nn	Send-Resource-Data	StoreResource[3]	[PWG5108.03]
<none>	Set-Resource-Attributes	SetResourceElements	[PWG5108.03]
<none>	Set-System-Attributes	SetSystemElements	[PWG5108.06]
0x00nn	Shutdown-All-Printers	ShutdownAllServices	[PWG5108.06]
<none>	Shutdown-One-Printer	ShutdownService	[PWG5108.06]
0x00nn	Startup-All-Printers	StartupAllServices	[PWG5108.06]
<none>	Startup-One-Printer	StartupService	[PWG5108.06]

- Deleted: 0x00nn
- Deleted: Restart-All-Printers
- Deleted: RestartAllServices
- Deleted: [PWG5108.06]
- Deleted: <none>
- Deleted: Restart-One-Printer
- Deleted: RestartService
- Deleted: [PWG5108.06]

606 Notes:

607 1) Pause-All-Printers-After-Current-Job is a useful operation for graceful stopping of all  
 608 Printers (Imaging Services) on an Imaging System, but it can be an arbitrarily long  
 609 duration operation.

- 618 2) [Enable/Disable]-Printer and [Pause/Resume]-Printer are intentionally left out of this  
619 specification – they should be directed to the specific Imaging Service that is  
620 enumerated in the “configured-printers” attribute defined in section 5.x above.
- 621 3) Create-Resource and Send-Resource-Data are intentionally decomposed from the  
622 original ambiguously scoped StoreResource operation specified in PWG Resource  
623 Service [PWG5108.03]. Create-Resource is semantically equivalent to Create (for  
624 a Resource object) defined in ISO Document Printing Application (DPA) Part 3:  
625 Management Abstract Service Definition and Procedures [ISO10175-3] where a  
626 newly created Resource object has the special initial state of ‘unknown’ (which is  
627 NOT defined or used in this specification).
- 628 4) Install-Resource is to activate (for use) firmware, software, fonts, etc. after Create-  
629 Resource and Send-Resource-Data.
- 630 5) Create-Printer is semantically equivalent to Create (for a Printer object) defined in  
631 ISO Document Printing Application (DPA) Part 3: Management Abstract Service  
632 Definition and Procedures [ISO10175-3] (where a newly created Printer object had  
633 the special initial state of ‘unknown’, which is NOT defined or used in this  
634 specification).
- 635 6) Register-Output-Device is semantically equivalent to Register-System defined in  
636 PWG Cloud Imaging Model [PWG5109.1] with the difference that the System itself  
637 is not registered, but rather the associated Output Devices are registered.

## 638 5.5 Resource Attribute Group

639 This document defines the resource-attributes-tag (0x08) for attribute groups.

640

641 **5.6 Resource Description Attributes**

642 The READ-WRITE attributes in the IPP Resource Description group are listed in Table 4.

643 **Table 4 – IPP Resource Description Attributes**

<b>Conformance</b>	<b>IPP Attribute Name</b>	<b>SM Element Name</b>	<b>Reference</b>
REQUIRED	resource-info	ResourceInfo	[PWG5108.03]
REQUIRED	resource-name	ResourceName	[PWG5108.03]
REQUIRED	resource-string-version	FirmwareStringVersion[1]	[PWG5110.1]
REQUIRED	resource-version	FirmwareVersion[1]	[PWG5110.1]

644 Notes:

645 1) REQUIRED for a Resource by analogy to PWG Hardcopy Device Health  
646 Assessment Attributes [PWG5110.1].  
647



648 **5.7 Resource Status Attributes**

649 The READ-ONLY attributes in the IPP Resource Status group are listed in Table 5. These  
 650 attributes are inherently READ-ONLY and can only be modified indirectly as a side effect  
 651 of one or more IPP System Service operations, but NOT by a Set-Resource-Attributes  
 652 operation.

653 **Table 5 – IPP Resource Status Attributes**

Conformance	IPP Attribute Name	SM Element Name	Reference
REQUIRED	date-time-at-canceled	DateTimeOfExpiration[1]	[PWG5108.03]
REQUIRED	date-time-at-creation	DateTimeAtCreation[1]	[PWG5108.03]
REQUIRED	resource-authenticator	<none>[7]	<none>
REQUIRED	resource-category	ResourceCategory	[PWG5108.03]
REQUIRED	resource-data-uri	<none>	<none>
REQUIRED	resource-format	ResourceFormat	[PWG5108.03]
REQUIRED	resource-id	ResourceId[4]	[PWG5108.03]
REQUIRED	resource-job-id	<none>[2][5]	[RFC2911]
REQUIRED	resource-k-octets	<none>[2][8]	[RFC2911]
REQUIRED	resource-originating-user-name	<none>[2]	[RFC2911]
REQUIRED	resource-originating-user-uri	<none>[3]	[PWG5100.13]
REQUIRED	resource-printer-uri	<none>[2][6]	[RFC2911]
REQUIRED	resource-state	<none>[2]	[RFC2911]
REQUIRED	resource-state-reasons	<none>[2]	[RFC2911]
REQUIRED	resource-type	ResourceType	[PWG5108.03]
REQUIRED	resource-uuid	<none>[3]	[PWG5100.13]
REQUIRED	time-at-canceled	<none>[2]	[RFC2911]
REQUIRED	time-at-creation	<none>[2]	[RFC2911]

654 Notes:

- 655 1) REQUIRED for a Resource by analogy to PWG Network Resource Service  
 656 Semantic Model and Service Interface [PWG5108.03].
- 657 2) REQUIRED for a Resource by analogy to a Job in IETF IPP/1.1 Model and  
 658 Semantics [RFC2911].
- 659 3) REQUIRED for a Resource by analogy to a Job in PWG IPP: Job and Printer  
 660 Extensions – Set 3 (JPS3) [PWG5100.13].
- 661 4) REQUIRED for a Resource by analogy to a Job in IETF IPP/1.1 Model and  
 662 Semantics [RFC2911]. See section 7.6 of this specification for details of the  
 663 “resource-id” attribute which MUST be monotonically increasing (as is “job-id”) to  
 664 avoid re-use of a “resource-id” values and resulting ambiguity in log files.
- 665 5) REQUIRED for a Resource that is Job-scoped.
- 666 6) REQUIRED for a Resource that is Printer-scoped.

- 667 7) REQUIRED for a Resource to allow for verification of the validity and source of  
 668 Resource data after a Send-Resource-Data operation. See section 7.6 of this  
 669 specification for details of the “resource-authenticator” attribute.
- 670 8) REQUIRED for a Resource by analogy to a “job-k-octets” in a Job in IETF IPP/1.1  
 671 Model and Semantics [RFC2911].

## 672 5.8 Printer Description Attributes

673 The additional READ-WRITE attributes in the IPP Printer Description group are listed in  
 674 Table 6.

675 **Table 6 – IPP Printer Description Attributes**

Conformance	IPP Attribute Name	SM Element Name	Reference
REQUIRED	printer-owner-uri	OwnerUri	[PWG5108.06]
REQUIRED	printer-owner-vcard	OwnerVCard	[PWG5108.06]

676

677 **6. IPP Operations**

678 Note: All IPP System Service operation requests and responses use standard operation  
679 parameters as defined in [RFC2911] and encoded in [RFC2910].

680 **6.1 Cancel-Resource**

681 [rename of DeleteResource – change resource-state (for history) – also delete any  
682 associated Resource data?]

683 **6.2 Create-Printer**

684 - Drop printer-state and printer-is-accepting-jobs

685 - Initial state is stopped, "shutdown" reason

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686 - Initial printer-is-accepting-jobs is false.

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687 - Requires Startup-Printer call to bring the service up, followed by Enable-Printer to set  
688 printer-is-accepting-jobs to true and Resume-Printer to set "printer-state" to 'idle' and  
689 remove 'pause' from "printer-state-reasons".

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690 - How to provide resources?

691 - Create resource in system and reference them (resource-data-uri).

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692 - PUT them after creating the service

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693 - How to associate with Subunits?

694 - Could use list of Subunit types and IDs

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695 - Semantic Model does not go into great detail

696 - One of the envisioned uses is to create "copies" of a service with restricted capabilities,  
697 e.g. a service for guests that only allowed B&W printing

698 - Default (modulo extensions) is to create a Printer that is associated with all of the  
699 subunits applicable to the printer service-type

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700 - Extensions for Printers:

701 - system-uri-supported (1setOf uri) Printer Description attribute pointing to System service

702 - Get-Resources, Create-Resource, Send-Resource-Data, Cancel-Resource using printer-  
703 uri

- 704 - Create-Job with resource-attributes-tag group, a la subscriptions
- 705 - Response includes resource IDs
- 706 - Upload resource with Send-Resource-Data operation or reference existing resource-id to  
707 do a fast copy whose life is limited to the job
- 708 - No Cancel-Resource for jobs - just cancel the job to do it
- 709 - Send-Resource-Data before Send-Document/URI
- 710 - job-resource-ids (1setOf integer(1:MAX)) Job Status attribute that lists the resource IDs  
711 associated with a Job.
- 712 - Job resources persist with the Job/Document data

713 This REQUIRED operation allows a Client to create a new Printer object (i.e., Job  
714 processing service) on the target System object. This operation is semantically equivalent  
715 to the Create operation for a Printer object defined in ISO “Document Printing Application  
716 (DPA) Part 3: Management Abstract Service Definition and Procedures” [ISO10175-3] (where  
717 a newly created Printer object had the special initial state of ‘unknown’, which is NOT defined  
718 or used in this specification). This operation is semantically analogous to the Create-Job  
719 operation defined in [RFC2911]. This operation does not change the “system-state” of the  
720 System itself.

721 A new Printer object will be created and initialized with the “printer-state” set to ‘stopped’  
722 (i.e., no Jobs can be processed and intervention is required), “printer-is-accepting-jobs” set  
723 to ‘false’ (i.e., no incoming Jobs accepted), and the ‘paused’ value added to “printer-state-  
724 reasons” (i.e., no Job processing output allowed). The Client can then send one or more  
725 Set-Printer-Attributes operations to modify the configuration of the Printer, followed by  
726 Resume-Printer (i.e., remove ‘paused’ from “printer-state-reasons” and change “printer-  
727 state” to ‘idle’ ) and Enable-Printer (i.e., change “printer-is-accepting-jobs” to ‘true’) to  
728 change the “printer-state” to ‘idle’ (unless there is another reason for the Printer to stay in  
729 the ‘stopped’ state).

730 Note: Printer-scope Resource objects MUST be created after the related Create-Printer  
731 operation, so that “resource-printer-uri” can be correctly specified. Printer-scope  
732 Subscription objects MUST be created after the related Create-Printer operation, so that  
733 “notify-printer-uri” can be correctly specified.

734 [[[ISSUE: Printer-related Subunits are automatically associated with a new Printer object  
735 based on “printer-service-type”, inherent System capabilities, and System policies (out-of-  
736 band).]]]

737

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Comment [11]: Is this true?

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738 **6.2.1 Create-Printer Request**

739 The Client submits a Create-Printer operation request to a System object. The following  
740 groups of attributes are part of a Create-Printer request.

741 Group 1: Operation Attributes

742 "attributes-charset" (charset) and  
743 "attributes-natural-language" (naturalLanguage):

744 The Client MUST supply and the System MUST support both of these  
745 attributes.

746 "system-uri" (uri):

747 The Client MUST supply and the System MUST support the "system-uri"  
748 operation attribute which is the target System for the operation.

749 "printer-uri" (uri):

750 The Client MUST supply and the System MUST support the "printer-uri"  
751 operation attribute which is the target Printer for the operation.

752 "requesting-user-name" (name(MAX)) and  
753 "requesting-user-uri" (uri):

754 The Client SHOULD supply and the System MUST support both of these  
755 attributes.

756 "printer-service-type" (type2 keyword) [PWG5108.06]:

757 The Client MUST supply and the System MUST support this attribute.

758 Group 2: Printer Description Attributes

759 <any Printer Description attribute>

760 The Client MAY supply and the System MAY support these attributes. See  
761 "printer-settable-attributes-supported" defined in [RFC3380].

762 **6.2.2 Create-Printer Response**

763 The System MUST return a Create-Printer operation response to the Client.

764 Group 1: Operation Attributes

765 "attributes-charset" (charset) and  
766 "attributes-natural-language" (naturalLanguage):

**Deleted:** "status-code" (type2 enum):¶  
The System MUST return this attribute.

769 The System MUST return both of these attributes.

770 "status-message" (text(255)) and/or  
771 "detailed-status-message" (text(MAX)):

772 The System MAY return one or both of these attributes.

773 Group 2: Unsupported Attributes

774 See [RFC2911] for details on returning Unsupported Attributes.

775 Groups 3: Printer Attributes

776 See [RFC2911] for details on returning Printer Attributes.

777 "printer-uri" (uri):

778 The System MUST return this attribute.

779 "printer-uuid" (uri(45)):

780 The System MUST return this attribute.

781 "printer-uri-supported" (1setOf uri) and  
782 "uri-authentication-supported" (1setOf type2 keyword) and  
783 "uri-security-supported (1setOf type2 keyword)":

784 The System MUST return all three of these attributes.

785 "printer-state" (type1 enum) and  
786 "printer-state-reasons" (1setOf type2 keyword):

787 The System MUST return both of these attributes.

788 **6.3 Create-Resource**

789 [rename of \*part\* of original StoreResource to create resource metadata but NOT resource  
790 data]

791 - Good, add type and category attributes to Resource Description attributes

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792 - Resources are managed by the System - IDs are unique across all services of a system

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793 - Persistence is decided by System

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794 - System-wide resources typically persisted for life of system

795 - Printer/service resources persist for life of printer/service

796 - Job resource persist for life of job

797 - Residence (after restart) depends on use/implementation

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798 - Job resources retained for as long as document data

799 - Installation/use of resources through separate operation ("Install-Resource")

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800 - Firmware, software, fonts, etc.

801 - No expiration/lease like in PWG Network Resource Service

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802 - Too much like DRM, still manual maintenance

803 - Just cancel resource at the right time

804 - Avoids resource race conditions

805 This REQUIRED operation allows a Client to create a new Resource object on the target  
 806 System object. This operation is semantically analogous to the StoreResource operation  
 807 defined in [PWG5108.06] (except that the Resource data is separately transferred with a  
 808 subsequent Send-Resource-Data operation). This operation does not change the "system-  
 809 state" of the System itself.

810 A new Resource object will be created and initialized with the "resource-state" set to  
 811 'pending' (i.e., no Resource data has been associated yet). The Client can then send one  
 812 or more Set-Resource-Attributes operations to modify the Resource object, followed by a  
 813 Send-Resource-Data operation (i.e., upload the associated Resource data) to change the  
 814 "resource-state" to 'active' (unless there is another reason for the Resource to stay in the  
 815 'pending' state).

816 Note: Printer-scope Resource objects MUST be created after the related Create-Printer  
 817 operation, so that "resource-printer-uri" can be correctly specified. Resource-scope  
 818 Subscription objects MUST be created after the related Create-Resource operation, so  
 819 that "notify-printer-uri" can be correctly specified.

### 820 **6.3.1 Create-Resource Request**

821 The Client submits a Create-Resource operation request to a System object. The  
 822 following groups of attributes are part of a Create-Resource request.

#### 823 Group 1: Operation Attributes

824 "attributes-charset" (charset) and  
 825 "attributes-natural-language" (naturalLanguage):

826 The Client MUST supply and the System MUST support both of these  
 827 attributes.

828 “system-uri” (uri):

829 The Client MUST supply and the System MUST support the “system-uri”  
 830 operation attribute which is the target System for the operation.

831 “requesting-user-name” (name(MAX)) and  
 832 “requesting-user-uri” (uri):

833 The Client SHOULD supply and the System MUST support both of these  
 834 attributes.

835 “resource-category” (type2 keyword) and  
 836 “resource-format” (mimeType) and  
 837 “resource-type” (type2 keyword):

838 The Client MUST supply and the System MUST support all three of these  
 839 attributes.

840 “resource-job-id” (integer(1:MAX)):

841 The Client MUST supply this attribute for a Job-scope Resource and the  
 842 System MUST support this attribute.

843 “resource-printer-uri” (uri):

844 The Client MUST supply this attribute for a Job-scope Resource and the  
 845 System MUST support this attribute.

846 Group 2: Resource Description Attributes

847 <any Resource Description attribute>

848 The Client MAY supply and the System MAY support these attributes.

### 849 **6.3.2 Create-Resource Response**

850 The System MUST return a Create-Resource operation response to the Client.

851 Group 1: Operation Attributes

852 “attributes-charset” (charset) [RFC2911] and  
 853 “attributes-natural-language” (naturalLanguage) [RFC2911]:

854 The System MUST return both of these attributes.

**Deleted:** “status-code” (type2 enum):¶  
 The System MUST return this attribute.¶



857 "status-message" (text(255)) and/or  
858 "detailed-status-message" (text(MAX)):

859 The System MAY return one or both of these attributes.

860

861 Group 2: Unsupported Attributes

862 See [RFC2911] for details on returning Unsupported Attributes.

863 Groups 3: Resource Attributes

864 See [RFC2911] for details on returning analogous Printer Attributes.

865 "resource-id" (integer(1:MAX)):

866 The System MUST return this attribute.

867 "resource-uuid" (uri(45)):

868 The System MUST return this attribute.

869 "resource-state" (type1 enum) and  
870 "resource-state-reasons" (1setOf type2 keyword):

871 The System MUST return both of these attributes.

872

## 873 **6.4 Create-Resource-Subscriptions**

## 874 **6.5 Create-System-Subscriptions**

## 875 **6.6 Delete-Printer**

876 This REQUIRED operation allows a Client to delete entirely one configured Printer object  
877 (i.e., Job processing service) on the target System object. If the Printer object is not  
878 already shutdown, with 'shutdown' in the "printer-state-reasons", then the System MUST  
879 return a "status-code" of 'client-error-forbidden'. This operation is semantically equivalent  
880 to the DeleteService operation defined in [PWG5108.06]. The Printer object and all  
881 associated Jobs will be removed entirely. The Printer object cannot be subsequently  
882 started up with a Startup-One-Printer operation. This operation MAY change the state of  
883 the System itself to 'stopped' (if there are no other configured Printers or all other Printers  
884 already had a "printer-state" of 'stopped').

**Deleted:** [actual delete is intended to completely remove a Printer (service)]

887 The specified Printer will be shutdown with the “printer-state” set to ‘stopped’ (i.e., no Jobs  
888 can be processed and intervention is required) and the ‘shutdown’ value added to “printer-  
889 state-reasons”. The Client can later send a Startup-One-Printer operation to the System  
890 (preferred) or a Startup-Printer operation [RFC3998] to the Printer to start up the specified  
891 Printer.

#### 892 **6.6.1 Delete-Printer Request**

893 The Client submits a Delete-Printer operation request to a System object. The following  
894 groups of attributes are part of a Delete-Printer request.

##### 895 Group 1: Operation Attributes

896 The System MUST support the same operation attributes in a Delete-Printer  
897 operation request as those defined for the Startup-One-Printer operation.

#### 898 **6.6.2 Delete-Printer Response**

899 The System MUST return a Delete-Printer operation response to the Client.

##### 900 Group 1: Operation Attributes

901 The System MUST support the same operation attributes in a Delete-Printer  
902 operation response as those defined for the Startup-One-Printer operation.

903

### 904 **6.7 Disable-All-Printers**

905 This REQUIRED operation allows a Client to pause all configured Printer objects (i.e., Job  
906 processing services) on the target System object. This operation is semantically  
907 equivalent to the DisableAllServices operation defined in [PWG5108.06]. This operation is  
908 also semantically equivalent to a sequence of Disable-Printer operations [RFC3398] to  
909 each configured Printer object. This operation does not change the “system-state” of the  
910 System itself.

911 Each configured Printer will be disabled with “printer-is-accepting-jobs” set to ‘false’ but the  
912 value of “printer-state” or “printer-state-reasons” is not affected by the Disable-All-Printers  
913 operation.

#### 914 **6.7.1 Disable-All-Printers Request**

915 The Client submits a Disable-All-Printers operation request to a System object. The  
916 following groups of attributes are part of a Disable-All-Printers request.

##### 917 Group 1: Operation Attributes

918 The System MUST support the same operation attributes in a Disable-All-Printers  
919 operation request as those defined for the Startup-All-Printers operation.

### 920 **6.7.2 Disable-All-Printers Response**

921 The System MUST return a Disable-All-Printers operation response to the Client. If no  
922 Printers are configured on the System, then the System MUST return a “status-code” of  
923 'successful-ok'.

#### 924 Group 1: Operation Attributes

925 The System MUST support the same operation attributes in a Disable-All-Printers  
926 operation response as those defined for the Startup-All-Printers operation.

### 927 **6.8 Enable-All-Printers**

928 This REQUIRED operation allows a Client to enable all configured Printer objects (i.e., Job  
929 processing services) on the target System object. This operation is semantically  
930 equivalent to the EnableAllServices operation defined in [PWG5108.06]. This operation is  
931 also semantically equivalent to a sequence of Enable-Printer operations [RFC3398] to  
932 each configured Printer object. This operation does not change the “system-state” of the  
933 System itself.

934 Each configured Printer will be enabled with “printer-is-accepting-jobs” set to ‘true’ but the  
935 value of “printer-state” or “printer-state-reasons” is not affected by the Enable-All-Printers  
936 operation.

#### 937 **6.8.1 Enable-All-Printers Request**

938 The Client submits a Enable-All-Printers operation request to a System object. The  
939 following groups of attributes are part of a Enable-All-Printers request.

#### 940 Group 1: Operation Attributes

941 The System MUST support the same operation attributes in a Enable-All-Printers  
942 operation request as those defined for the Startup-All-Printers operation.

#### 943 **6.8.2 Enable-All-Printers Response**

944 The System MUST return a Enable-All-Printers operation response to the Client. If no  
945 Printers are configured on the System, then the System MUST return a “status-code” of  
946 'successful-ok'.

#### 947 Group 1: Operation Attributes

948 The System MUST support the same operation attributes in a Enable-All-Printers  
949 operation response as those defined for the Startup-All-Printers operation.

950 **6.9 Get-Printers**

951 This REQUIRED operation allows a Client to retrieve a filtered list of the Printer objects  
 952 (i.e., Job processing services) on the target System object. This operation is semantically  
 953 equivalent to the ListAllServices operation defined in [PWG5108.06]. This operation is  
 954 also semantically equivalent to a sequence of Get-Printer-Attributes [RFC2911] operations  
 955 to each Printer object except that the target is a System object (rather than a Printer  
 956 object). A Printer URI will be returned for each matching Printer object.

957 Note: This End User operation does NOT require Client authentication, but MAY be  
 958 encrypted just as any other IPP System Service operation.

959 **6.9.1 Get-Printers Request**

960 The Client submits a Get-Printers operation request to a System object. The following  
 961 groups of attributes are part of a Get-Printers request.

## 962 Group 1: Operation Attributes

963 "attributes-charset" (charset), and  
 964 "attributes-natural-language" (naturalLanguage);

Deleted: [RFC2911]

Deleted: [RFC2911]

965 The Client MUST supply and the System MUST support both of these  
 966 attributes.

967 "system-uri" (uri);

Deleted: [PWG5108.06]

968 The Client MUST supply and the System MUST support the "system-uri"  
 969 operation attribute which is the target System for the operation.

970 "requesting-user-name" (name(MAX)), and  
 971 "requesting-user-uri" (uri);

Deleted: [RFC2911]

Deleted: [PWG5100.13]

972 The Client SHOULD supply and the System MUST support both of these  
 973 attributes.

974 "first-index" (integer(1:MAX));

Deleted: [PWG5100.13]

975 The Client MAY supply and the System MUST support this attribute.

976 "limit" (integer(1:MAX));

Deleted: [RFC2911]

977 The Client MAY supply and the System MUST support this attribute.

978 "printer-geo-location" (uri);

Deleted: [PWG5100.13]

979 The Client MAY supply and the System MUST support this attribute.

988 “printer-location” (text(127));

Deleted: [RFC2911]

989 The Client MAY supply and the System MUST support this attribute.

990 “printer-service-type” (1setOf (type2 keyword));

Deleted: s

Deleted: [PWG5108.06]

991 The Client MAY supply and the System MUST support this attribute.

992 “requested-attributes” (1setOf type2 keyword);

Deleted: [RFC2911]

993 The Client MAY supply and the System MUST support this attribute. If this  
 994 operation attribute is NOT supplied, then the System MUST only return  
 995 printer-uri-supported, uri-authentication-supported, and uri-security-  
 996 supported.

997 Note: The Printer attributes listed in the IETF LDAP Schema for Printer  
 998 Services [RFC7612] describe all of the valid Printer attributes that MAY be  
 999 specified in this “requested-attributes” operation attribute.

Deleted: the most important characteristics of a Printer

1000 “which-printers” (type2 keyword);

Deleted: [RFC2911]

1001 The Client MAY supply and the System MUST support this attribute.

## 1002 6.9.2 Get-Printers Response

1003 The System MUST return a Get-Printers operation response to the Client up to the number  
 1004 specified by the “limit” operation attribute that match the filter criteria as specified by the  
 1005 attribute values supplied by the Client in the request. If no Printers match the specified  
 1006 filter criteria, then the System MUST return a “status-code” of ‘successful-ok’.

### 1007 Group 1: Operation Attributes

1008 “attributes-charset” (charset) and  
 1009 “attributes-natural-language” (naturalLanguage);

Deleted: “status-code” (type2 enum):¶  
 The System MUST return this attribute.¶

Deleted: [RFC2911]

Deleted: [RFC2911]

1010 The System MUST return both of these attributes, unless no Printers match  
 1011 the filter criteria specified by the Client.

1012 “status-message” (text(255)) and/or

1013 “detailed-status-message” (text(MAX));

Deleted: [RFC2911]

Deleted: [RFC2911]

1014 The System MAY return one or both of these attributes.

### 1015 Group 2: Unsupported Attributes

1016 See [RFC2911] for details on returning Unsupported Attributes.

### 1017 Groups 3 to N: Printer Attributes

1031 See [RFC2911] for details on returning Printer Attributes.

## 1032 **6.10 Get-Printer-Attributes**

1033 This REQUIRED operation allows a Client to retrieve a filtered list of the Printer attributes  
1034 for the default Printer specified by the “system-default-printer-uri” on the target System  
1035 object. This operation is semantically equivalent to the Get-Printer-Attributes operation  
1036 defined in [RFC2911], except that the target is a System object (rather than a Printer  
1037 object). A Printer URI will be returned for the default Printer specified by the “system-  
1038 default-printer-uri” on the target System object.

### 1039 **6.10.1 Get-Printer-Attributes**

1040 The Client submits a Get-Printer-Attributes operation request to a System object. The  
1041 following groups of attributes are part of a Get-Printer-Attributes request.

#### 1042 Group 1: Operation Attributes

1043 The System MUST support the same operation attributes in a Get-Printer-Attributes  
1044 operation request as those defined for the Get-Printers operation.

### 1045 **6.10.2 Get-Printer-Attributes Response**

1046 The System MUST return a Get-Printer-Attributes operation response to the Client up to  
1047 the number specified by the “limit” operation attribute that match the filter criteria as  
1048 specified by the attribute values supplied by the Client in the request. If there is no  
1049 configured default Printer, then the System MUST return a “status-code” of 'successful-ok'.

#### 1050 Group 1: Operation Attributes

1051 The System MUST support the same operation attributes in a Get-Printer-Attributes  
1052 operation response as those defined for the Get-Printers operation.

#### 1053 Group 2: Unsupported Attributes

1054 See [RFC2911] for details on returning Unsupported Attributes.

#### 1055 Groups 3 to N: Printer Attributes

1056 See [RFC2911] for details on returning Printer Attributes.

## 1057 **6.11 Get-Resources**

1058 [rename of ListResources]

1059 - modeled on Get-Jobs with “requested-attributes” for which attributes to return – default is  
1060 “resource-id” and “resource-state”

1061 Note: This Administrator operation requires Client authentication.

## 1062 **6.12 Get-Resource-Attributes**

1063 [rename of GetResourceElements]

1064 - modeled on Get-Job-Attributes with “requested-attributes” for which attributes to return –  
1065 default is “resource-id” and “resource-state”

## 1066 **6.13 Get-System-Attributes**

1067 - modeled on 2911 Get-Printer-Attributes with “requested-attributes” for which attributes to  
1068 return – default is all

## 1069 **6.14 Install-Resource**

1070 [To activate (for use) firmware, software, font, etc. after Create-Resource and Send-  
1071 Resource-Data]

## 1072 **6.15 Pause-All-Printers**

1073 This REQUIRED operation allows a Client to pause all configured Printer objects (i.e., Job  
1074 processing services) on the target System object. This operation is semantically  
1075 equivalent to the PauseAllServices operation defined in [PWG5108.06]. This operation is  
1076 also semantically equivalent to a sequence of Pause-Printer operations [RFC2911] to each  
1077 configured Printer object. The System will be paused with the “system-state” set to  
1078 ‘stopped’.

1079 Each configured Printer will be paused with the “printer-state” set to ‘stopped’ (although  
1080 incoming Jobs can be accepted if the Printer is not disabled) and the ‘paused’ value added  
1081 to “printer-state-reasons” (i.e., no Job processing output allowed).

### 1082 **6.15.1 Pause-All-Printers Request**

1083 The Client submits a Pause-All-Printers operation request to a System object. The  
1084 following groups of attributes are part of a Pause-All-Printers request.

#### 1085 Group 1: Operation Attributes

1086 The System MUST support the same operation attributes in a Pause-All-Printers  
1087 operation request as those defined for the Startup-All-Printers operation.

Deleted: <#>Get-Subscriptions¶  
<#>Get-Subscription-Attributes¶

1090 **6.15.2 Pause-All-Printers Response**

1091 The System MUST return a Pause-All-Printers operation response to the Client. If no  
 1092 Printers are configured on the System, then the System MUST return a “status-code” of  
 1093 ‘successful-ok’.

1094 **Group 1: Operation Attributes**

1095 The System MUST support the same operation attributes in a Pause-All-Printers  
 1096 operation response as those defined for the Startup-All-Printers operation.

1097 **6.16 Pause-All-Printers-After-Current-Job**1098 **6.17 Register-Output-Device**

1099 [for IPP Infra/Cloud Model]

1100 - Drop system attributes in request? Continue discussion later (from PWG F2F 4/29/15)

1101 - Put static resource attributes in the printer groups of the response

1102 ▾

1103 **6.18 Restart-System**

1104 [operation to restart an entire System with existing firmware or different firmware (from  
 1105 Install-Resource after Create-Resource and Send-Resource-Data) – added for normal  
 1106 System maintenance and also System remediation based on health monitoring]

1107 **6.19 Resume-All-Printers**

1108 This REQUIRED operation allows a Client to resume all configured Printer objects (i.e.,  
 1109 Job processing services) on the target System object. This operation is semantically  
 1110 equivalent to the ResumeAllServices operation defined in [PWG5108.06]. This operation  
 1111 is also semantically equivalent to a sequence of Resume-Printer operations [RFC2911] to  
 1112 each configured Printer object. This operation changes the “system-state” of the System  
 1113 itself to ‘idle’ (unless there is another reason for one or more Printers to stay in the  
 1114 ‘stopped’ state).

1115 Each configured Printer will be resumed with the “printer-state” set to ‘idle’ (unless there is  
 1116 another reason for the Printer to stay in the ‘stopped’ state) and the ‘paused’ value  
 1117 removed from “printer-state-reasons” (i.e., Job processing output allowed).

**Deleted: <#>Restart-All-Printers¶**

This REQUIRED operation allows a Client to restart all configured Printer objects (i.e., Job processing services) on the target System object. This operation is semantically equivalent to the RestartAllServices operation defined in [PWG5108.06]. This operation is also semantically equivalent to a Shutdown-All-Printers operation followed by either a Startup-All-Printers operation (preferred) or a sequence of Restart-One-Printer operations (preferred) or Restart-Printer operations [RFC3998] for all configured Printer objects. The System will be paused with the “system-state” set to ‘stopped’. Each configured Printer will be restarted with the “printer-state” set to ‘stopped’ (i.e., no Jobs can be processed and intervention is required), “printer-is-accepting-jobs” set to ‘false’ (i.e., no incoming Jobs accepted), and the ‘paused’ value added to “printer-state-reasons” (i.e., no Job processing output allowed). The Client can then send one or more Set-Printer-Attributes operations to modify the configuration of each Printer, followed by Resume-Printer (i.e., remove ‘paused’ from “printer-state-reasons”) and Enable-Printer (i.e., change “printer-is-accepting-jobs” to ‘true’).¶

**<#>Restart-All-Printers Request¶**

The Client submits a Restart-All-Printers operation request to a System object. The following groups of attributes are part of a Restart-All-Printers request.¶

**Group 1: Operation Attributes¶**

The System MUST support the same operation attributes in a Restart-All-Printers operation request as those defined for the Startup-All-Printers operation.¶

**<#>Restart-All-Printers Response¶**

The System MUST return a Restart-All-Printers operation response to the Client. If no Printers are configured on the System, then the System MUST return a “status-code” of ‘successful-ok’.¶

**Group 1: Operation Attributes¶**

The System MUST support the same operation attributes in a Restart-All-Printers operation response as those defined for the Startup-All-Printers operation.¶

**<#>Restart-One-Printer¶**

This REQUIRED operation allows a Client to restart one configured Printer object (i.e., Job processing service) on the target System object. This operation is semantically equivalent to the RestartService operation defined in [PWG5108.06]. This operation is also semantically equivalent to a Restart-Printer operation [RFC3998] to the configured Printer object (except for the resulting “printer-state” of ‘stopped’ rather than ‘idle’). This operation MAY cause the System to pause with the “system-state” set to ‘stopped’ (if all other Printers already had a “printer-state” of ‘stopped’). ¶ The specified Printer will be restarted with the “printer-state” set to ‘stopped’ (i.e., no Jobs can be processed and intervention is required), “printer-is-accepting-jobs” set to ‘false’ (i.e., no incoming Jobs accepted), and the ‘paused’ value added to “printer-state-reasons” (i.e., no Job processing output allowed). The Client can then send one or more Set-Printer-Attributes (...)



1273 **6.19.1 Resume-All-Printers Request**

1274 The Client submits a Resume-All-Printers operation request to a System object. The  
1275 following groups of attributes are part of a Resume-All-Printers request.

1276 Group 1: Operation Attributes

1277 The System MUST support the same operation attributes in a Resume-All-Printers  
1278 operation request as those defined for the Startup-All-Printers operation.

1279 **6.19.2 Resume-All-Printers Response**

1280 The System MUST return a Resume-All-Printers operation response to the Client. If no  
1281 Printers are configured on the System, then the System MUST return a “status-code” of  
1282 ‘successful-ok’.

1283 Group 1: Operation Attributes

1284 The System MUST support the same operation attributes in a Resume-All-Printers  
1285 operation response as those defined for the Startup-All-Printers operation.

1286 **6.20 Send-Resource-Data**

1287 [rename of \*part\* of original StoreResource]

1288 - Agreement on not supporting replacement of resource data

1289 **6.21 Set-Resource-Attributes**

1290 [rename of SetResourceElements for Resource description attributes – MUST NOT  
1291 change Resource status attributes or Resource data]

1292 **6.22 Set-System-Attributes**

1293 **6.23 Shutdown-All-Printers**

1294 This REQUIRED operation allows a Client to shutdown all configured Printer objects (i.e.,  
1295 Job processing services) on the target System object. This operation is semantically  
1296 equivalent to the ShutdownAllServices operation defined in [PWG5108.06]. This operation  
1297 is also semantically equivalent to a sequence of Shutdown-Printer operations [RFC3998]  
1298 to each configured Printer object (except for the resulting “printer-state” of ‘stopped’ rather  
1299 than ‘idle’). The System will be paused with the “system-state” set to ‘stopped’.

1300 Each configured Printer will be shutdown with the “printer-state” set to ‘stopped’ (i.e., no  
1301 Jobs can be processed and intervention is required) and the ‘shutdown’ value added to  
1302 “printer-state-reasons”. The Client can later send a Startup-All-Printers operation

1303 (preferred) or a sequence of Startup-One-Printer operations (preferred) or Startup-Printer  
1304 operations [RFC3998] to each Printer to start up all of the configured Printers.

### 1305 **6.23.1 Shutdown-All-Printers Request**

1306 The Client submits a Shutdown-All-Printers operation request to a System object. The  
1307 following groups of attributes are part of a Shutdown-All-Printers request.

#### 1308 Group 1: Operation Attributes

1309 The System MUST support the same operation attributes in a Shutdown-All-Printers  
1310 operation request as those defined for the Startup-All-Printers operation.

### 1311 **6.23.2 Shutdown-All-Printers Response**

1312 The System MUST return a Shutdown-All-Printers operation response to the Client. If no  
1313 Printers are configured on the System, then the System MUST return a “status-code” of  
1314 ‘successful-ok’.

#### 1315 Group 1: Operation Attributes

1316 The System MUST support the same operation attributes in a Shutdown-All-Printers  
1317 operation response as those defined for the Startup-All-Printers operation.

## 1318 **6.24 Shutdown-One-Printer**

1319 This REQUIRED operation allows a Client to shutdown one configured Printer object (i.e.,  
1320 Job processing service) on the target System object. This operation is semantically  
1321 equivalent to the ShutdownService operation defined in [PWG5108.06]. This operation is  
1322 also semantically equivalent to a Shutdown-Printer operation [RFC3998] to the configured  
1323 Printer object (except for the resulting “printer-state” of ‘stopped’ rather than ‘idle’). This  
1324 operation MAY cause the System to pause with “system-state” set to ‘stopped’ (if all other  
1325 Printers already had a “printer-state” of ‘stopped’).

1326 The specified Printer will be shutdown with the “printer-state” set to ‘stopped’ (i.e., no Jobs  
1327 can be processed and intervention is required) and the ‘shutdown’ value added to “printer-  
1328 state-reasons”. The Client can later send a Startup-One-Printer operation to the System  
1329 (preferred) or a Startup-Printer operation [RFC3998] to the Printer to start up the specified  
1330 Printer.

### 1331 **6.24.1 Shutdown-One-Printer Request**

1332 The Client submits a Shutdown-One-Printer operation request to a System object. The  
1333 following groups of attributes are part of a Shutdown-One-Printer request.

#### 1334 Group 1: Operation Attributes

1335 The System MUST support the same operation attributes in a Shutdown-One-  
 1336 Printer operation request as those defined for the Startup-One-Printer operation.

### 1337 **6.24.2 Shutdown-One-Printer Response**

1338 The System MUST return a Shutdown-One-Printer operation response to the Client.

#### 1339 Group 1: Operation Attributes

1340 The System MUST support the same operation attributes in a Shutdown-One-  
 1341 Printer operation response as those defined for the Startup-One-Printer operation.

## 1342 **6.25 Startup-All-Printers**

1343 This REQUIRED operation allows a Client to startup all configured Printer objects (i.e., Job  
 1344 processing services) on the target System object. This operation is semantically  
 1345 equivalent to the StartupAllServices operation defined in [PWG5108.06]. This operation is  
 1346 also semantically equivalent to a sequence of Startup-One-Printer operations for each  
 1347 configured Printer object. The System will be paused with the “system-state” set to  
 1348 ‘stopped’.

**Deleted:** (except for the resulting “printer-state” of ‘stopped’ rather than ‘idle’)

1349 Each configured Printer will be started up with the “printer-state” set to ‘stopped’ (i.e., no  
 1350 Jobs can be processed and intervention is required), “printer-is-accepting-jobs” set to  
 1351 ‘false’ (i.e., no incoming Jobs accepted), and the ‘paused’ value added to “printer-state-  
 1352 reasons” (i.e., no Job processing output allowed). The Client can then send one or more  
 1353 Set-Printer-Attributes operations to modify the configuration of each Printer, followed by  
 1354 Resume-Printer (i.e., remove ‘paused’ from “printer-state-reasons”) and Enable-Printer  
 1355 (i.e., change “printer-is-accepting-jobs” to ‘true’).

### 1356 **6.25.1 Startup-All-Printers Request**

1357 The Client submits a Startup-All-Printers operation request to a System object. The  
 1358 following groups of attributes are part of a Startup-All-Printers request.

#### 1359 Group 1: Operation Attributes

1360 "attributes-charset" (charset), and  
 1361 "attributes-natural-language" (naturalLanguage);

**Deleted:** [RFC2911]

**Deleted:** [RFC2911]

1362 The Client MUST supply and the System MUST support both of these  
 1363 attributes.

1364 “system-uri” (uri);

**Deleted:** [PWG5108.06]

1365 The Client MUST supply and the System MUST support the “system-uri”  
 1366 operation attribute which is the target System for the operation.

1372 "requesting-user-name" (name(MAX)), and  
1373 "requesting-user-uri" (uri):

Deleted: [RFC2911]

Deleted: [PWG5100.13]

1374 The Client SHOULD supply and the System MUST support both of these  
1375 attributes.

1376 **6.25.2 Startup-All-Printers Response**

1377 The System MUST return a Startup-All-Printers operation response to the Client. If no  
1378 Printers are configured on the System, then the System MUST return a "status-code" of  
1379 'successful-ok'.

1380 Group 1: Operation Attributes

1381 "attributes-charset" (charset), and  
1382 "attributes-natural-language" (naturalLanguage);

Deleted: [RFC2911]

Deleted: [RFC2911]

1383 The System MUST return both of these attributes.

1384 "status-message" (text(255)), and/or  
1385 "detailed-status-message" (text(MAX));

Deleted: "status-code" (type2 enum):¶  
The System MUST return this attribute.¶

Deleted: [RFC2911]

Deleted: [RFC2911]

1386 The System MAY return one or both of these attributes.

1387 **6.26 Startup-One-Printer**

1388 This REQUIRED operation allows a Client to startup one configured Printer object (i.e.,  
1389 Job processing service) on the target System object. This operation is semantically  
1390 equivalent to the StartupService operation defined in [PWG5108.06]. This operation MAY  
1391 cause the System to pause with "system-state" set to 'stopped' (if all other Printers already  
1392 had a "printer-state" of 'stopped').

1393 The specified Printer will be started up with the "printer-state" set to 'stopped' (i.e., no Jobs  
1394 can be processed and intervention is required), "printer-is-accepting-jobs" set to 'false'  
1395 (i.e., no incoming Jobs accepted), and the 'paused' value added to "printer-state-reasons"  
1396 (i.e., no Job processing output allowed). The Client can then send one or more Set-  
1397 Printer-Attributes operations to modify the configuration of the Printer, followed by  
1398 Resume-Printer (i.e., remove 'paused' from "printer-state-reasons") and Enable-Printer  
1399 (i.e., change "printer-is-accepting-jobs" to 'true') to change the "printer-state" to 'idle'  
1400 (unless there is another reason for the Printer to stay in the 'stopped' state).

1401 **6.26.1 Startup-One-Printer Request**

1402 The Client submits a Startup-One-Printer operation request to a System object. The  
1403 following groups of attributes are part of a Startup-One-Printer request.

1404 Group 1: Operation Attributes

1413 "attributes-charset" (charset) and  
1414 "attributes-natural-language" (naturalLanguage):  
1415 The Client MUST supply and the System MUST support both of these  
1416 attributes.  
1417 "system-uri" (uri):  
1418 The Client MUST supply and the System MUST support the "system-uri"  
1419 operation attribute which is the target System for the operation.  
1420 "printer-uri" (uri):  
1421 The Client MUST supply and the System MUST support the "printer-uri"  
1422 operation attribute which is the target Printer for the operation.  
1423 "requesting-user-name" (name(MAX)) and  
1424 "requesting-user-uri" (uri):  
1425 The Client SHOULD supply and the System MUST support both of these  
1426 attributes.

1427 **6.26.2 Startup-One-Printer Response**

1428 The System MUST return a Startup-One-Printer operation response to the Client.

1429 Group 1: Operation Attributes

1430 "attributes-charset" (charset) and  
1431 "attributes-natural-language" (naturalLanguage):  
1432 The System MUST return both of these attributes.  
1433 "status-message" (text(255)) and/or  
1434 "detailed-status-message" (text(MAX)):  
1435 The System MAY return one or both of these attributes.  
1436

**Deleted:** "status-code" (type2 enum):¶  
The System MUST return this attribute.

1439 **7. IPP Attributes**

1440 **7.1 System, Printer, and Resource Operation Attributes**

1441 **7.1.1 printer-geo-location (uri)**

1442 This operation attribute specifies a filter for the applicable Printers as used in Get-Printers  
1443 defined in section 6. This attribute is semantically analogous to the “printer-geo-location”  
1444 attribute as described in [PWG5100.13].

**Deleted:** for the operation

**Deleted:** the

**Deleted:** operation

1445 **7.1.2 printer-location (text(127))**

1446 This operation attribute specifies a filter for the applicable Printers as used in Get-Printers  
1447 defined in section 6. This attribute is semantically analogous to the “printer-location”  
1448 attribute as described in [RFC2911].

**Deleted:** for the operation

**Deleted:** the

**Deleted:** operation

1449 **7.1.3 printer-service-type (1setOf (type2 keyword))**

1450 This operation attribute specifies the service type for a Printer as used in Create-Printer or  
1451 a filter for the applicable Printers as used in Get-Printers defined in section 6. This  
1452 attribute is semantically analogous to the ServiceType element as described in  
1453 [PWG5108.06]. See “printer-service-type” in section 7.5 Printer Status Attributes.

**Deleted:** the

**Deleted:** operation

1454 **7.1.4 resource-category (type2 keyword)**

1455 This operation attribute specifies the category for a Resource as used in Create-Resource  
1456 or a filter for the applicable Resources as used in Get-Resources defined in section 6.  
1457 This attribute is semantically equivalent to the ResourceCategory element as described in  
1458 [PWG5108.03]. See “resource-category” in section 7.7 Resource Status Attributes.

**Deleted:** The values for this attribute are specified below in “printer-service-types”.  
printer-service-types (1setOf (type2 keyword))  
This operation attribute filters which selects the set of Printers for the operation as used in the Get-Printers operation defined in section 6. This attribute is semantically analogous to the ServiceType attribute as described in [PWG5108.06]. The values for this attribute are:  
'copy': A Copy service as described in [PWG5108.04].  
'faxout': A FaxOut service as described in [PWG5100.15].  
'print': A Print service as described in [RFC2911].  
'scan': A Scan service as described in [PWG5100.17].  
'transform': A Transform service as described in [PWG5108.01].  
'vendor': A vendor-specific service.

**Deleted:** objects for the operation

**Deleted:** the

**Deleted:** operation

**Deleted:** objects for the operation

**Deleted:** the

**Deleted:** operation

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**Deleted:** the

**Deleted:** operation

1459 **7.1.5 resource-format (1setOf (mimeMediaType))**

1460 This operation attribute specifies the format for a Resource as used in Create-  
1461 Resource/Send-Resource-Data or a filter for the applicable Resources as used in Get-  
1462 Resources defined in section 6. This attribute is semantically equivalent to the  
1463 ResourceFormat element as described in [PWG5108.03]. This attribute is semantically  
1464 analogous to the “document-format” attribute as described in [RFC2911]. See “resource-  
1465 format” in section 7.7 Resource Status Attributes.

1466 **7.1.6 resource-id (integer(1:MAX))**

1467 This operation attribute specifies the target Resource object as used in Get-Resource-  
1468 Attributes and other Resource operations defined in section 6. This attribute is  
1469 semantically equivalent to the ResourceId element as described in [PWG5108.03]. This  
1470 attribute is semantically analogous to the “job-id” attribute as described in [RFC2911]. See  
1471 “resource-id” in section 7.7 Resource Status Attributes.

1510 **7.1.7 resource-job-id (integer(1:MAX))**

1511 This operation attribute specifies [the Job scope for a Resource as used in Create-](#)  
 1512 [Resource or](#) a filter for the applicable Job scope Resources as used in [Get-Resources](#)  
 1513 [defined in section 6](#). This attribute is semantically analogous to the “job-id” attribute as  
 1514 described in [RFC2911]. See “resource-job-id” in section 7.7 Resource Status Attributes.

**Deleted:** objects for the operation**Deleted:** the**Deleted:** operation1515 **7.1.8 resource-k-octets (integer(0:MAX))**

1516 This operation attribute specifies the size of the data for [a Resource as used in Create-](#)  
 1517 [Resource/Send-Resource-Data](#) defined in section 6. This attribute is semantically  
 1518 analogous to the “job-k-octets” attribute as described in [RFC2911]. See “resource-k-  
 1519 [octets](#)” in section 7.7 Resource Status Attributes.

**Deleted:** the target**Deleted:** object for the operation**Deleted:** the**Deleted:** operation**Deleted:** format1520 **7.1.9 resource-printer-uri (uri)**

1521 This operation attribute specifies [the Printer scope for a Resource as used in Create-](#)  
 1522 [Resource or](#) a filter for the applicable Printer scope Resources as used in [Get-Resources](#),  
 1523 defined in section 6. This attribute is semantically analogous to the “job-printer-uri”  
 1524 attribute as described in [RFC2911]. See “resource-printer-uri” in section 7.7 Resource  
 1525 Status Attributes.

**Deleted:** objects for the operation**Deleted:** the**Deleted:** operation1526 **7.1.10 resource-state (type1 enum)**

1527 This operation attribute specifies a filter for the applicable Resources as used in [Get-](#)  
 1528 [Resources](#) defined in section 6. This attribute replaces the semantically analogous  
 1529 [DateTimeAtExpiration](#) (Resource lease time) and [ResourceIsExpired](#) elements as  
 1530 described in [PWG5108.03]. This attribute is semantically analogous to the “job-state”  
 1531 attribute as described in [RFC2911]. See “resource-state” in section 7.7 Resource Status  
 1532 Attributes.

**Deleted:** objects for the operation**Deleted:** the**Deleted:** operation1533 **7.1.11 resource-type (type2 keyword)**

1534 This operation attribute specifies a filter for the applicable Resources as used in [Get-](#)  
 1535 [Resources](#) defined in section 6. This attribute replaces the semantically analogous  
 1536 [DateTimeAtExpiration](#) (Resource lease time) element as described in [PWG5108.03]. See  
 1537 “resource-type” in section 7.7 Resource Status Attributes.

**Deleted:** objects for the operation**Deleted:** the**Deleted:** operation1538 **7.1.12 system-uri (uri)**

1539 This operation attribute specifies the target System object as used in [Get-Printers](#) [and all](#)  
 1540 [other operations](#) defined in section 6. This attribute is semantically analogous to the  
 1541 “printer-uri” attribute as described in [RFC2911] and is semantically equivalent to the  
 1542 “SystemURI” attribute as described in [PWG5108.06].

**Deleted:** for the operation**Deleted:** the**Deleted:** operation

1563 **7.1.13 which-printers (type2 keyword):**

1564 This operation attribute specifies a filter for the applicable Printers as used in Get-Printers  
 1565 defined in section 6. This attribute is semantically analogous to the “which-jobs” attribute  
 1566 as described in [RFC2911]. The values for this attribute include:

Deleted: for the operation

Deleted: the

Deleted: operation

Deleted: are

1567 ‘accepting’: All Printers with “printer-state” of ‘idle’ or ‘processing’ and “printer-is-  
 1568 accepting-jobs” of ‘true’.

1569 ‘all’: All Printers configured on this System object, regardless of their state.

1570 ‘idle’: All Printers with “printer-state” of ‘idle’.

1571 ‘not-accepting’: All Printers with “printer-is-accepting-jobs” of ‘false’.

1572 ‘processing’: All Printers with “printer-state” of ‘processing’.

1573 ‘shutdown’: All Printers with “printer-state” of ‘stopped’ and “printer-state-reasons”  
 1574 of ‘shutdown’.

1575 ‘stopped’: All Printers with “printer-state” of ‘stopped’, but do not have “printer-state-  
 1576 reasons” of ‘shutdown’ or ‘testing’.

1577 ‘testing’: All Printers with “printer-state” of ‘stopped’ and “printer-state-reasons” of  
 1578 testing’.

1579 **7.2 System Description Attributes**1580 **7.2.1 charset-configured (charset)**

1581 This REQUIRED System attribute identifies the charset that the System object has been  
 1582 configured to represent 'text' and 'name' System attributes that are set by the operator,  
 1583 system administrator, or manufacturer, e.g., for "system-name" (name) and "system-info"  
 1584 (text). Therefore, the value of the System object's "charset-configured" attribute MUST  
 1585 also be among the values of the System object's "charset-supported" attribute.

1586 This attribute is semantically analogous to the "charset-configured" Printer attribute defined  
 1587 in [RFC2911].

1588 **7.2.2 charset-supported (1setOf charset)**

1589 This REQUIRED System attribute identifies the set of charsets that the System object  
 1590 supports in attributes with attribute syntax 'text' and 'name'. At least the value 'utf-8' MUST  
 1591 be present, since IPP objects MUST support the UTF-8 [RFC3629] charset. If a System  
 1592 object supports a charset, it means that for all attributes of syntax 'text' and 'name' the IPP  
 1593 object MUST (1) accept the charset in requests and return the charset in responses as  
 1594 needed.



1599 If more charsets than UTF-8 are supported, the System object MUST perform charset  
 1600 conversion between the charsets as described in [RFC2911].

1601 This attribute is semantically analogous to the "charset-supported" Printer attribute defined  
 1602 in [RFC2911].

### 1603 **7.2.3** ipp-versions-supported (1setOf type2 keyword)

Deleted: <#>device-id (text(1023))¶

1604 This REQUIRED attribute identifies the IPP protocol version(s) that this System supports,  
 1605 including major and minor versions, i.e., the version numbers for which this System  
 1606 implementation meets the conformance requirements. For version number validation, the  
 1607 System matches the (two-octet binary) "version-number" parameter supplied by the Client  
 1608 in each request [RFC2911] with the keyword values of this attribute.

1609 Standard keyword values are defined in the IANA IPP Registry [IANAIPP].

1610 This attribute is semantically analogous to the "ipp-versions-supported" Printer attribute  
 1611 defined in [RFC2911].

### 1612 **7.2.4** natural-language-configured (naturalLanguage)

Deleted: ¶  
 <#>make-and-model (text(127))¶  
 <#>message-from-operator (text(127))¶

1613 This REQUIRED System attribute identifies the natural language that the System object  
 1614 has been configured to represent 'text' and 'name' System attributes that are set by the  
 1615 operator, system administrator, or manufacturer, e.g., for "system-name" (name) and  
 1616 "system-info" (text). When returning these System attributes, the System object MAY  
 1617 return them in the configured natural language specified by this attribute, instead of the  
 1618 natural language requested by the Client in the "attributes-natural-language" operation  
 1619 attribute. See [RFC2911] for the specification of the OPTIONAL multiple natural language  
 1620 support. Therefore, the value of the System object's "natural-language-configured"  
 1621 attribute MUST also be among the values of the System object's "natural-language-  
 1622 supported" attribute.

1623 This attribute is semantically analogous to the "natural-language-configured" Printer  
 1624 attribute defined in [RFC2911].

### 1625 **7.2.5** natural-language-supported (1setOf naturalLanguage)

1626 This REQUIRED System attribute identifies the natural language(s) that the System object  
 1627 supports in attributes with attribute syntax 'text' and 'name'. The natural language(s)  
 1628 supported depends on implementation and/or configuration. Unlike charsets, System  
 1629 objects MUST accept requests with any natural language or any Natural Language  
 1630 Override whether the natural language is supported or not.

1631 This attribute is semantically analogous to the "generated-natural-language-supported"  
 1632 Printer attribute defined in [RFC2911].

1637 **7.2.6 operations-supported (1setOf type2 enum)**

Deleted: ¶

1638 This REQUIRED System attribute specifies the set of supported operations for this System  
1639 object.1640 Standard enum and "operation-id" values are defined in the IANA IPP Registry [IANAIPP].

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1641 This attribute is semantically analogous to the "operations-supported" Printer attribute  
1642 defined in [RFC2911].1643 **7.2.7 power-calendar (1setOf collection)**Deleted: ¶  
<#>owner-uri (uri)¶  
<#>owner-vcard (1setOf text(1023))¶1644 This OPTIONAL System attribute specifies the list of configured calendar-based power  
1645 state change policies for the System.1646 This attribute is semantically equivalent to the Power Calendar group defined in  
1647 [PWG5106.4].1648 **7.2.8 power-event (1setOf collection)**

Deleted: ¶

1649 This OPTIONAL System attribute specifies the list of configured event-based power state  
1650 change policies for the System.1651 This attribute is semantically equivalent to the Power Event group defined in [PWG5106.4].1652 **7.2.9 power-timeout (1setOf collection)**

Deleted: ¶

1653 This RECOMMENDED System attribute specifies the list of configured timeout-based  
1654 power state change policies for the System.1655 This attribute is semantically equivalent to the Power Timeout group defined in  
1656 [PWG5106.4].1657 **7.2.10 system-default-printer-uri (uri)**1658 This REQUIRED System attribute specifies the default Printer URI configured by the  
1659 operator, administrator, or manufacturer and is used by the User operation Get-Printer-  
1660 Attributes defined in this specification.1661 **7.2.11 system-device-id (text(1023))**1662 This REQUIRED System attribute specifies the IEEE 1284 Device ID of the overall System  
1663 as defined in [IEEE1284] and further refined in [PWG5107.2].1664 This attribute is semantically analogous to the "printer-device-id" Printer attribute defined in  
1665 [PWG5107.2].

1672 **7.2.12 system-geo-location (uri)**

1673 This REQUIRED System attribute specifies location of the associated System using the  
1674 World Geodetic System 1984 [WGS84]. The means for expressing the location information  
1675 is a "geo:" URI scheme [RFC5870]. When the information is unknown, Systems MUST  
1676 return the "system-geo-location" attribute using the unknown out-of-band value. Systems  
1677 MUST allow the operator or administrator to set the location manually.

1678 This attribute is semantically analogous to the "printer-geo-location" Printer attribute  
1679 defined in [PWG5100.13].

1680 **7.2.13 system-info (text(127))**

1681 This REQUIRED System attribute identifies the descriptive information about this System  
1682 object, e.g., "This System can be used for printing color transparencies for HR  
1683 presentations."

1684 This attribute is semantically analogous to the "printer-info" Printer attribute defined in  
1685 [RFC2911].

1686 **7.2.14 system-location (text(127))**

1687 This REQUIRED System attribute identifies the location of the System, e.g., "in Room  
1688 123A, second floor of building XYZ."

1689 This attribute is semantically analogous to the "printer-location" Printer attribute defined in  
1690 [RFC2911].

1691 **7.2.15 system-make-and-model (text(127))**

1692 This REQUIRED System attribute identifies the make and model of the System. The  
1693 manufacturer may initially populate this attribute.

1694 This attribute is semantically analogous to the "printer-make-and-model" Printer attribute  
1695 defined in [RFC2911].

1696 **7.2.16 system-message-from-operator (text(127))**

1697 This OPTIONAL System attribute provides a message from an operator, system  
1698 administrator or "intelligent" process to indicate to the reasons for modification or other  
1699 management action taken on a System.

1700 This attribute is semantically analogous to the "printer-message-from-operator" Printer  
1701 attribute defined in [RFC2911].

1702 **7.2.17 system-name (name(127))**

1703 This REQUIRED System attribute contains the name of the System object. It is a name  
1704 that is more end-user friendly than a URI. An administrator determines a System's name  
1705 and sets this attribute to that name. This name may be the last part of the System's URI or  
1706 it may be unrelated. In non-US-English locales, a name may contain characters that are  
1707 not allowed in a URI.

1708 This attribute is semantically analogous to the "printer-name" Printer attribute defined in  
1709 [RFC2911].

1710 **7.2.18 system-owner-uri (uri)**

1711 This CONDITIONALLY REQUIRED System attribute contains a URI for the Owner of this  
1712 System object, e.g., "mailto:bob@example.com." and is REQUIRED if the System  
1713 supports the Set-System-Attributes operation. If specified in a Set-System-Attributes  
1714 operation, then the "system-owner-vcard" attribute MUST also be specified (to preserve  
1715 consistency).

1716 **7.2.19 system-owner-vcard (1setOf text(1023))**

1717 This CONDITIONALLY REQUIRED System attribute contains a vCard [RFC6350] for the  
1718 Owner of this System object and is REQUIRED if the System supports the Set-System-  
1719 Attributes operation. If specified in a Set-System-Attributes operation, then the "system-  
1720 owner-uri" attribute MUST also be specified (to preserve consistency).

1721 **7.2.20 system-xri-supported (1setOf collection)**

1722 This REQUIRED System attribute specifies a list of supported XRI (URI, authentication,  
1723 and security tuples) for the System.

1724 This attribute is semantically analogous to the "printer-xri-supported" Printer attribute  
1725 defined in [RFC3380].

1726 **7.3 System Status Attributes**

Deleted: New

1727 All of the System Status attributes are READ-ONLY and can only be updated by automata  
1728 but not by Set-System-Attributes operations.

1729 **7.3.1 power-counters (1setOf collection)**

Deleted: <#>configured-printers (1setOf collection)¶  
<#>configured-resources (1setOf collection)¶  
<#>configured-subunits (1setOf collection)¶  
<#>current-time (dateTime)¶

1730 This OPTIONAL System attribute specifies the list of power counters (total usage) for the  
1731 System.

1732 This attribute is semantically equivalent to the Power Counter group defined in  
1733 [PWG5106.4].

1734 **7.3.2 power-general (collection)**

1735 This RECOMMENDED System attribute specifies the power general scalars (capabilities)  
1736 for the System.

1737 This attribute is semantically equivalent to the Power General group defined in  
1738 [PWG5106.4].

1739 **7.3.3 power-log (1setOf collection)**

1740 This RECOMMENDED System attribute specifies the list of power log entries (events) for  
1741 the System.

1742 This attribute is semantically equivalent to the Power Log group defined in [PWG5106.4].

1743 **7.3.4 power-meters (1setOf collection)**

1744 This OPTIONAL System attribute specifies the list of power meters (current usage) for the  
1745 System.

1746 This attribute is semantically equivalent to the Power Meter group defined in [PWG5106.4].

1747 **7.3.5 power-monitor (collection)**

1748 This RECOMMENDED System attribute specifies the power monitor scalars (status) for  
1749 the System.

1750 This attribute is semantically equivalent to the Power Monitor group defined in  
1751 [PWG5106.4].

1752 **7.3.6 power-support (1setOf collection)**

1753 This OPTIONAL System attribute specifies the list of power support entries (capabilities  
1754 per power state) for the System.

1761 This attribute is semantically equivalent to the Power Support group defined in  
1762 [PWG5106.4].

1763 **7.3.7 power-transition (1setOf collection)**

1764 This OPTIONAL System attribute specifies the list of power transition entries (capabilities  
1765 for state transitions) for the System.

1766 This attribute is semantically equivalent to the Power Transition group defined in  
1767 [PWG5106.4].

1768 **7.3.8 system-config-changes (integer(0:MAX))**

1769 This REQUIRED System attribute specifies the count of configuration changes for the  
1770 System. This attribute is semantically equivalent to the SystemConfigChangeNumber  
1771 element defined in [PWG5108.06]. This attribute is semantically analogous to the  
1772 prtGeneralConfigChanges object defined in [RFC3805].

1773 **7.3.9 system-configured-printers (1setOf collection)**

1774 This REQUIRED System attribute specifies the summary of all configured Printers for the  
1775 System. This attribute is semantically equivalent to the ConfiguredServices element  
1776 defined in [PWG5108.06].

1777 **7.3.10 system-configured-resources (1setOf collection)**

1778 This REQUIRED System attribute specifies the summary of all configured Resources for  
1779 the System. This attribute is semantically equivalent to the ConfiguredResources element  
1780 defined in [PWG5108.06].

1781 **7.3.11 system-configured-subunits (1setOf collection)**

1782 This REQUIRED System attribute specifies the summary of all configured Subunits for the  
1783 System. This attribute is semantically analogous to the SystemConfiguration element  
1784 defined in [PWG5108.06].

1785 **7.3.12 system-current-time (dateTime)**

1786 This REQUIRED System attribute specifies the current date and time for the System. This  
1787 attribute is semantically equivalent to the CurrentTime element defined in [PWG5108.06].

1788 **7.3.13 system-health (1set of collection)**

1789 This RECOMMENDED System attribute specifies the list of health (posture) properties for  
1790 the System. This attribute is semantically analogous to the standard system health  
1791 attributes defined in [HCD-TNC].

1792 **[[[ ISSUE: Reference HCD TNC sections 5.x for serialized canonical health attributes?]]]**

1793 **7.3.14 system-serial-number (text(255))**

1794 This OPTIONAL System attribute specifies the serial number for the System. This  
1795 attribute is semantically equivalent to the SerialNumber element defined in [PWG5108.06].

1796 **7.3.15 system-state (type1 enum)**

1797 This REQUIRED System attribute specifies the current state for the System. This attribute  
1798 is semantically equivalent to the State element defined in [PWG5108.06]. This attribute is  
1799 semantically analogous to the “printer-state” attribute defined in [RFC2911]. The values  
1800 for this attribute are:

1801 '3' 'idle': Indicates that one or more Printers are in the 'idle' state.

1802 '4' 'processing': Indicates that one or more Printers are processing Jobs.

1803 '5' 'stopped': Indicates that all Printers are in the 'stopped' state.

1804 **7.3.16 system-state-message (text(MAX))**

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1805 This REQUIRED System attribute specifies the list of state messages for the System. This  
1806 attribute is semantically equivalent to the StateMessages element defined in  
1807 [PWG5108.06].

1808 **7.3.17 system-state-reasons (1setOf type2 keyword)**

1809 This REQUIRED System attribute specifies the list of state reasons for the System. This  
1810 attribute is semantically equivalent to the StateReasons element defined in [PWG5108.06].

1811 **7.3.18 system-totals (1setOf collection)**

1812 This RECOMMENDED System attribute specifies the list of aggregate counters for all  
1813 Printers configured on the System. This attribute is semantically equivalent to the  
1814 SystemTotals element defined in [PWG5108.06].

1815 **7.3.19 system-up-time (integer(1:MAX))**

1816 This REQUIRED System attribute specifies the time in seconds since last boot for the  
1817 System. This attribute is semantically equivalent to the UpTime element defined in  
1818 [PWG5108.06].

1819 **7.3.20 system-uuid (uri(45))**

1820 This REQUIRED System attribute specifies the UUID as a URI [RFC4122] for the System.  
1821 This attribute is semantically equivalent to the ServiceUuid element defined in  
1822 [PWG5108.01].

1824 **7.4 Printer Description Attributes**

1825 **7.5 Printer Status Attributes**

1826 All of the Printer Status attributes are READ-ONLY and can only be updated by automata  
1827 but not by Set-Printer-Attributes operations.

1828 **7.5.1 printer-service-type (type2 keyword)**

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1829 This REQUIRED Printer attribute specifies the service type for a Printer as used in Create-  
1830 Printer defined in section 6. This attribute is semantically analogous to the ServiceType  
1831 element as described in [PWG5108.06]. The values for this attribute include:

1832 'copy': A Copy service as described in [PWG5108.04].

1833 'emailin': An EmailIn service as described in [PWG5108.01].

1834 'emailout': An EmailOut service as described in [PWG5108.01].

1835 'faxin': A FaxIn service as described in [RFC2707] and [PWG5108.01].

1836 'faxout': A FaxOut service as described in [PWG5100.15].

1837 'print': A Print service as described in [RFC2911].

1838 'scan': A Scan service as described in [PWG5100.17].

1839 'transform': A Transform service as described in [PWG5108.01].

1840 'vendor': A vendor-specific service

1841 **7.6 Resource Description Attributes**

Deleted: <#>New Resource Operation Attributes] [TBD]¶ New

1842 **7.6.1 resource-info (text(127))**

1843 **7.6.2 resource-name (name(127))**

1844 **7.6.3 resource-string-version (text(127))**

1845 [follow HCD-TNC]

1846 **7.6.4 resource-version (octetString(16))**

Deleted: 20

1847 [follow HCD-TNC = but no infix periods allowed as separators]

Deleted: -

1848

Deleted: allow for



1856 **7.7 Resource Status Attributes**

Deleted: New

1857 All of the Resource Status attributes are READ-ONLY and can only be updated by  
1858 automata but not by Set-Resource-Attributes operations.

1859 **7.7.1 date-time-at-canceled (dateTime)**

1860 **7.7.2 date-time-at-creation (dateTime)**

1861 **7.7.3 resource-authenticator (1setOf collection)**

1862 - hash, signature, etc. of Resource data for verification after a Send-Resource-Data  
1863 operation.

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1864 **[[[ ISSUE: Define this collection to allow broad choices for Resource data verification**  
1865 **methods ]]]**

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1866 **7.7.4 resource-category (type2 keyword)**

- 1867 - Static resources already supported in INFRA
- 1868 - Executable resources: focus on firmware and applications,
- 1869 but not code that runs as part of a job (ew!)
- 1870 - Template resources: define what an IPP Job Ticket resource
- 1871 looks like, need to have a way to differentiate between Print
- 1872 and FaxOut and Scan job tickets
- 1873 - IPP Job Ticket has a few select operation attributes
- 1874 (destination-uri, etc.) + Job Template attributes
- 1875 - Looks like a Create-Job request?
- 1876 - No document template attributes - those can be
- 1877 inferred from Job Template as needed.

- 1879 **7.7.5 resource-data-uri (uri)**
- 1880 **7.7.6 resource-format (mimeMediaType)**
- 1881 **7.7.7 resource-id (integer(1:MAX))**
- 1882 **7.7.8 resource-job-id (integer(1:MAX))**
- 1883 **7.7.9 resource-k-octets (integer(0:MAX))**
- 1884 **7.7.10 resource-originating-user-name (name(MAX))**
- 1885 **7.7.11 resource-originating-user-uri (uri)**
- 1886 **7.7.12 resource-printer-uri (uri)**

1887 **7.7.13 resource-state (type1 enum)**

1888 This REQUIRED attribute identifies the current state of the Resource. This attribute is  
1889 semantically analogous to the DateTimeOfExpiration and ResourceHasExpired elements  
1890 defined in [PWG5108.03]. This attribute is semantically analogous to the “job-state”  
1891 attribute defined in [RFC2911]. The values for this attribute are:

- 1892 ‘3’ ‘pending’: The Resource has been created but not yet activated.
- 1893 ‘4’ ‘active’: The Resource has been activated and is available for use.
- 1894 ‘5’ ‘canceled’: The Resource has been canceled and can no longer be used.

1895 **7.7.14 resource-state-message (text(MAX))**

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1896 **7.7.15 resource-state-reasons (1setOf type2 keyword)**

1897 **7.7.16 resource-type (type2 keyword)**

1898 **7.7.17 resource-uuid (uri(45))**

1899 **7.7.18 time-at-canceled (integer(MIN:MAX))**

1900 **7.7.19 time-at-creation (integer(MIN:MAX))**

1902 **8. Additional Semantics for Existing Operations**

1903 **8.1 Cancel-Subscription, Get-Notifications, and Renew-Subscription;**  
1904 **system-uri (uri) and resource-id (integer(1:MAX))**

Deleted: Create-Subscription,

Deleted: s

1905 **8.2 Get-Printer-Attributes: printer-resource-ids (1 setOf integer(1:MAX))**

1906 for compatibility with legacy IPP Clients – choose implementation-dependent “default”  
1907 Printer object. “redirect” operation to that Printer object, and relay response to Client]

1908 **8.3 Create-Job, Get-Job-Attributes: job-resource-ids (1 setOf**  
1909 **integer(1:MAX))**

1910

1911 **9. Additional Values for Existing Attributes**

1912 **9.1 notify-events (1 setOf type2 keyword)**

1913

## 1916 **10. Conformance Requirements**

1917 Provide numbered lists of conformance requirements for the document.

### 1918 **10.1 Conformance Requirements for Clients**

### 1919 **10.2 Conformance Requirements for Infrastructure Systems**

### 1920 **10.3 Conformance Requirements for Systems**

1921

## 1922 **11. Internationalization Considerations**

1923 For interoperability and basic support for multiple languages, conforming implementations  
1924 MUST support the Universal Character Set (UCS) Transformation Format -- 8 bit (UTF-8)  
1925 [RFC3629] encoding of Unicode [UNICODE] [ISO10646] and the Unicode Format for  
1926 Network Interchange [RFC5198].

1927 Implementations of this specification SHOULD conform to the following standards on  
1928 processing of human-readable Unicode text strings, see:

- 1929 • Unicode Bidirectional Algorithm [UAX9] – left-to-right, right-to-left, and vertical
- 1930 • Unicode Line Breaking Algorithm [UAX14] – character classes and wrapping
- 1931 • Unicode Normalization Forms [UAX15] – especially NFC for [RFC 5198]
- 1932 • Unicode Text Segmentation [UAX29] – grapheme clusters, words, sentences
- 1933 • Unicode Identifier and Pattern Syntax [UAX31] – identifier use and normalization
- 1934 • Unicode Collation Algorithm [UTS10] – sorting
- 1935 • Unicode Locale Data Markup Language [UTS35] – locale databases

1936 Implementations of this specification are advised to also review the following informational  
1937 documents on processing of human-readable Unicode text strings:

- 1938 • Unicode Character Encoding Model [UTR17] – multi-layer character model
- 1939 • Unicode in XML and other Markup Languages [UTR20] – XML usage
- 1940 • Unicode Character Property Model [UTR23] – character properties

- 1941
- Unicode Conformance Model [UTR33] – Unicode conformance basis

1942 **12. Security Considerations**

1943 The IPP extensions defined in this document require the same security considerations as  
1944 defined in the IPP/1.1: Model and Semantics [RFC2911] and PWG System Object and  
1945 System Control Service Semantics [PWG5108.06].

1946 Implementations of this specification SHOULD conform to the following standard on  
1947 processing of human-readable Unicode text strings, see:

- 1948
- Unicode Security Mechanisms [UTS39] – detecting and avoiding security attacks

1949 Implementations of this specification are advised to also review the following informational  
1950 document on processing of human-readable Unicode text strings:

- 1951
- Unicode Security FAQ [UNISECFAQ] – common Unicode security issues

1952

1953 **13. IANA and PWG Considerations**

1954 TBD

1955 **14. References**

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2111 standard:

2112 Peter Zehler (Xerox)

## 2113 16. Change History

### 2114 16.1 17 January 2016

- 2115 - Interim draft – changes per IPP WG reviews on 7 December 2015 and 4 January 2016
- 2116 - global – kept most redlines from previous versions for review by IPP WG
- 2117 - global – revised section 6 IPP Operations to delete trailing document references after
- 2118 every operation request and operation response attribute for clarity
- 2119 - global – revised section 7.1 System, Printer, and Resource Operation Attributes to further
- 2120 simplify and clarify filter text
- 2121 - revised section 5.4 System Operations and section 6 IPP Operations to delete redundant
- 2122 and ambiguous Restart-All-Printers and Restart-One-Printer operations (use Shutdown
- 2123 and Startup instead)
- 2124 - revised section 6 IPP Operations to add note that all operation requests and responses
- 2125 use standard operation parameters defined in [RFC2911] and encoded in [RFC2910]
- 2126 - revised section 6 IPP Operations definition of Get-Printers to add note that it is an End
- 2127 User operation and does NOT require Client authentication, but MAY be encrypted and
- 2128 another note that requested-attributes is limited to the LDAP Printer Schema [RFC7612]
- 2129 and if request-attributes is missing, then the System MUST only return printer-uri-
- 2130 supported, uri-authentication-supported, and uri-security-supported.
- 2131 - revised section 6 IPP Operations definition of Get-Resources to add note that it is an
- 2132 Administrator operation and requires Client authentication.
- 2133 - revised section 6 IPP Operations definition of Get-Printers to change operation attribute
- 2134 printer-service-type to '1setOf' (for Get-Printers)
- 2135 - revised section 6 IPP Operations definition of Startup-All-Printers and Startup-One-
- 2136 Printer to remove reference to RFC 3998 Startup-Printer
- 2137 - revised section 6 IPP Operations definition of Create-Printer, Create-Resources, Get-
- 2138 Printers, Startup-All-Printers responses to delete status-code (parameter, not an attribute)
- 2139 and move attributes-charset/attributes-natural-language before status-message
- 2140 - revised section 7.1 System, Printer, and Resource Operation Attributes to delete
- 2141 redundant printer-service-types, to change operation attribute printer-service-type to
- 2142 '1setOf' (for Get-Printers), and to move values to section 7.7 System Status Attributes
- 2143 printer-service-type
- 2144 - revised section 7.1 System, Printer, and Resource Operation Attributes to references to
- 2145 Create-Resource/Send-Resource-Data when appropriate
- 2146 - revised section 7.1 System, Printer, and Resource Operation Attributes resource-k-octets
- 2147 to correct forward reference to section 7.7
- 2148 - revised section 7.1 System, Printer, and Resource Operation Attributes which-printers
- 2149 to clarify 'all' and 'stopped' and add 'shutdown' and 'testing' to harmonize with MFD Model
- 2150 and IETF Host Resources MIB [RFC2790]

### 2151 16.2 6 December 2015

- 2152 - Interim draft – new content after IPP WG review on 5 October 2015
- 2153 - global – kept all redlines from previous versions for review by IPP WG

- 2154 - revised section 6 IPP Operations to define Startup-All-Printers (prototype for all other  
2155 Xxx-All-Printers operation attributes), Startup-One-Printer (prototype for all other Xxx-One-  
2156 Printer operation attributes), Create-Printer, Create-Resource, Delete-Printer, Disable-All-  
2157 Printers, Enable-All-Printers, Get-Printer-Attributes, Pause-All-Printers, Restart-All-  
2158 Printers, Restart-One-Printer, Resume-All-Printers, Shutdown-All-Printers, Shutdown-One-  
2159 Printer  
2160 - revised section 7.7 Resource Status Attributes to define resource-state (to be reviewed  
2161 by IPP WG since the Resource object has unique states)

### 2162 **16.3 2 November 2015**

- 2163 - Interim draft – new content after IPP WG review on 5 October 2015  
2164 - global – kept all redlines from previous version for review at PWG November F2F  
2165 - revised section 7.1 System, Printer, and Resource Operation Attributes to add Resource  
2166 operation attributes resource-category, resource-format, resource-id, resource-job-id,  
2167 resource-k-octets, resource-printer-uri, resource-state, and resource-type  
2168 - revised section 7.3 System Status Attributes to add power-counters, power-general,  
2169 power-log, power-meters, power-monitor, power-support, power-transition, system-config-  
2170 changes, system-configured-printers, system-configured-resources, system-configured-  
2171 subunits, system-current-time, system-health, system-serial-number, system-state,  
2172 system-state-messages, system-state-reasons, system-totals, system-up-time, and  
2173 system-uuid

### 2174 **16.4 18 October 2015**

- 2175 - Interim draft – changes per IPP WG review on 5 October 2015  
2176 - global - accepted all changes up to and through section 6.9 (from previous review)  
2177 - revised section 7.1 title to “System, Printer, and Resource Operation Attributes” to allow  
2178 for Printer operation attributes in future such as “printer-service-type” for Create-Printer  
2179 - revised sections 7.1.x to change “filters the set of Printers” to “specifies a filter for the  
2180 applicable Printers”  
2181 - added section 7.1.3 printer-service-type for Create-Printer operation  
2182 - revised section 7.1.4 printer-service-types to change “Service Type attribute” to “Service  
2183 Type element”, add forward reference to “printer-service-type” in section 7.5 Printer Status  
2184 Attributes, and add emailin, emailout, and faxin (references to PWG 5108.01 and RFC  
2185 2707)  
2186 - revised section 7.1.5 resource-id to add forward reference to “resource-id” in section 7.7  
2187 Resource Status Attributes  
2188 - revised section 7.1.11 system-uri to change “attribute the target” to “attribute specifies the  
2189 target”  
2190 - revised section 7.1.12 which-printers to change "This attribute and is" to “This attribute is”  
2191 (drop “and”)  
2192 - revised section 14 References to accept all changes and add PWG Job Monitoring MIB  
2193 (RFC 2707)

2194 **16.5 20 September 2015**

- 2195 - Interim draft - changes per PWG F2F review on 31 August 2015
- 2196 - global - accepted all changes up to and through section 6.9 (from previous review)
- 2197 - revised Abstract and section 1 Introduction to add explicit references to Cloud & Infra
- 2198 - deleted section 5.2 System Operation Attributes and section 5.7 Resource Operation
- 2199 Attributes
- 2200 - added section 5.8 Printer Description Attributes and table for “printer-owner-[uri|vcard]”
- 2201 - revised section 6.9.1 Get-Printers Request to make “attributes-charset” and “attributes-
- 2202 natural-language” REQUIRED for Client (per RFC 2911)
- 2203 - revised section 6.9.1 Get-Printers Request to add note to “requested-attributes” about the
- 2204 primary Printer attributes in the IETF LDAP Printer Schema (RFC 7612)
- 2205 - revised section 7.2 System Description Attributes to add new attribute definitions
- 2206 - revised section 14.1 Normative References to add references for new attribute definitions

2207 **16.6 31 August 2015**

- 2208 - Interim draft – changes per PWG F2F review on 10 August 2015
- 2209 - global – deleted redundant “new” and “now” and “below” in several dozen places
- 2210 - revised Table of Contents to delete List of Figures (all now deleted in this version)
- 2211 - revised section 2.2 Protocol Role Terminology to correct “Infrastructure System” from
- 2212 “PWG5109.CLOUD” to “PWG5109.1”, add “Printer”, and correct typos in “Protocol
- 2213 Endpoint”
- 2214 - revised section 2.2 Protocol Role Terminology to add references to IPP INFRA (PWG
- 2215 5100.18) to “Infrastructure Printer”, “Infrastructure System”, and “Proxy”
- 2216 - revised section 2.3 Printing Terminology to add “Printer” (synonym for “Imaging Service”)
- 2217 with RFC 2911 reference
- 2218 - revised section 3.1 Rationale for the IPP System Service to correct title of IPP/2.0
- 2219 - revised section 3.1 Rationale for the IPP System Service to add paragraphs for IPP
- 2220 INFRA [PWG5100.18] and Cloud Imaging Model [PWG5109.1]
- 2221 - revised section 5 IPP System and Resource Objects and Operations for clarity and
- 2222 deleted redundant Figure 1 through Figure 4 (PWG SM abstract objects) and text
- 2223 - revised section 5.1 System Attribute Groups and section 5.6 Resource Attribute Groups
- 2224 titles to be singular (only one of each)
- 2225 - revised section 5.2 System Operation Attributes and section 5.7 Resource Operation
- 2226 Attributes to be just forward references to section 7.1 System and Resource Operation
- 2227 Attributes
- 2228 - revised section 5.3 System Description Attributes Table 1 and section 7.2 System
- 2229 Description Attributes to add “system-default-printer-uri” to support the enhanced “Get-
- 2230 Printer-Attributes” operation
- 2231 - revised and reordered (alphabetized) section 5.3 System Description Attributes Table 1
- 2232 and section 7.2 System Description Attributes to insert “system” prefix on several attributes
- 2233 for consistency with Printer object in RFC 2911
- 2234 - revised and reordered (alphabetized) section 5.4 System Status Attributes Table 2 and
- 2235 section 7.3 System Status Attributes to insert “system” prefix on several attributes and add
- 2236 “system-up-time” for consistency with Printer object in RFC 2911

- 2237 - revised section 5.5 System Operations Table 3 to add missing references and change  
2238 “Cancel-Subscriptions” and “Renew-Subscriptions” to singular per RFC 3995  
2239 - revised section 5.5 System Operations Table 3 to update note for Create-Resource and  
2240 add note for Create-Printer referring to the semantically equivalent Create operation in ISO  
2241 10175-3  
2242 - revised section 5.5 System Operations Table 3 to add note that Register-Output-Device  
2243 is semantically equivalent to Register-System in PWG 5109.1 (with differences explained)  
2244 - revised section 5.9 Resource Status Attributes Table 5 to add note for “resource-id”  
2245 analogous to “job-id” in RFC 2911.  
2246 - revised section 5.9 Resource Status Attributes Table 5 to add note for “resource-k-octets”  
2247 analogous to “job-k-octets” in RFC 2911.  
2248 - revised section 5.9 Resource Status Attributes Table 5 to add notes for “resource-job-id”  
2249 and “resource-printer-uri” which are required for Job and Printer scoped Resource objects,  
2250 respectively  
2251 - revised section 5.9 Resource Status Attributes Table 5 to add “resource-authenticator” for  
2252 verification of Resource data after a Send-Resource-Data operation  
2253 - deleted redundant sections 6.x Cancel-Subscription, Get-Notifications, Get-Printer-  
2254 Attributes, and Renew-Subscription and moved to sections 8.x for existing operations with  
2255 new semantics  
2256 - revised section 6.x Get-Printers to change “selected” to “matching” and make sure that  
2257 each attribute has a colon (:) at the end and put the reference(s) at the end of each  
2258 attribute name  
2259 - revised section 6.x Get-Printers to use “the Client [MUST|SHOULD|MAY] supply and the  
2260 System MUST support” for clarity – “OPTIONALLY” is NOT a defined conformance  
2261 keyword  
2262 - revised section 6.x Get-Printers and section 7.1.x “printer-geo-location” to remove  
2263 ‘unknown’ value (never appropriate in this specification)  
2264 - revised section 6.x Get-Printers and section 7.1.x “printer-service-types” to change  
2265 singular to plural (i.e., multiple printers can be chosen by the filter)  
2266 - revised sections 6.x Get-Resources and Get-Resource-Attributes to note that they are  
2267 modeled on Get-Jobs and Get-Job-Attributes with default returns of “resource-id” and  
2268 “resource-state”  
2269 - revised section 6.x Get-System-Attributes to note that it is modeled on Get-Printer-  
2270 Attributes with default return of all System attributes  
2271 - revised section 7.1 title to be “System and Resource Operation Attributes” (since some  
2272 apply to operations on both objects)  
2273 - revised section 7.1.x to change “selects” to “filters” and “selected” to “matching” for clarity  
2274 - added sections 7.1.x for “resource-category”, “resource-id”, “resource-job-id”, “resource-  
2275 printer-uri”, “resource-state”, and “resource-type” operation attributes  
2276 - revised section 14.1 Normative References to update IPP/2.0 title and reference (work-in-  
2277 progress) and add IPP INFRA (PWG 5100.18-2015) and Cloud Imaging Model (PWG  
2278 5109.1-2015)  
2279

**2280 16.7 10 August 2015**

- 2281 - Interim draft – changes per PWG F2F review on 29 April 2015
- 2282 - global – added working notes from PWG F2F at appropriate operations and attributes to
- 2283 capture discussion and agreements
- 2284 - revised Abstract and section 1 Introduction to say “support registration of an IPP System,
- 2285 through its IPP Proxy, with one or more Cloud Imaging Systems”
- 2286 - revised section 1.1 Rationale for two IPP Protocol Endpoints to titlecase “Protocol
- 2287 Endpoint” in first paragraph
- 2288 - revised section 2.2 Protocol Role Terminology, to add “Endpoint” (whole computing
- 2289 device) from IETF NEA Overview [RFC5209], clarify “Infrastructure System”, and rewrite
- 2290 “Protocol Endpoint” (an application interface) based on standard IETF usage.
- 2291 - revised section 3.4 Out-of-Scope to add support for any non-IPP Cloud Imaging System.
- 2292 - revised section 5.3 System Description Attributes to delete issue about cardinality of
- 2293 “owner-uri” and “owner-vcard” (they are single-valued) and to remove Register-System
- 2294 operation from Table 1 Note 4
- 2295 - revised section 5.5 System Operations Table 3 to replace “Cancel-Xxx-Subscriptions”
- 2296 with “Cancel-Subscriptions” and “Renew-Xxx-Subscriptions” with “Renew-Subscriptions”
- 2297 and reference RFC 3995
- 2298 - revised section 5.5 System Operations Table 3 to delete “Renew-Resource”, add “Get-
- 2299 Subscriptions” and “Get-Subscription-Attributes, and replace “Get-Xxx-Notifications” with
- 2300 “Get-Notifications” and reference RFC 3996
- 2301 - revised section 5.5 System Operations Table 3 to add new “Install-Resource” operation
- 2302 to activate (for use) firmware, software, fonts, etc. after Create-Resource and Send-
- 2303 Resource-Data have completed
- 2304 - added section 5.6 Resource Attribute Groups
- 2305 - added section 5.7 Resource Operation Attributes
- 2306 - added section 5.8 Resource Description Attributes and Table 4
- 2307 - added section 5.9 Resource Status Attributes and Table 5
- 2308 - revised sections 6.x to align with current set of operations
- 2309 - added section 6.x Get-Printers in complete detail for review
- 2310 - added section 7 New IPP Attributes and sections 7.x for all System and Resource
- 2311 operation, description, and status attributes
- 2312 - revised sections 14.x to add or update several references

**2313 16.8 28 April 2015**

- 2314 - Interim draft – changes per IPP WG review on 30 March 2015
- 2315 - global – replaced “IPP System Control Service” with “IPP System Service” (but NOT in
- 2316 the abstract PWG equivalent), per IPP WG review
- 2317 - global – replaced titlecase “Object” with lowercase “object” (except in section title or PWG
- 2318 SM spec titles), per IPP WG review
- 2319 - revised Abstract to change “[PWG510x.y]” document references to “(PWG 510x.y)”,
- 2320 consistent with IETF RFC styles and change “Cloud Imaging services” to “Cloud Imaging
- 2321 Systems”, per IPP WG review
- 2322 - revised section 1 Introduction to replace with expanded scope text from Abstract, per IPP

- 2323 WG review
- 2324 - revised section 1.1 Rationale for two IPP Protocol Endpoints to clarify that a conforming
- 2325 IPP System Service supports both a URI for an IPP System object and a \*separate\* URI
- 2326 for the implementation defined “default” IPP Printer returned from Get-Printer-Attributes,
- 2327 per IPP WG review
- 2328 - revised section 2.2 Protocol Role Terminology to add definitions of Infrastructure System
- 2329 and Protocol Endpoint, remove the “IPP” prefix from the definitions of Client, Infrastructure
- 2330 Printer, Proxy, and System terms, and enhance the definition of Proxy, per IPP WG review
- 2331 - revised section 3.1 Rationale for the IPP System Service, to replace period “.” with semi-
- 2332 colon “;” in non-terminal members of both numbered lists, per IPP WG review
- 2333 - revised section 5.3 System Description Attributes in Table 1 to change owner-uri from
- 2334 RECOMMENDED to CONDITIONALLY REQUIRED and owner-vcard from OPTIONAL to
- 2335 CONDITIONALLY REQUIRED for systems that support the Set-System-Attributes and
- 2336 Register-System operations and added **issue** about possible multi-valued ordered sets for
- 2337 multiple owners (whose semantics are presently undefined in any PWG spec), per IPP WG
- 2338 review
- 2339 - revised section 5.4 System Status Attributes in Table 2, note (7) to delete sentence about
- 2340 already removed device-uuid attribute, per IPP WG review
- 2341 - revised section 5.5 System Operations to add Create/Cancel/Renew-Resource-
- 2342 Subscriptions, Create/Cancel/Renew-System-Subscriptions, Get-Notifications, Get-Printer-
- 2343 Attributes (for implementation-defined “default” Printer), RestartSystem (for restart with
- 2344 existing or new firmware Resource for remediation based on health monitoring), and to
- 2345 divide original StoreResource into Create-Resource and Send-Resource-Data (to correct
- 2346 scope ambiguity of original PWG Resource Service operation), per IPP WG review
- 2347 - added (blank placeholder) section 10.2 Conformance Requirements for Infrastructure
- 2348 Systems, per IPP WG review
- 2349 - revised section 11 Internationalization Considerations to add new Unicode boilerplate
- 2350 from JDFMAP, per IPP WG review
- 2351 - revised section 12 Security Considerations to add new Unicode boilerplate from
- 2352 JDFMAP, per IPP WG review
- 2353 - revised section 14.1 Normative References and section 14.2 Informative References to
- 2354 add new Unicode boilerplate specs from JDFMAP, per IPP WG review
- 2355 - TODO – add various spec references, per IPP WG review

## 2356 **16.9 15 March 2015**

- 2357 - Interim draft – changes per PWG F2F and IPP WG reviews on 4 November 2014, 17
- 2358 November 2014, 19 January 2015, and 3 February 2015
- 2359 - revised title to “IPP System Service”, per IPP WG review on 4 November 2014
- 2360 - revised Abstract to include management and status of Services, Subunits, and
- 2361 Resources and Cloud registration extensions, per IPP WG review on 4 November 2014
- 2362 - revised section 1.1 Rationale for two IPP Protocol Endpoint to mention of inclusion of
- 2363 original Get-Printer-Attributes that automatically selects the implementation-defined or site-
- 2364 defined “default” IPP Printer object for the convenience of existing IPP Clients, per IPP WG
- 2365 review on 4 November 2014
- 2366 - revised section 2.2 Protocol Role Terminology to add definitions of Infrastructure Printer

- 2367 and IPP Proxy from IPP Shared Infrastructure Extensions, per IPP WG review on 3  
2368 February 2015
- 2369 - revised section 2.3 Printing Terminology to delete Resource Service and revise the  
2370 definitions of Spooling Service and Streaming Service, per IPP WG review on 4 November  
2371 2014
- 2372 - revised section 2.3 Printing Terminology to add definitions of Logical Device, Output  
2373 Device, and Physical Device from IPP Shared Infrastructure Extensions, per IPP WG  
2374 review on 3 February 2015
- 2375 - renamed section 2.4 from “Acronyms and Organizations” to simply “Abbreviations”, for  
2376 consistency with RFC 7472, per RFC Editor on 5 March 2015
- 2377 - revised section 3.1 Rationale for the IPP System Service to add the Resource Service  
2378 functionality (objects, operations, and attributes), per IPP WG review on 4 November 2014
- 2379 - added new use case in section 3.2.4 Resource Management, per IPP WG review on 4  
2380 November 2014
- 2381 - revised section 3.4 Out-of-Scope, to delete creation/deletion of Imaging Services, per IPP  
2382 WG review on 3 February 2015
- 2383 - revised section 3.5 Design Requirements, to add Resource object, per IPP WG review on  
2384 4 November 2014
- 2385 - added section 4.6 Resource Service, to add Resource object, per IPP WG review on 4  
2386 November 2014
- 2387 - revised section 5.1 Attribute Groups to define the system-attributes-tag and resource-  
2388 attributes-tag, per IPP WG review on 19 January 2015
- 2389 - revised section 5.2 Operation Attributes to define system-uri and resource-uri, per IPP  
2390 WG review on 19 January 2015
- 2391 - revised title of section 5.3 to System Description Attributes, per IPP WG review on 19  
2392 January 2015
- 2393 - revised section 5.3 System Description Attributes in Table 1 to raise owner-uri from  
2394 OPTIONAL to RECOMMENDED, per IPP WG review on 19 January 2015
- 2395 - revised section 5.3 System Description Attributes to delete redundant original Figure 3  
2396 and Figure 4, per IPP WG review on 19 January 2015
- 2397 - revised title of section 5.4 to System Status Attributes, per IPP WG review on 19 January  
2398 2015
- 2399 - revised section 5.4 to System Status Attributes in Table 2 to delete redundant device-  
2400 uuid, per IPP WG review on 19 January 2015
- 2401 - revised section 5.4 to System Status Attributes to delete redundant original Figure 4,  
2402 Figure 5, Figure 6, and Figure 7, per IPP WG review on 19 January 2015
- 2403 - revised section 5.5 System Operations to delete issue about Subscription operations, per  
2404 IPP WG review on 3 February 2015
- 2405 - revised section 5.5 System Operations in Table 3 to add Create/Delete-Printer and  
2406 Resource operations, per IPP WG review on 3 February 2015

## 2407 **16.10 2 November 2014**

- 2408 - Interim draft – changes per IPP WG review on 29 September 2014
- 2409 - corrected typos and wording
- 2410 - revised cover page and headers to change “IPPSYSTEM” to “SYSTEM”, per IPP WG



- 2411 review
- 2412 - globally changed “Imaging Device” to “Imaging System” where appropriate (most
- 2413 instances), per IPP WG review
- 2414 - globally changed “[RFC2616]” to “[RFC7230]”, per IPP WG review
- 2415 - globally changed “[PWG5100.SCAN]” to “PWG5100.17” and corrected reference in
- 2416 section 10.1, per PWG approval of IPP Scan Service
- 2417 - added section 1.1 Rationale for two IPP Protocol Endpoints to explain the reason for
- 2418 separate URI for System and Printer objects, per IPP WG review
- 2419 - revised section 2.2 to change title from “Printing Terminology” to “Protocol Roles”, per
- 2420 IPP WG review
- 2421 - revised section 2.2 to delete “IPP Printer” (and thus Logical Device and Physical Device
- 2422 definitions and details) as not applicable to System Control Service and to add “IPP
- 2423 System”, per IPP WG review
- 2424 - revised section 2.3 to change title from “Other Terminology” to “Printing Terminology”, per
- 2425 IPP WG review
- 2426 - moved first sentence of section 2.2 (sources of terms) to section 2.3, per IPP WG review
- 2427 - revised section 2.3 to add new terms, including “Document”, “FaxOut Job/Service”, “ith”,
- 2428 “Job”, “Print Job/Service”, “Scan Job/Service”, “Spooling Service”, “Streaming Service”,
- 2429 “Subunit”, “Transform Job/Service”, per IPP WG review
- 2430 - revised section 2.3 to improve “Imaging System” definition, per IPP WG review
- 2431 - revised section 3.1 Rationale to clarify various paragraphs and add numbered lists, per
- 2432 IPP WG review
- 2433 - revised section 3.2 Use Cases to clarify various paragraphs, per IPP WG review
- 2434 - revised section 3.3 to change “TBD” to “There are no exceptions to the use cases defined
- 2435 in section 3.2”, per IPP WG review
- 2436 - revised section 3.4 Out of Scope to clarify first sentence, per IPP WG review
- 2437 - revised section 3.4 Out of Scope to clarify several statements, per IPP WG review
- 2438 - revised section 3.4 Design Requirements to clarify first sentence, per IPP WG review
- 2439 - added section 4.5 Document Object, per IPP WG review
- 2440 - revised section 5.3 System Description to change “READ-ONLY” to “READ-WRITE”
- 2441 (because Set-System-Attributes was restored in this draft), per IPP WG review and Cloud
- 2442 Imaging WG recommendations
- 2443 - revised section 5.4 System Status to clarify the “READ-ONLY” cannot be modified by a
- 2444 Set-System-Attributes operation, per IPP WG review and Cloud Imaging WG
- 2445 recommendations
- 2446 - revised section 5.4 System Status to clarify the meaning of “system-uuid” (SCS), “printer-
- 2447 uuid” (Imaging Service), and “device-uuid” (physical hardware, i.e., network device), per
- 2448 IPP WG review
- 2449 - revised section 5.4 System Status Table 2 to change “configured-services” to
- 2450 “configured-printers”, per IPP WG review
- 2451 - revised section 5.5 System Operations Table 3 to add back Restart-One-Printer, Startup-
- 2452 One-Printer, Shutdown-One-Printer, and Set-System-Elements, per IPP WG review and
- 2453 Cloud Imaging WG recommendations
- 2454 - revised section 6 New IPP Operations to add back Restart-One-Printer, Startup-One-
- 2455 Printer, Shutdown-One-Printer, and Set-System-Elements, per IPP WG review and Cloud
- 2456 Imaging WG recommendations

- 2457 - revised section 8.1 title to add “Create-Subscription” operation, per IPP WG review
- 2458 - revised section 13 to change title from “IANA Considerations” to “IANA and PWG
- 2459 Considerations”, per IPP WG review
- 2460

2461 **16.11 24 August 2014**

- 2462 - Interim draft
- 2463 - corrected typos and wording
- 2464 - revised section 5.3 and added Table 1 – Attributes in IPP System Description group with
- 2465 notes for rationale of all conformance requirements
- 2466 - revised section 5.4 and added Table 2 – Attributes in IPP System Status group with notes
- 2467 for rationale of all conformance requirements
- 2468 - added section 6 New IPP Operations (empty)
- 2469 - added section 7 New IPP Attributes (empty)

2470 **16.12 11 August 2014**

- 2471 - Initial draft
- 2472 - based on Mike Sweet’s presentation at PWG F2F meeting in October 2013
- 2473 - added Abstract and Introduction
- 2474 - added Terminology, including new and refined terms for clarity
- 2475 - added Requirements (rationale, use cases, out-of-scope, design requirements)
- 2476 - added IPP Object Model (extensions to RFC 2911)
- 2477 - added IPP System Object (still a sketch)
- 2478 - combined System object and System Control Service object (separation was artificial)
- 2479 - added References (normative and informative)