



The Printer Working Group

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IPP System Service v1.0 (SYSTEM)

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Abstract: This document defines an IPP binding of the PWG Semantic Model root System object and associated System Control Service that are defined in (PWG 5108.06), the PWG Resource Service that is defined in (PWG 5108.03), and an IPP operation to support registration as defined in the PWG Cloud Imaging Requirements and Model (PWG 5109.1).

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<https://ftp.pwg.org/pub/pwg/ipp/wd/wd-ippsystem10-20180504.pdf>

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1. Introduction

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 [PWG5108.06] and the PWG Resource Service that is defined in [PWG5108.03]. This document defines IPP objects, operations, and attributes to support management and status monitoring of all configured Services, Subunits, and Resources on an Imaging System. 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 [PWG5109.1] and concrete IPP Shared Infrastructure Extensions [PWG5100.18].

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1.1 Rationale for Two IPP Protocol Endpoints

This document defines the IPP System object that represents the IPP System Service. The IPP operations on this System object and the IPP attributes defined for this System object are disjoint from those defined for the Printer object in [RFC8011]. An IPP Imaging System that conforms to this document supports both an IPP System object and (via a System response to the Get-Printers operation) [zero](#) or more IPP Printer objects, each of which has a separate IPP Protocol Endpoint – i.e., separate values of IPP URI [RFC3510] or IPPS URI [RFC7472].

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1.2 Get-Printer-Attributes Extension

For the convenience of existing IPP Clients, this document also includes the original Get-Printer-Attributes operation defined in IPP/1.1 Model and Semantics [RFC8011] with an extension to automatically select the implementation-defined or site-defined “default” IPP Printer object, unless the IPP Client explicitly specifies a given target Printer object in the Get-Printer-Attributes request.

1.3 Printer Identifier Extension

This document defines a new IPP attribute “printer-id” that contains an integer unique identifier for each Printer object within the IPP Imaging System. This extension simplifies references to Printer objects, each of which can potentially support multiple Protocol Endpoints in “printer-xri-supported” with different Client authentication and Printer security policies. The use of a “printer-uri” operation attribute to identify a Printer object therefore has some ambiguity about available operations and attributes via a specific Protocol Endpoint.

2. Terminology

2.1 Conformance Terminology

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

2.2 Protocol Role Terminology

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

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

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

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

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

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

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

Proxy: A Client that sends configuration and status information to and retrieves and manages Jobs and Documents from an Infrastructure Printer [PWG5100.18] on behalf of one or more Output Devices and also communicates internally with an Infrastructure System to register the local System and get back Infrastructure Printer URIs.

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

427 **2.3 Printing Terminology**

428 Normative definitions and semantics of printing terms are imported from IETF Design Goals
429 for an Internet Printing Protocol [RFC2567], IETF Printer MIB v2 [RFC3805], IETF Printer
430 Finishing MIB [RFC3806], IETF Internet Printing Protocol: Event Notifications and
431 Subscriptions [RFC3995], PWG IPP FaxOut Service [PWG5100.15], PWG IPP Scan
432 Service [PWG5100.17], PWG IPP Shared Infrastructure Extensions (INFRA)
433 [PWG5100.18], PWG MFD Model and Common Semantics [PWG5108.01], PWG Network
434 Resource Service Semantic Model and Service Interface [PWG5108.03], PWG System
435 Object and System Control Service Semantics [PWG5108.06], and IETF Internet Printing
436 Protocol/1.1: Model and Semantics [RFC8011].

437 *Administrator*: An End User who is also authorized to manage all aspects of an Output
438 Device or Printer, including creating the printer instances and controlling the authorization
439 of other End Users and Operators [RFC2567].

440 *Delivery Method*: The mechanism by which a System or Printer delivers an Event
441 Notification [RFC3995].

442 *Document*: An object created and managed by an Imaging Service that contains the
443 description, processing, and status information. A Document object may have attached data
444 and is bound to a single Job object [RFC8011].

445 *End User*: A person or software process that is authorized to perform basic printing
446 functions, including finding/locating a printer, creating a local instance of a printer, viewing
447 printer status, viewing printer capabilities, submitting a print job, viewing print job status, and
448 altering the attributes of a print job [RFC2567].

449 *Event*: An occurrence (either expected or unexpected) within a System of a change of state,
450 condition, or configuration of a System, Printer, or Job. An Event occurs only at one instant
451 in time and does not span the time the physical Event takes place [RFC3995].

452 *Event Notification*: The information about an Event that the Printer delivers when an Event
453 occurs [RFC3995].

454 *FaxOut Job*: An object created and managed by a FaxOut Service that contains description,
455 processing, and status information. The FaxOut Job also contains zero or more Document
456 objects [PWG5100.15].

457 *FaxOut Service*: An Imaging Service that accepts incoming IPP operation requests for
458 creation of FaxOut Jobs and management of FaxOut Jobs and the service itself
459 [PWG5100.15].

- 460 *IPP Binding*: The Internet Printing Protocol implementation of an abstract information model
461 and associated set of abstract operations and data elements [RFC8011].
- 462 *Imaging Device*: A physical hardware entity (stand-alone) or logical software entity (hosted
463 on a network server) that supports one or more Imaging Services (e.g., Print, Scan, FaxOut,
464 etc.) [PWG5108.01].
- 465 *Imaging Service*: A software entity that supports document or image processing (e.g., Print,
466 Scan, FaxOut, etc.) [PWG5108.01].
- 467 *Imaging System*: A logical or physical system supports a System object and a System
468 Service for monitoring and management of one or more Imaging Services (e.g., Print, Scan,
469 FaxOut, etc.) [PWG5108.01].
- 470 *ith*: Referring to a specific IPP '1setOf' value - the first value, the second value, and so forth.
- 471 *Job*: An object created and managed by an Imaging Service that contains the description,
472 processing, and status information. A Job object also contains zero or more Document
473 objects [RFC8011].
- 474 *Logical Device*: a print server, software service, or gateway that processes jobs and either
475 forwards or stores the processed job or uses one or more Physical Devices to render output
476 [RFC8011].
- 477 *Notification*: Synonym for Event Notification [RFC3995].
- 478 *Operator*: An End User that also has special rights on the Output Device or Printer. The
479 Operator typically monitors the status of the Printer and manages and controls the Jobs at
480 the Output Device [RFC2567]. The Operator is allowed to query and control the Printer,
481 Jobs, and Documents based on site policy.
- 482 *Output Device*: a single Logical or Physical Device [PWG5100.18].
- 483 *Owner*: The End User or Administrator who owns and manages (and typically created) a
484 Job, Printer, Resource, Subscription, or System [PWG5108.06].
- 485 *Physical Device*: a hardware implementation of an endpoint device, e.g., a marking engine,
486 a fax modem, etc [RFC8011].
- 487 *Print Job*: An object created and managed by a Print Service that contains description,
488 processing, and status information. The Print Job also contains zero or more Document
489 objects [RFC8011].
- 490 *Print Service*: An Imaging Service that accepts incoming IPP operation requests for creation
491 of Print Jobs and management of Print Jobs and the service itself [PWG5108.01].
- 492 *Printer*: Synonym for Imaging Service – an object that accepts incoming IPP operation
493 requests for creation of Imaging Jobs and management of Imaging Jobs [RFC8011].

494 *Resource*: A data object (e.g., firmware, font, logo, etc.) that can be configured on an
495 Imaging System for use by one or more Imaging Services and has a System, Printer, or Job
496 scope [PWG5108.01].

497 *Scan Job*: An object created and managed by a Scan Service that contains description,
498 processing, and status information. The Scan Job also contains zero or more Document
499 objects [PWG5100.17].

500 *Scan Service*: An Imaging Service that accepts incoming IPP operation requests for creation
501 of Scan Jobs and management of Scan Jobs and the service itself [PWG5100.17].

502 *Spooling Service*: An Imaging Service that stores all of a Job's document data so that it can
503 be reprocessed as needed [PWG5100.18].

504 *Streaming Service*: An Imaging Service that stores some of a Job's document data as it is
505 processed, output, and/or delivered [PWG5100.18].

506 *Subscription*: An object containing a set of attributes that indicate: the Notification Recipient
507 (for Push Delivery Method only), the Delivery Method, the Subscribed Events that cause the
508 Printer to deliver an Event Notification, and the information to include in an Event Notification
509 [RFC3995].

510 *Subunit*: A hardware component (e.g., input tray or marker) or software component (e.g.,
511 input channel or interpreter) of an Imaging System [RFC3995] [PWG5108.01].

512 *System Service*: A software entity that supports management of all hardware and software
513 components of an Imaging System and the System object defined in this specification
514 [PWG5108.06].

515 *Transform Job*: An object created and managed by a Transform Service that contains
516 description, processing, and status information. The Transform Job also contains zero or
517 more Document objects [PWG5108.01].

518 *Transform Service*: An Imaging Service that accepts incoming IPP operation requests for
519 creation of Transform Jobs and management of Transform Jobs and the service itself
520 [PWG5108.01].

521 **2.4 Abbreviations**

522 *DPA*: ISO Document Printing Application, <https://www.iso.org/standard/18191.html>

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

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

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

526 *PWG*: Printer Working Group, <http://www.pwg.org/>
527

3. Requirements for the IPP System Service

3.1 Rationale

Deleted: for the IPP System Service

Existing IPP specifications define the following features and functionality:

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

Existing PWG Semantic Model specifications define the following features and functionality:

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

568 Therefore, this IPP System Service specification should define:

- 569 1. An IPP binding of the PWG System object;
570 2. An IPP binding of the PWG System Control Service to support management and
571 monitoring of Imaging Systems and their configured Imaging Services; and
572 3. An IPP binding of the PWG Resource object and the PWG Resource Service.

573 **3.2 Use Cases**

574 **3.2.1 Imaging System Service Enumeration**

575 Jane wants to determine what services are available on an Imaging System and their
576 capabilities. After Jane initiates service enumeration by using the IPP Client on her laptop
577 to send a query to the Imaging System for the list of available services. After receiving the
578 response from the Imaging System, the IPP Client sends further queries to each Imaging
579 Service for its capabilities and configuration. Finally, the IPP Client displays the list of
580 available Imaging Services and their capabilities.

581 **3.2.2 Imaging System Monitoring**

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

586 **3.2.3 Imaging System Management**

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

590 **3.2.4 Resource Management**

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

594 **3.2.5 Bootstrap Client Access to Default Print Service**

595 Jane sees that there's a new network printer installed in the hall near her office that has an
596 IPv4 address written on the top (e.g., "10.1.2.3"). She wants to use that network printer, but
597 doesn't know how to find the specific URI of a running print service on that machine. She
598 uses the IPP Client on her laptop to query the IPP System Service that listens on the
599 standard IPP port (e.g., "ipp://10.1.2.3:631") on that machine to find the default print service
600 URI on that machine (e.g., "ipp://printer12.example.com/ipp/print").

3.3 Exceptions

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

3.4 Out of Scope

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

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

3.5 Design Requirements

The design requirements for this IPP System Service specification are:

1. Follow the naming conventions defined in IPP/1.1: Model and Semantics [RFC8011], including keyword value case (lower) and hyphenation requirements.
2. Define objects, attribute groups, attributes, and values to support the System object, Resource object, and System Service.
3. Define operations to support the System Service and the use cases defined in section 3.2, and
4. [Register all new IPP attributes, attribute groups, objects, operations, status codes, and values with IANA.](#)

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4. IPP Object Model

This specification extends the original IPP Model defined in section 2 of IETF IPP/1.1 Model and Semantics [RFC8011] from the original print service scope to include all Imaging Services on a managed Imaging System.

4.1 System Object

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

Deleted: object

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

Note: Since Systems are typically long-lived objects, System Owners are mutable (i.e., System Description attributes).

4.2 Subunit Object

This specification identifies a component object called a “Subunit” that is an IPP binding of the Subunit object defined in PWG MFD Model and Common Semantics [PWG5801.01] and is based on the Subunit (hardware or software component) defined in IETF Printer MIB v2 [RFC3805]. This specification does not define any explicit System object attributes to refer to Subunit objects. Instead, existing IPP Printer object attributes (e.g., “printer-input-tray” defined in [PWG5100.13]) can be used to convey information about Subunit objects.

Deleted:

4.3 Printer Object

This specification extends the original IPP Printer object defined in IETF IPP/1.1 Model and Semantics [RFC8011] to represent any Imaging Service (print, scan, etc.), in order to reuse existing IPP Printer operations and attributes in the individual Imaging Services, but NOT directly in this specification.

Note: Since Printers are typically long-lived objects, Printer Owners are mutable (i.e., Printer Description attributes).

4.4 Job Object

This specification extends the original IPP Job object defined in IETF IPP/1.1 Model and Semantics [RFC8011] to represent a Job on any Imaging Service (Print, Scan, etc.), in order to reuse existing IPP Job operations and attributes in the individual Imaging Services, but NOT directly in this specification.

660 Note: Since Jobs are typically short-lived objects, Job Owners are immutable (i.e., Job
661 Status attributes).

Commented [MS2]: DISCUSS (see job-owner-col in section 7.4.1)

662 4.5 Document Object

663 This specification extends the original IPP Document object defined in IETF IPP/1.1 Model
664 and Semantics [RFC8011] to represent a Document contained in a Job on any Imaging
665 Service (Print, Scan, etc.), in order to reuse existing IPP Document operations and attributes
666 in the individual Imaging Services, but NOT directly in this specification.

667 4.6 Resource Object

668 This specification extends the original Resource object defined in PWG Network Resource
669 Service [PWG5108.03], in order to incorporate Resource operations directly into the IPP
670 System Service. Resources are managed by the System and each Resource has a system-
671 wide unique status attribute “resource-id”. Resources are persistent until they are explicitly
672 canceled by an Administrator or aborted by the System.

673 Resources have an allocation scope of System, Printer, or Job. Throughout this
674 specification, the phrases “[System|Printer|Job]-scope Resource” and “per-
675 [System|Printer|Job] Resource” are used to specify the usage of Resources.

676 Creation of a new Resource is supported via the Create-Resource operation and “resource-
677 use-count” will be set to zero. Upload of Resource data is supported via the Send-Resource-
678 Data operation. Installation of a Resource (for subsequent use) is supported via the Install-
679 Resource operation. For a System-scope Resource, “resource-use-count” will be set to one
680 after the Resource is successfully installed. For a Printer-scope or Job-scope Resource,
681 “resource-use-count” will be incremented by one each time that the Resource is allocated to
682 a Printer or a Job, e.g., via Allocate-Printer-Resource or a Job Creation operation that
683 includes a “resource-ids” operation attribute. When an allocated Resource is busy at the
684 time of a Cancel-Resource request, ‘cancel-requested’ will be added to the “resource-state-
685 reasons” and the Resource will not transition to a “resource-state” of ‘canceled’ until the
686 allocated Resource is no longer busy, as indicated by a “resource-use-count” value of zero.

687 See Figure 2 in section 7.8.8 for a diagram of normal Resource state transitions. Resources
688 in this specification do not have leases and expiration times, as they formerly did in the
689 original Resource object defined in [PWG5108.03].

Deleted: resource-state

690 IPP System Service implementations SHOULD support System-scope executable
691 resources (e.g., for firmware update). System Service implementations MAY support Printer-
692 scope and/or Job-scope executable resources in an implementation-defined manner.

693 Note: Since Resources are typically long-lived objects, Resource Owners are mutable (i.e.,
694 Resource Description attributes).

696 4.6.1 Resource History

697 The System MUST support an implementation-defined Resource History phase of at least
698 300 seconds, to preserve the integrity of system log files. The System SHOULD “age” out
699 (i.e., delete) Resource objects with “resource-state” of ‘canceled’ or ‘aborted’ from the
700 Resource History when they have exceeded the implementation-defined Resource History
701 period. This is analogous to the handling of Job objects in a terminal state as discussed in
702 the section “Partitioning of Job States” in [RFC8011]. However, unlike Job objects, the
703 Resource object associated data referenced by “resource-data-uri” SHOULD be discarded
704 as soon as the Resource transitions to the ‘canceled’ or ‘aborted’ terminal state (instead of
705 at the end of the Resource History phase).

706 4.7 Subscription Object

707 This specification extends the original IPP Subscription object defined in IPP Event
708 Notifications and Subscriptions [RFC3995] to allow subscriptions to the IPP System object
709 [and its Resource objects](#) for event notifications.

710 Note: Since Subscriptions are typically short-lived objects, Subscription Owners are
711 immutable (i.e., Subscription Status attributes).

Commented [MS3]: DISCUSS: We have not yet defined a notify-owner-col Subscription Status attribute. Similar to the job-owner-col discussion, what would this new owner-col be for?

5. IPP Objects and Operations Summary

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

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

This specification defines additional attributes for the Printer and Job objects [RFC8011].

Note: All tables in this section list only top-level attributes. Collection member attributes are not listed here and are described in detail in section 7 IPP Attributes below their enclosing collection attributes.

5.1 System Attribute Group

This document defines the system-attributes-tag (0x0A) for a System attribute group.

5.2 System Description Attributes

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

Note: An SM/IPP Equivalent entry of “<none>” indicates that there is no previously defined equivalent attribute and the attribute is defined for the first time in this specification.

Table 1 – IPP System Description Attributes

Conformance	IPP Attribute Name	SM/IPP Equivalent	Reference
REQUIRED	charset-configured	CharsetConfigured[1]	[PWG5108.06]
REQUIRED	charset-supported	CharsetSupported[1]	[PWG5108.06]
REQUIRED	document-format-supported	document-format-supported	[RFC8011]
REQUIRED	generated-natural-language-supported	NaturalLanguageSupported[1]	[PWG5108.06]
REQUIRED	ipp-features-supported	ipp-features-supported	[PWG5100.13]
REQUIRED	ipp-versions-supported	VersionsSupported[1]	[PWG5108.06]
REQUIRED	multiple-document-printers-supported	multiple-document-jobs-supported	[RFC8011]
REQUIRED	natural-language-configured	NaturalLanguageConfigured[1]	[PWG5108.06]
REQUIRED	operations-supported	OperationsSupported[1]	[PWG5108.06]
OPTIONAL	power-calendar-policy-col	PowerCalendar	[PWG5108.06]
OPTIONAL	power-event-policy-col	PowerEvent	[PWG5108.06]
RECOMMENDED	power-timeout-policy-col	PowerTimeout[3]	[PWG5108.06]
REQUIRED	printer-creation-attributes-supported	job-creation-attributes-supported [8]	[PWG5100.11]
REQUIRED	printer-service-type-supported	ServiceType	[PWG5108.06]
REQUIRED	resource-format-supported	document-format-supported [10]	[RFC8011]
REQUIRED	resource-type-supported	document-format-supported [11]	[RFC8011]
REQUIRED	resource-settable-attributes-supported	job-settable-attributes-supported [7]	[RFC3380]
REQUIRED	system-current-time	CurrentTime[2]	[PWG5108.06]
REQUIRED	system-default-printer-id	<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]
REQUIRED	system-mandatory-printer-attributes	printer-mandatory-job-attributes [9]	[PWG5100.13]
OPTIONAL	system-message-from-operator	MessageFromOperator	[PWG5108.06]
REQUIRED	system-name	SystemName[2]	[PWG5108.06]
REQUIRED	system-owner-col	OwnerUri, OwnerVCard[4]	[PWG5108.06]
REQUIRED	system-settable-attributes-supported	printer-settable-attributes-supported [6]	[RFC3380]
REQUIRED	system-xri-supported	XriSupported	[PWG5108.06]

732

733 Notes:

- 734 1. REQUIRED for a Printer per IETF IPP/1.1 Model and Semantics [RFC8011].
735 2. REQUIRED for a Printer per PWG IPP Everywhere [PWG5100.14].
736 3. REQUIRED or RECOMMENDED for a System per PWG Power Management
737 Model [PWG5106.4].
738 4. REQUIRED for all Systems since they MUST support the Set-System-Attributes
739 operation – also “owner-uri” and “owner-vcid” MUST be updated
740 simultaneously if specified in a Set-System-Attributes operation (to preserve
741 consistency).
742 5. REQUIRED for a System to support the Get-Printer-Attributes operation which
743 can use the implementation-defined or administratively-configured “default”
744 Printer object as a target.
745 6. REQUIRED for System support of the REQUIRED Set-System-Attributes
746 operation and semantically analogous to the “printer-settable-attributes-
747 supported” Printer Description attribute defined in Internet Printing Protocol
748 (IPP): Job and Printer Set Operations [RFC3380].
749 7. REQUIRED for System support of the REQUIRED Set-Resource-Attributes
750 operation and semantically analogous to the “job-settable-attributes-supported”
751 Job Description attribute defined in Internet Printing Protocol (IPP): Job and
752 Printer Set Operations [RFC3380].
753 8. REQUIRED for System support of the REQUIRED Create-Printer operation and
754 semantically analogous to the “job-creation-attributes-supported” Printer
755 Description attribute defined in Internet Printing Protocol (IPP): Job and Printer
756 Extensions – Set 2 [PWG5100.11].
757 9. REQUIRED for System support of the REQUIRED Create-Printer operation and
758 semantically analogous to the “printer-mandatory-job-attributes” Printer
759 Description attribute defined in IPP: Job and Printer Extensions – Set
760 3[PWG5100.13].
761 10. REQUIRED for System support of the REQUIRED Send-Resource-Data
762 operation and semantically analogous to the “document-format-supported”
763 Printer Description attribute defined in [RFC8011].
764 11. REQUIRED for System support of the REQUIRED Create-Resource operation
765 and semantically analogous to the “document-format-supported” Printer
766 Description attribute defined in [RFC8011].

767 **5.3 System Status Attributes**

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

771 Note: An SM/IPP Equivalent entry of “<none>” indicates that there is no previously defined
772 equivalent attribute and the attribute is defined for the first time in this specification.

Table 2 – IPP System Status Attributes

Conformance	IPP Attribute Name	SM/IPP Equivalent	Reference
RECOMMENDED	power-log-col	PowerLog[3]	[PWG5108.06]
OPTIONAL	power-state-capabilities-col	PowerSupport	[PWG5108.06]
OPTIONAL	power-state-counters-col	PowerCounters	[PWG5108.06]
RECOMMENDED	power-state-monitor-col	PowerMonitor[3]	[PWG5108.06]
OPTIONAL	power-state-transitions-col	PowerTransition	[PWG5108.06]
REQUIRED	system-config-change-date-time	printer-config-change-date-time [8]	[PWG5100.13]
REQUIRED	system-config-change-time	printer-config-change-time [8]	[PWG5100.13]
REQUIRED	system-config-changes	SystemConfigChangeNumber[5]	[PWG5108.06]
REQUIRED	system-configured-printers	ConfiguredServices	[PWG5108.06]
REQUIRED	system-configured-resources	ConfiguredResources	[PWG5108.06]
RECOMMENDED	system-impressions-completed	SystemTotals	[PWG5108.06]
RECOMMENDED	system-impressions-completed-col	SystemTotals	[PWG5108.06]
RECOMMENDED	system-media-sheets-completed	SystemTotals	[PWG5108.06]
RECOMMENDED	system-media-sheets-completed-col	SystemTotals	[PWG5108.06]
RECOMMENDED	system-pages-completed	SystemTotals	[PWG5108.06]
RECOMMENDED	system-pages-completed-col	SystemTotals	[PWG5108.06]
OPTIONAL	system-serial-number	SerialNumber[5]	[PWG5108.06]
REQUIRED	system-state	State[1]	[PWG5108.06]
REQUIRED	system-state-change-date-time	printer-state-change-date-time [8]	[RFC3995]
REQUIRED	system-state-change-time	printer-state-change-time [8]	[RFC3995]
REQUIRED	system-state-message	StateMessages[2]	[PWG5108.06]
REQUIRED	system-state-reasons	StateReasons[2]	[PWG5108.06]
RECOMMENDED	system-strings-languages-supported	printer-strings-languages-supported[9]	[PWG5100.13]
RECOMMENDED	system-strings-uri	printer-strings-uri[9]	[PWG5100.13]
REQUIRED	system-up-time	UpTime[2]	[PWG5108.06]
REQUIRED	system-uuid	ServiceUuid[2] [7]	[PWG5108.01]

Deleted: RECOMMENDED

... [1]

Notes:

1. REQUIRED for a Printer per IETF IPP/1.1 Model and Semantics [RFC8011].
2. REQUIRED for a Printer per PWG IPP Everywhere [PWG5100.14].
3. REQUIRED or RECOMMENDED for a System per PWG Power Management Model [PWG5106.4] – Power General, Meters, and Monitor groups have been combined into the “power-state-monitor-col” System attribute.
4. Summary of SystemConfiguration group (subunits) – similar to ConfiguredServices in [PWG5108.06].
5. REQUIRED for a Printer per IETF Printer MIB v2 [RFC3805].
6. REQUIRED for a System per PWG Imaging System Counters [PWG5106.1].
7. The System object “system-uuid” attribute identifies the System Service and is semantically analogous to the Printer object “printer-uuid” defined in IPP Job and

Printer Extensions – Set 3 (JPS3) [PWG5100.13] that identifies a specific Imaging Service (e.g., Print, Scan, FaxOut, etc.).

8. The System object “system-config-change-[date-time|time]” and “system-state-change-[date-time|time]” attributes are necessary to support System event notifications per IPP: Events Notifications and Subscriptions [RFC3995] and are semantically analogous to the Printer object “printer-config-change-[date-time|time]” attributes defined in [PWG5100.13] and “printer-state-change-[date-time|time]” attributes defined in [RFC3995].

9. The System object “system-strings-languages-supported” and “system-strings-uri” attributes are necessary to support Client-side localizations and are semantically analogous to the Printer object “printer-strings-languages-supported” and “printer-strings-uri” attributes defined in IPP Job and Printer Extensions – Set 3 (JPS3) [PWG5100.13].

5.4 System Operations

The operations for an IPP System Service conforming to this specification are listed in Table 3. All of these operations are REQUIRED except for Register-Output-Device which is CONDITIONALLY REQUIRED for Systems that implement IPP Shared Infrastructure Extensions [PWG5100.18]

Note: An SM/IPP/DPA[ISO10175-3] Equivalent entry of “<none>” indicates that there is no previously defined equivalent operation and the operation is defined for the first time in this specification.

Table 3 – IPP System Service Operations

Code	IPP Operation Name	SM/IPP/DPA Equivalent	Reference
0x004B	Allocate-Printer-Resources	<none>	<none>
0x0052	Cancel-Resource	DeleteResource	[PWG5108.03]
0x001B	Cancel-Subscription	Cancel-Subscription[8]	[RFC3995]
0x004C	Create-Printer	Create[5]	[ISO10175-3]
0x0053	Create-Resource	StoreResource[3]	[PWG5108.03]
0x0057	Create-Resource-Subscriptions	Create-Printer-Subscriptions[8]	[RFC3995]
0x0058	Create-System-Subscriptions	Create-Printer-Subscriptions [8]	[RFC3995]
0x004D	Deallocate-Printer-Resources	<none>	<none>
0x004E	Delete-Printer	DeleteService	[PWG5108.06]
0x0059	Disable-All-Printers	DisableAllServices[2]	[PWG5108.06]
0x005A	Enable-All-Printers	EnableAllServices[2]	[PWG5108.06]
0x001C	Get-Notifications	Get-Notifications[8]	[RFC3996]
0x004F	Get-Printers	ListAllServices	[PWG5108.06]
0x000B	Get-Printer-Attributes	Get-Printer-Attributes	[RFC8011]
0x0065	Get-Printer-Resources	<none>[10]	<none>
0x0020	Get-Resources	ListResources	[PWG5108.03]
0x001E	Get-Resource-Attributes	GetResourceElements	[PWG5108.03]
0x0019	Get-Subscriptions	Get-Subscriptions [8]	[RFC3995]

0x0018	Get-Subscription-Attributes	Get-Subscription-Attributes [8]	[RFC3995]
0x005B	Get-System-Attributes	GetSystemElements	[PWG5108.06]
0x005C	Get-System-Supported-Values	Get-Printer-Supported-Values [7]	[RFC3380]
0x0054	Install-Resource	StoreResource [3][4]	[PWG5108.03]
0x005D	Pause-All-Printers	PauseAllServices	[PWG5108.06]
0x005E	Pause-All-Printers-After-Current-Job	PauseAllServicesAfterCurrentJob [1]	[PWG5108.06]
0x005F	Register-Output-Device	RegisterSystem [6]	[PWG5109.1]
0x001A	Renew-Subscription	Renew-Subscription [8]	[RFC3995]
0x0060	Restart-System	Restart-Printer [9]	[RFC3998]
0x0061	Resume-All-Printers	ResumeAllServices	[PWG5108.06]
0x0055	Send-Resource-Data	StoreResource [3]	[PWG5108.03]
0x0056	Set-Resource-Attributes	SetResourceElements	[PWG5108.03]
0x0062	Set-System-Attributes	SetSystemElements	[PWG5108.06]
0x0063	Shutdown-All-Printers	ShutdownAllServices	[PWG5108.06]
0x0050	Shutdown-One-Printer	ShutdownService	[PWG5108.06]
0x0064	Startup-All-Printers	StartupAllServices	[PWG5108.06]
0x0051	Startup-One-Printer	StartupService	[PWG5108.06]

810 Notes:

- 811 1. Pause-All-Printers-After-Current-Job is a useful operation for graceful stopping
812 of all Printers (Imaging Services) on an Imaging System, but it can be an
813 arbitrarily long duration operation.
- 814 2. [Enable/Disable]-Printer and [Pause/Resume]-Printer are intentionally left out of
815 this specification – they should be directed to the specific Imaging Service that is
816 enumerated in the “system-configured-printers” attribute defined in section 5.x
817 above.
- 818 3. Create-Resource, Send-Resource-Data, and Install-Resource are intentionally
819 decomposed from the original ambiguously scoped StoreResource operation
820 specified in PWG Resource Service [PWG5108.03]. Create-Resource is
821 semantically equivalent to Create (for a Resource object) defined in ISO
822 Document Printing Application (DPA) Part 3: Management Abstract Service
823 Definition and Procedures [ISO10175-3] where a newly created Resource object
824 has the special initial state of ‘unknown’ (which is NOT defined or used in this
825 specification).
- 826 4. Install-Resource is used to install (for subsequent use) a Resource for use after
827 Create-Resource (metadata) and Send-Resource-Data (upload data) have
828 completed.
- 829 5. Create-Printer is semantically equivalent to Create (for a Printer object) defined
830 in ISO Document Printing Application (DPA) Part 3: Management Abstract
831 Service Definition and Procedures [ISO10175-3] (where a newly created Printer
832 object had the special initial state of ‘unknown’, which is NOT defined or used in
833 this specification).
- 834 6. Register-Output-Device is semantically equivalent to RegisterSystem defined in
835 PWG Cloud Imaging Model [PWG5109.1] with the difference that the System
836 itself is not registered, but rather the associated Output Devices are registered.

Register-Output-Device is CONDITIONALLY REQUIRED for Systems that implement IPP Shared Infrastructure Extensions [PWG5100.18].

7. Get-System-Supported-Values is semantically equivalent to Get-Printer-Supported-Values in IPP: Job and Printer Set Operations [RFC3380] and is necessary for support of the REQUIRED Set-System-Attributes operation.
8. REQUIRED for a System and/or Resource and analogous to the operations defined in IPP: Event Notifications and Subscriptions [RFC3995] and IPP: The 'ippget' Delivery Method for Event Notifications [RFC3996]. Cancel-Subscription, Get-Notifications, Get-Subscription-Attributes, Get-Subscriptions, and Renew-Subscription (all defined in [RFC3995]) are extended by this specification for use with the IPP System Service.
9. REQUIRED for a System and analogous to the Restart-Printer operation defined in IPP: Job and Printer Administrative Operations [RFC3998].
10. REQUIRED for a Printer and analogous to Get-Resources operation defined in this specification.

5.5 Resource Attribute Group

This document defines the resource-attributes-tag (0x08) for a Resource attribute group.

5.6 Resource Description Attributes

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

Note: An SM/IPP Equivalent entry of “<none>” indicates that there is no previously defined equivalent attribute and the attribute is defined for the first time in this specification.

Note: Printer-scope Resource objects MAY be:

1. Created **before** the related Create-Printer operation and then associated with a given Printer using a Create-Printer operation via the “resource-ids” operation attribute to update the “printer-resource-ids” Printer Status attribute;
2. Created **after** the related Create-Printer operation and then associated with a given Printer using an Allocate-Printer-Resources operation via the “resource-ids” operation attribute to update the “printer-resource-ids” Printer Status attribute; or
3. Created **after** the related Create-Printer operation and then associated with a given Printer using an HTTP PUT request [RFC7230] as defined in section 4.1.9 Resources of IPP Shared Infrastructure Extensions [PWG5100.18] to update the “printer-resource-ids” Printer Status attribute.

Note: Job-scope Resource objects MUST be created **before** the Job creation operation and then associated with a given Job via the “resource-ids” Job creation operation attribute to update the “job-resource-ids” Job Status attribute.

Table 4 – IPP Resource Description Attributes

Conformance	IPP Attribute Name	SM/IPP Equivalent	Reference
REQUIRED	resource-info	ResourceInfo	[PWG5108.03]
REQUIRED	resource-name	ResourceName	[PWG5108.03]
REQUIRED	resource-owner-col	OwnerUri, OwnerVCard[1]	[PWG5108.06]

Commented [MS4]: DISCUSS: Why READ-WRITE, required

Notes:

1. REQUIRED for a Resource by analogy to “system-owner-col” in System since all Systems MUST support the Set-Resource-Attributes operation to conform to this IPP System Service specification – also “owner-uri” and “owner-vcard” MUST be updated simultaneously if specified in a Set-Resource-Attributes operation (to preserve consistency).

5.7 Resource Status Attributes

The READ-ONLY attributes in the IPP Resource Status group are listed in Table 5. These attributes are inherently READ-ONLY and can only be modified indirectly as a side effect of one or more IPP System Service operations, but NOT by a Set-Resource-Attributes operation. See Figure 2 in section 7.8.8 resource-state for a diagram of normal Resource state transitions.

Note: An SM/IPP Equivalent entry of “<none>” indicates that there is no previously defined equivalent attribute and the attribute is defined for the first time in this specification.

Table 5 – IPP Resource Status Attributes

Conformance	IPP Attribute Name	SM/IPP Equivalent	Reference
REQUIRED	date-time-at-canceled	date-time-at-completed [1]	[RFC8011]
REQUIRED	date-time-at-creation	date-time-at-creation [1]	[RFC8011]
REQUIRED	date-time-at-installed	date-time-at-processing [1][6]	[RFC8011]
REQUIRED	resource-data-uri	<none>	<none>
REQUIRED	resource-format	ResourceFormat	[PWG5108.03]
REQUIRED	resource-id	ResourceId[4]	[PWG5108.03]
REQUIRED	resource-k-octets	job-k-octets[2][5]	[RFC8011]
REQUIRED	resource-state	job-state[2]	[RFC8011]
REQUIRED	resource-state-reasons	job-state-reasons[2]	[RFC8011]
REQUIRED	resource-string-version	XxxStringVersion[7]	[PWG5110.1]
REQUIRED	resource-type	ResourceType	[PWG5108.03]
REQUIRED	resource-use-count	<none>	<none>
REQUIRED	resource-uuid	job-uuid[3]	[PWG5100.13]
REQUIRED	resource-version	XxxVersion[7]	[PWG5110.1]
REQUIRED	time-at-canceled	time-at-completed[2]	[RFC8011]
REQUIRED	time-at-creation	time-at-creation[2]	[RFC8011]
REQUIRED	time-at-installed	time-at-processing [2][6]	[RFC8011]

Notes:

1. REQUIRED for a Resource by analogy to PWG Network Resource Service Semantic Model and Service Interface [PWG5108.03] and “date-time-at-completed” “date-time-at-creation”, and “date-time-at-processing” Job attributes defined in IETF IPP/1.1 Model and Semantics [RFC8011].
2. REQUIRED for a Resource by analogy to “job-state”, “job-state-reasons”, “time-at-completed” “time-at-creation”, and “time-at-processing” Job attributes defined in IETF IPP/1.1 Model and Semantics [RFC8011].
3. REQUIRED for a Resource by analogy to “job-uuid” Job attribute defined in PWG IPP: Job and Printer Extensions – Set 3 (JPS3) [PWG5100.13].
4. REQUIRED for a Resource by analogy to PWG Network Resource Service Semantic Model and Service Interface [PWG5108.03] and Job in IETF IPP/1.1 Model and Semantics [RFC8011]. See section 7.6 of this specification for details of the “resource-id” attribute which MUST be monotonically increasing (as is “job-id”) to avoid re-use of “resource-id” values and resulting ambiguity in log files.
5. REQUIRED for a Resource by analogy to a “job-k-octets” Job attribute defined in IETF IPP/1.1 Model and Semantics [RFC8011].
6. REQUIRED for a Resource by analogy to “date-time-at-processing” and “time-at-processing” Job attributes defined in [RFC8011] and set by System during an Install-Resource operation.
7. REQUIRED for a Resource by analogy to the functionally equivalent [Firmware|ResidentApplication|UserApplication]StringVersion and [Firmware|ResidentApplication|UserApplication]Version elements defined in PWG Hardcopy Device Health Assessment Attributes [PWG5110.1] and PWG Hardcopy Device Health Assessment Trusted Network Connect Binding [PWG5110.4].

5.8 Printer Description Attributes

Additional potentially READ-WRITE attributes in the IPP Printer Description group are listed in Table 6.

Note: An SM/IPP Equivalent entry of “<none>” indicates that there is no previously defined equivalent attribute and the attribute is defined for the first time in this specification.

Table 6 – IPP Printer Description Attributes

Conformance	IPP Attribute Name	SM/IPP Equivalent	Reference
REQUIRED	printer-owner-col	OwnerUri, OwnerVCard[1]	[PWG5108.06]

Commented [MS5]: DISCUSS: Why READ-WRITE, required?

Notes:

1. REQUIRED for a Printer by analogy to “system-owner-col” in System since all Systems MUST support the Set-Printer-Attributes operation to conform to this IPP System Service specification – also “owner-uri” and “owner-vcard” MUST be

929 updated simultaneously if specified in a Set-Printer-Attributes operation (to
930 preserve consistency).

931 5.9 Printer Status Attributes

932 Additional READ-ONLY attributes in the IPP Printer Status group are listed in Table 7.

933 Note: An SM/IPP Equivalent entry of “<none>” indicates that there is no previously defined
934 equivalent attribute and the attribute is defined for the first time in this specification.

935 **Table 7 – IPP Printer Status Attributes**

Conformance	IPP Attribute Name	SM/IPP Equivalent	Reference
REQUIRED	printer-config-changes	ConfigChanges[1]	[PWG5106.1]
REQUIRED	printer-id	ID[2]	[PWG5108.06]
RECOMMENDED	printer-impressions-completed	PrintServiceCounters	[PWG5108.01]
RECOMMENDED	printer-impressions-completed-col	PrintServiceCounters	[PWG5108.01]
RECOMMENDED	printer-media-sheets-completed	PrintServiceCounters	[PWG5108.01]
RECOMMENDED	printer-media-sheets-completed-col	PrintServiceCounters	[PWG5108.01]
RECOMMENDED	printer-pages-completed	PrintServiceCounters	[PWG5108.01]
RECOMMENDED	printer-pages-completed-col	PrintServiceCounters	[PWG5108.01]
REQUIRED	printer-resource-ids	<none>[4]	<none>
REQUIRED	printer-service-type	ServiceType[3]	[PWG5108.06]

936 Notes:

- 937 1. REQUIRED for all Printers and semantically equivalent to the Monitoring
938 element ConfigChanges defined in [PWG5106.1] and semantically equivalent to
939 “prtGeneralConfigChanges” in IETF Printer MIB v2 [RFC3805].
- 940 2. REQUIRED for all Printers and semantically equivalent to the ServiceSummary
941 element ID defined in [PWG5108.06] and semantically analogous to the “job-id”
942 attribute defined in [RFC2911].
- 943 3. REQUIRED for all Printers and semantically equivalent to the ServiceSummary
944 element ServiceType defined in [PWG5108.06].
- 945 4. REQUIRED for all Printers since all Systems MUST support the assignment of
946 requested Printer-scope Resources via the “resource-ids” Create-Printer
947 operation attribute to conform to this IPP System Service specification.
948

5.10 Job Status Attributes

Additional READ--ONLY attributes in the IPP Job Status group are listed in Table 8.

Note: An SM/IPP Equivalent entry of “<none>” indicates that there is no previously defined equivalent attribute and the attribute is defined for the first time in this specification.

Table 8 – IPP Job Status Attributes

Conformance	IPP Attribute Name	SM/IPP Equivalent	Reference
REQUIRED	job-owner-col	OwnerUri, OwnerVCard[1]	[PWG5108.06]
REQUIRED	job-resource-ids	<none>[2]	<none>

Commented [MS6]: DISCUSS Why READ-ONLY, needed?, required?

Notes:

1. REQUIRED for a Job by analogy to “system-owner-col” in System since all Systems MUST support the Set-Job-Attributes operation to conform to this IPP System Service specification – also “owner-uri” and “owner-vcard” MUST be updated simultaneously if specified in a Set-Job-Attributes operation (to preserve consistency all Systems since they MUST support the “requesting-user-vcard” Job Creation operation attribute to conform to this IPP System Service specification.
2. REQUIRED for all Jobs since all Systems MUST support the assignment of requested Job-scope Resources via the “resource-ids” Job Creation operation attribute to conform to this IPP System Service specification.

6. IPP Operations

IPP System Service implementations MUST support Client authentication and Client authorization based on System policy. Except for Get-Printer-Attributes, all System Service operations MAY require Client authentication based on System policy. All IPP Clients MUST support HTTP Basic authentication and SHOULD support HTTP Digest authentication per [RFC8011].

Note: Get-Printer-Attributes does not require Client authentication for backwards compatibility with existing Clients.

Note: All IPP System Service operation requests and responses use standard operation parameters as defined in [RFC8011] and encoded in [RFC8010].

6.1 Printer Operations

IPP System Service operations on single Printer objects (except for Get-Printers) are defined in this section.

979 Note: The System MUST copy the value of any supplied "printer-message-from-operator"
980 operation attribute to any affected Printer objects (for Create-Printer, Shutdown-One-Printer,
981 and Startup-One-Printer).

982 **6.1.1 Allocate-Printer-Resources**

983 This REQUIRED operation allows an authorized Operator or Administrator to allocate
984 Resources to an existing Printer object on the target System object and update "resource-
985 use-count" in each Resource. If the Printer object is already shutdown, with 'shutdown' in
986 the "printer-state-reasons", then the System MUST return a "status-code" of 'client-error-
987 forbidden'.

988 **6.1.1.1 Allocate-Printer-Resources Request**

989 The following groups of attributes are part of an Allocate-Printer-Resources request.

990 Group 1: Operation Attributes

991 "attributes-charset" (charset) and
992 "attributes-natural-language" (naturalLanguage):

993 The Client MUST supply and the System MUST support both of these
994 attributes.

995 "system-uri" (uri):

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

998 "printer-id" (integer(1:65535)):

999 The Client MUST supply and the System MUST support this operation
1000 attribute which is the target Printer for the operation.

1001 "requesting-user-name" (name(MAX)) and
1002 "requesting-user-uri" (uri) and
1003 "requesting-user-vcard" (1setOf text(MAX)):

1004 The Client SHOULD supply and the System MUST support all three of these
1005 attributes.

1006 "resource-ids" (1setOf integer(1:MAX)):

1007 The Client MUST supply and the System MUST support this attribute.

1008 **6.1.1.2 Allocate-Printer-Resources Response**

1009 The following groups of attributes are part of an Allocate-Printer-Resources response.

1010 Group 1: Operation Attributes

1011 "attributes-charset" (charset) and
1012 "attributes-natural-language" (naturalLanguage):

1013 The System MUST return both of these attributes.

1014 "status-message" (text(255)) and/or
1015 "detailed-status-message" (text(MAX)):

1016 The System MAY return one or both of these attributes.

1017 Group 2: Unsupported Attributes

1018 See [RFC8011] for details on returning Unsupported Attributes.

1019 Group 3: Printer Attributes

1020 See [RFC8011] for details on returning Printer Attributes.

1021 "printer-id" (integer(1:65535)):

1022 The System MUST return this attribute.

1023 "printer-resource-ids" (1setOf integer(1:MAX)):

1024 The System MUST return this attribute, which contains the complete list of
1025 Resources currently allocated to this Printer (including all of the valid ones
1026 listed in the request attribute "resource-ids").

1027 **6.1.2 Deallocate-Printer-Resources**

1028 This REQUIRED operation allows an authorized Operator or Administrator to deallocate
1029 Resources from an existing Printer object on the target System object and update "resource-
1030 use-count" in each Resource. If the Printer object is already shutdown, with 'shutdown' in
1031 the "printer-state-reasons", then the System MUST return a "status-code" of 'client-error-
1032 forbidden'.

1033 **6.1.2.1 Deallocate-Printer-Resources Request**

1034 The following groups of attributes are part of a Deallocate-Printer-Resources request.

1035 Group 1: Operation Attributes

1036 "attributes-charset" (charset) and
1037 "attributes-natural-language" (naturalLanguage):

- 1038 The Client MUST supply and the System MUST support both of these
1039 attributes.
- 1040 “system-uri” (uri):
- 1041 The Client MUST supply and the System MUST support the “system-uri”
1042 operation attribute which is the target System for the operation.
- 1043 “printer-id” (integer(1:65535)):
- 1044 The Client MUST supply and the System MUST support this operation
1045 attribute which is the target Printer for the operation.
- 1046 “requesting-user-name” (name(MAX)) and
1047 “requesting-user-uri” (uri) and
1048 “requesting-user-vcard” (1setOf text(MAX)):
- 1049 The Client SHOULD supply and the System MUST support all three of these
1050 attributes.
- 1051 “resource-ids” (1setOf integer(1:MAX)):
- 1052 The Client MUST supply and the System MUST support this attribute.
- 1053 **6.1.2.2 Deallocate-Printer-Resources Response**
- 1054 The following groups of attributes are part of a Deallocate-Printer-Resources response.
- 1055 Group 1: Operation Attributes
- 1056 “attributes-charset” (charset) and
1057 “attributes-natural-language” (naturalLanguage):
- 1058 The System MUST return both of these attributes.
- 1059 “status-message” (text(255)) and/or
1060 “detailed-status-message” (text(MAX)):
- 1061 The System MAY return one or both of these attributes.
- 1062 Group 2: Unsupported Attributes
- 1063 See [RFC8011] for details on returning Unsupported Attributes.
- 1064 Groups 3: Printer Attributes
- 1065 See [RFC8011] for details on returning Printer Attributes.
- 1066 “printer-id” (integer(1:65535)):

1067 The System MUST return this attribute.

1068 “printer-resource-ids” (1setOf integer(1:MAX)):

1069 The System MUST return this attribute, which contains the complete list of
1070 remaining Resources currently allocated to this Printer (after removing all of
1071 the valid ones listed in the request attribute “resource-ids”).

1072 6.1.3 Delete-Printer

1073 This REQUIRED operation allows an authorized Operator or Administrator to delete entirely
1074 one configured Printer object (i.e., Job processing service) on the target System object. If
1075 the Printer object is not already shutdown, with ‘shutdown’ in the “printer-state-reasons”,
1076 then the System MUST return a “status-code” of ‘client-error-forbidden’.

1077 This operation is semantically equivalent to the DeleteService operation defined in
1078 [PWG5108.06]. The Printer object and all associated Jobs will be removed entirely. The
1079 Printer object cannot be subsequently started up with a Startup-One-Printer operation.

1080 If accepted, the System MUST shutdown the specified Printer with the “printer-state” set to
1081 ‘stopped’ (i.e., no Jobs can be processed and intervention is required) and the ‘shutdown’
1082 value added to “printer-state-reasons”. This operation MAY change the state of the System
1083 itself to ‘stopped’ (if there are no other configured Printers or all other Printers already had
1084 a “printer-state” of ‘stopped’).

1085 6.1.3.1 Delete-Printer Request

1086 The following groups of attributes are part of a Delete-Printer request.

1087 Group 1: Operation Attributes

1088 “attributes-charset” (charset) and
1089 “attributes-natural-language” (naturalLanguage):

1090 The Client MUST supply and the System MUST support both of these
1091 attributes.

1092 “system-uri” (uri):

1093 The Client MUST supply and the System MUST support the “system-uri”
1094 operation attribute which is the target System for the operation.

1095 “printer-id” (integer(1:65535)):

1096 The Client MUST supply and the System MUST support this operation
1097 attribute which is the target Printer for the operation.

1098 "requesting-user-name" (name(MAX)) and
1099 "requesting-user-uri" (uri) and
1100 "requesting-user-vcard" (1setOf text(MAX)):

1101 The Client SHOULD supply and the System MUST support all three of these
1102 attributes.

1103 6.1.3.2 Delete-Printer Response

1104 The following groups of attributes are part of a Delete-Printer response.

1105 Group 1: Operation Attributes

1106 "attributes-charset" (charset) and
1107 "attributes-natural-language" (naturalLanguage):

1108 The System MUST return both of these attributes.

1109 "status-message" (text(255)) and/or
1110 "detailed-status-message" (text(MAX)):

1111 The System MAY return one or both of these attributes.

1112 Group 2: Unsupported Attributes

1113 See [RFC8011] for details on returning Unsupported Attributes.

1114 Groups 3: Printer Attributes

1115 See [RFC8011] for details on returning Printer Attributes.

1116 "printer-id" (integer(1:65535)):

1117 The System MUST return this attribute.

1118 "printer-uuid" (uri(45)):

1119 The System MUST return this attribute.

1120 "printer-xri-supported" (1setOf collection)

1121 The System MUST return this attribute.

1122 "printer-state" (type1 enum) and
1123 "printer-state-reasons" (1setOf type2 keyword) and
1124 "printer-is-accepting-jobs" (boolean):

1125 The System MUST return all three of these attributes.

1126 Group 4: System Attributes

1127 See [RFC8011] and [RFC3380] for details on returning analogous Printer Attributes.

1128 “system-uuid” (uri(45)):

1129 The System MUST return this attribute.

1130 “system-xri-supported” (1setOf collection)

1131 The System MUST return this attribute.

1132 “system-state” (type1 enum) and

1133 “system-state-reasons” (1setOf type2 keyword):

1134 The System MUST return both of these attributes.

1135 **6.1.4 Get-Printers**

1136 This REQUIRED operation allows an authorized User to retrieve a filtered list of some or all
1137 of the Printer objects (i.e., Job processing services) on the target System object. If no
1138 Printers match the specified filter criteria, then the System MUST return a “status-code” of
1139 'successful-ok'.

1140 This operation is semantically equivalent to the ListAllServices operation defined in
1141 [PWG5108.06]. This operation is also semantically equivalent to a sequence of Get-Printer-
1142 Attributes [RFC8011] operations to each Printer object.

1143 If accepted, the System MUST return “printer-id” and “printer-xri-supported” for each
1144 matching Printer object. The returned Printers and Printer attributes from the System MAY
1145 also be filtered based on Client access rights (i.e., the value of “requesting-user-name”) or
1146 the specified “document-format”. This operation does not change the state of any Printer or
1147 the System itself.

1148 **6.1.4.1 Get-Printers Request**

1149 The following groups of attributes are part of a Get-Printers request.

1150 Group 1: Operation Attributes

1151 “attributes-charset” (charset) and

1152 “attributes-natural-language” (naturalLanguage):

1153 The Client MUST supply and the System MUST support both of these
1154 attributes.

1155 “system-uri” (uri):

- 1156 The Client MUST supply and the System MUST support the “system-uri”
1157 operation attribute which is the target System for the operation.
- 1158 “printer-ids” (1setOf (integer(1:65535))):
- 1159 The Client MAY supply and the System MUST support the “printer-ids”
1160 operation attribute which is the list of target Printers for the operation.
- 1161 “requesting-user-name” (name(MAX)) and
1162 “requesting-user-uri” (uri) and
1163 “requesting-user-vcard” (1setOf text(MAX)):
- 1164 The Client SHOULD supply and the System MUST support all three of these
1165 attributes.
- 1166 “first-index” (integer(1:MAX)):
- 1167 The Client MAY supply and the System MUST support this attribute.
- 1168 “limit” (integer(1:MAX)):
- 1169 The Client MAY supply and the System MUST support this attribute.
- 1170 “printer-geo-location” (uri):
- 1171 The Client MAY supply and the System MUST support this attribute.
- 1172 “printer-location” (text(127)):
- 1173 The Client MAY supply and the System MUST support this attribute.
- 1174 “printer-service-type” (1setOf (type2 keyword)):
- 1175 The Client MAY supply and the System MUST support this attribute. If this
1176 operation attribute is supplied, then the System MUST return the attributes
1177 and values for the selected Printers (e.g., Printers offering ‘scan’ service).
1178 See “printer-service-type” in section 7.5 Printer Status Attributes.
- 1179 “requested-attributes” (1setOf type2 keyword):
- 1180 The Client MAY supply and the System MUST support this attribute. If this
1181 operation attribute is NOT supplied, then the System MUST only return the
1182 value of the “system-configured-printers” entry for each selected Printer. See
1183 section “system-configured-printers” in section 7.3 System Status Attributes.
- 1184 The Client SHOULD supply only and the System MUST support requests for
1185 Printer attributes that are listed as IPP Printer source attributes in the table in

1186 section 4 Definition of Attribute Types in the IETF LDAP Schema for Printer
1187 Services [RFC7612].

1188 "document-format" (mimeMediaType):

1189 The Client MAY supply and the System MUST support this attribute. If this
1190 operation attribute is supplied, then the System MUST return the attributes
1191 and values that it uses to validate a job on a create or Validate-Job operation
1192 in which this document format is supplied. The System SHOULD return only
1193 (1) those attributes that are supported for the specified format and (2) the
1194 attribute values that are supported for the specified document format.

1195 "which-printers" (type2 keyword):

1196 The Client MAY supply and the System MUST support this attribute. If this
1197 operation attribute is supplied, then the System MUST return the attributes
1198 and values for the selected printers (e.g., Printers in 'idle' state). See "which-
1199 printers" in section 7.1 Operation Attributes.

1200 6.1.4.2 Get-Printers Response

1201 The following groups of attributes are part of a Get-Printers response. The System returns
1202 a Get-Printers operation response to the Client up to the number specified by the "limit"
1203 operation attribute that match the filter criteria as supplied by the Client in the request.

1204 Group 1: Operation Attributes

1205 "attributes-charset" (charset) and
1206 "attributes-natural-language" (naturalLanguage):

1207 The System MUST return both of these attributes, unless no Printers match
1208 the filter criteria specified by the Client.

1209 "status-message" (text(255)) and/or
1210 "detailed-status-message" (text(MAX)):

1211 The System MAY return one or both of these attributes.

1212 Group 2: Unsupported Attributes

1213 See [RFC8011] for details on returning Unsupported Attributes.

1214 Groups 3 to N: Printer Attributes

1215 See [RFC8011] for details on returning Printer Attributes.

1216 "printer-id" (integer(1:65535)):

1217 The System MUST return this attribute for each Printer.

1218 “printer-uuid” (uri(45)):

1219 The System MUST return this attribute for each Printer.

1220 “printer-xri-supported” (1setOf collection):

1221 The System MUST return this attribute for each Printer.

1222 “printer-state” (type1 enum) and

1223 “printer-state-reasons” (1setOf type2 keyword) and

1224 “printer-is-accepting-jobs” (boolean):

1225 The System MUST return all three of these attributes for each Printer.

1226 **6.1.5 Get-Printer-Resources**

1227 This REQUIRED operation allows an authorized End User to retrieve a filtered list of some
1228 or all of the Resource objects allocated on the target Printer object. If no Resources match
1229 the specified filter criteria, then the Printer MUST return a “status-code” of 'successful-ok'.

1230 This operation is semantically analogous to the ListResources operation defined in
1231 [PWG5108.03]. This operation is also semantically analogous the Get-Jobs operation
1232 defined in [RFC8011].

1233 If accepted, the Printer MUST return the “resource-id” for each matching Resource object.
1234 This operation does not change the state of any Resource or the Printer itself.

1235 **6.1.5.1 Get-Printer-Resources Request**

1236 The following groups of attributes are part of a Get-Printer-Resources request.

1237 Group 1: Operation Attributes

1238 “attributes-charset” (charset) and

1239 “attributes-natural-language” (naturalLanguage):

1240 The Client MUST supply and the Printer MUST support both of these
1241 attributes.

1242 “printer-uri” (uri):

1243 The Client MUST supply and the Printer MUST support the “printer-uri”
1244 operation attribute which is the target Printer for the operation.

1245 “resource-ids (1setOf (integer(1:MAX)))”:

- 1246 The Client MAY supply and the Printer MUST support the "resource-ids"
1247 operation attribute which is the list of target Resources for the operation.
- 1248 "requesting-user-name" (name(MAX)) and
1249 "requesting-user-uri" (uri) and
1250 "requesting-user-vcard" (1setOf text(MAX)):
- 1251 The Client SHOULD supply and the Printer MUST support all three of these
1252 attributes.
- 1253 "first-index" (integer(1:MAX)):
- 1254 The Client MAY supply and the Printer MUST support this attribute.
- 1255 "limit" (integer(1:MAX)):
- 1256 The Client MAY supply and the Printer MUST support this attribute.
- 1257 "requested-attributes" (1setOf type2 keyword):
- 1258 The Client MAY supply and the Printer MUST support this attribute. If this
1259 operation attribute is NOT supplied, then the System MUST only return the
1260 value of the equivalent "system-configured-resources" entry for each
1261 selected Resource. See section "system-configured-resources" in section 7.3
1262 System Status Attributes.
- 1263 "resource-formats" (1setOf (mimeMediaType)):
- 1264 The Client MAY supply and the Printer MUST support this attribute. If this
1265 operation attribute is supplied, then the Printer MUST return the attributes
1266 and values for the selected Resources. See "resource-format" in section 7.7
1267 Resource Status Attributes.
- 1268 "resource-states" (1setOf (type1 enum)):
- 1269 The Client MAY supply and the Printer MUST support this attribute. If this
1270 operation attribute is supplied, then the Printer MUST return the attributes
1271 and values for the selected Resources. See "resource-state" in section 7.7
1272 Resource Status Attributes.
- 1273 "resource-types" (1setOf (type2 keyword)):
- 1274 The Client MAY supply and the Printer MUST support this attribute. If this
1275 operation attribute is supplied, then the Printer MUST return the attributes
1276 and values for the selected Resources. See "resource-type" in section 7.7
1277 Resource Status Attributes.

1278 6.1.5.2 Get-Printer-Resources Response

1279 The following groups of attributes are part of a Get-Printer-Resources response. The Printer
1280 returns a Get-Printer-Resources operation response to the Client up to the number specified
1281 by the “limit” operation attribute that match the filter criteria as supplied by the Client in the
1282 request.

1283 Group 1: Operation Attributes

1284 “attributes-charset” (charset) and
1285 “attributes-natural-language” (naturalLanguage):

1286 The System MUST return both of these attributes, unless no Resources
1287 match the filter criteria specified by the Client.

1288 “status-message” (text(255)) and/or
1289 “detailed-status-message” (text(MAX)):

1290 The Printer MAY return one or both of these attributes.

1291 Group 2: Unsupported Attributes

1292 See [RFC8011] for details on returning Unsupported Attributes.

1293 Groups 3 to N: Resource Attributes

1294 See [RFC8011] for details on returning analogous Printer Attributes.

1295 “resource-id” (integer(1:MAX)):

1296 The Printer MUST return this attribute.

1297 “resource-uuid” (uri(45)):

1298 The Printer MUST return this attribute.

1299 “resource-state” (type1 enum) and
1300 “resource-state-reasons” (1setOf type2 keyword):

1301 The Printer MUST return both of these attributes.

1302 6.1.6 Shutdown-One-Printer

1303 This REQUIRED operation allows an authorized Operator or Administrator to shutdown one
1304 configured Printer object (i.e., Job processing service) on the target System object.

1305 This operation is semantically equivalent to the ShutdownService operation defined in
1306 [PWG5108.06]. This operation is also semantically equivalent to a Shutdown-Printer

1307 operation [RFC3998] to the configured Printer object (except for the resulting “printer-state”
1308 of ‘stopped’ rather than ‘idle’).

1309 If accepted, the System MUST shutdown the specified Printer with the “printer-state” set to
1310 ‘stopped’ (i.e., no Jobs can be processed and intervention is required) and the ‘shutdown’
1311 value added to “printer-state-reasons”. This operation MAY cause the System to pause with
1312 “system-state” set to ‘stopped’ (if all other Printers already had a “printer-state” of ‘stopped’).

1313 The Client can later send a Startup-One-Printer operation to the System (preferred) or a
1314 Startup-Printer operation [RFC3998] to the Printer to start up the specified Printer.

1315 **6.1.6.1 Shutdown-One-Printer Request**

1316 The following groups of attributes are part of a Shutdown-One-Printer request.

1317 Group 1: Operation Attributes

1318 "attributes-charset" (charset) and
1319 "attributes-natural-language" (naturalLanguage):

1320 The Client MUST supply and the System MUST support both of these
1321 attributes.

1322 “system-uri” (uri):

1323 The Client MUST supply and the System MUST support the “system-uri”
1324 operation attribute which is the target System for the operation.

1325 “printer-id” (integer(1:65535)):

1326 The Client MUST supply and the System MUST support the “printer-id”
1327 operation attribute which is the target Printer for the operation.

1328 "requesting-user-name" (name(MAX)) and
1329 "requesting-user-uri" (uri) and
1330 "requesting-user-vcard" (1setOf text(MAX)):

1331 The Client SHOULD supply and the System MUST support all three of these
1332 attributes.

1333 “printer-message-from-operator” (text(127)):

1334 The Client MAY supply and the System MUST support this attribute.

1335 **6.1.6.2 Shutdown-One-Printer Response**

1336 The following groups of attributes are part of a Shutdown-One-Printer response.

1337 Group 1: Operation Attributes

1338 "attributes-charset" (charset) and
1339 "attributes-natural-language" (naturalLanguage):

1340 The System MUST return both of these attributes.

1341 "status-message" (text(255)) and/or
1342 "detailed-status-message" (text(MAX)):

1343 The System MAY return one or both of these attributes.

1344 Group 2: Unsupported Attributes

1345 See [RFC8011] for details on returning Unsupported Attributes.

1346 Group 3: Printer Attributes

1347 See [RFC8011] for details on returning Printer Attributes.

1348 "printer-id" (integer(1:65535)):

1349 The System MUST return this attribute for the target Printer.

1350 "printer-uuid" (uri(45)):

1351 The System MUST return this attribute for the target Printer.

1352 "printer-xri-supported" (1setOf collection):

1353 The System MUST return this attribute for the target Printer.

1354 "printer-state" (type1 enum) and
1355 "printer-state-reasons" (1setOf type2 keyword) and
1356 "printer-is-accepting-jobs" (boolean):

1357 The System MUST return all three of these attributes for the target Printer.

1358 **6.1.7 Startup-One-Printer**

1359 This REQUIRED operation allows an authorized Operator or Administrator to startup one
1360 configured Printer object (i.e., Job processing service) on the target System object.

1361 This operation is semantically equivalent to the StartupService operation defined in
1362 [PWG5108.06].

1363 If accepted, the System MUST start the specified Printer with the "printer-state" set to
1364 'stopped' (i.e., no Jobs can be processed and intervention is required), "printer-is-accepting-
1365 jobs" set to 'false' (i.e., no incoming Jobs accepted), and the 'paused' value added to "printer-

1366 state-reasons" (i.e., no Job processing output allowed). This operation MAY cause the
1367 System to resume with "system-state" set to 'idle' (if all other Printers already had a "printer-
1368 state" of 'stopped').

1369 The Client can later send one or more Set-Printer-Attributes operations to modify the
1370 configuration of the Printer, followed by Resume-Printer (i.e., remove 'paused' from "printer-
1371 state-reasons") and Enable-Printer (i.e., change "printer-is-accepting-jobs" to 'true') to
1372 change the "printer-state" to 'idle' (unless there is another reason for the Printer to stay in
1373 the 'stopped' state).

1374 **6.1.7.1 Startup-One-Printer Request**

1375 The following groups of attributes are part of a Startup-One-Printer request.

1376 Group 1: Operation Attributes

1377 "attributes-charset" (charset) and
1378 "attributes-natural-language" (naturalLanguage):

1379 The Client MUST supply and the System MUST support both of these
1380 attributes.

1381 "system-uri" (uri):

1382 The Client MUST supply and the System MUST support the "system-uri"
1383 operation attribute which is the target System for the operation.

1384 "printer-id" (integer(1:65535)):

1385 The Client MUST supply and the System MUST support the "printer-id"
1386 operation attribute which is the target Printer for the operation.

1387 "requesting-user-name" (name(MAX)) and
1388 "requesting-user-uri" (uri) and
1389 "requesting-user-vcard" (1setOf text(MAX)):

1390 The Client SHOULD supply and the System MUST support all three of these
1391 attributes.

1392 "printer-message-from-operator" (text(127)):

1393 The Client MAY supply and the System MUST support this attribute.

1394 **6.1.7.2 Startup-One-Printer Response**

1395 The following groups of attributes are part of a Startup-One-Printer response.

1396 Group 1: Operation Attributes

1397 "attributes-charset" (charset) and
1398 "attributes-natural-language" (naturalLanguage):

1399 The System MUST return both of these attributes.

1400 "status-message" (text(255)) and/or
1401 "detailed-status-message" (text(MAX)):

1402 The System MAY return one or both of these attributes.

1403 Group 2: Unsupported Attributes

1404 See [RFC8011] for details on returning Unsupported Attributes.

1405 Group 3: Printer Attributes

1406 See [RFC8011] for details on returning Printer Attributes.

1407 "printer-id" (integer(1:65535)):

1408 The System MUST return this attribute for the target Printer.

1409 "printer-uuid" (uri(45)):

1410 The System MUST return this attribute for the target Printer.

1411 "printer-xri-supported" (1setOf collection):

1412 The System MUST return this attribute for the target Printer.

1413 "printer-state" (type1 enum) and
1414 "printer-state-reasons" (1setOf type2 keyword) and
1415 "printer-is-accepting-jobs" (boolean):

1416 The System MUST return all three of these attributes for the target Printer.

1417 6.2 Resource Operations

1418 IPP System Service operations on single Resource objects (except for Get-Resources) are
1419 defined in this section.

1420 6.2.1 Cancel-Resource

1421 This REQUIRED operation allows an authorized Operator or Administrator to cancel an
1422 existing Resource object on the target System object. If the Resource object's "resource-
1423 state" is 'canceled' or 'aborted' or "resource-state-reasons" includes 'cancel-requested', then
1424 the System MUST return a "status-code" of 'client-error-not-possible'.

1425 This operation is semantically analogous to the DeleteResource operation defined in
1426 [PWG5108.03] (except that the Resource is not removed, in order to preserve the integrity of
1427 system log files). See section 4.6. Resource Object and section 4.6.1 Resource History for
1428 more details.

1429 If accepted, the System MUST set the “resource-state” to ‘canceled’ or leave “resource-
1430 state” unchanged and add ‘cancel-requested’ to “resource-state-reasons” (e.g., if the
1431 Resource is currently in use by a Job). In either case, the System MUST make the Resource
1432 permanently unavailable for future use. The System MUST preserve all Resource object
1433 attributes for an implementation-defined Resource History period.

1434 When “resource-state” eventually transitions to ‘canceled’, the System SHOULD delete any
1435 local copy of Resource data. This operation does not change the “system-state” of the
1436 System itself.

1437 **6.2.1.1 Cancel-Resource Request**

1438 The following groups of attributes are part of a Cancel-Resource request.

1439 Group 1: Operation Attributes

1440 "attributes-charset" (charset) and
1441 "attributes-natural-language" (naturalLanguage):

1442 The Client MUST supply and the System MUST support both of these
1443 attributes.

1444 “system-uri” (uri):

1445 The Client MUST supply and the System MUST support the “system-uri”
1446 operation attribute which is the target System for the operation.

1447 “resource-id” (integer(1:MAX)):

1448 The Client MUST supply and the System MUST support this attribute which
1449 is the target Resource for the operation.

1450 "requesting-user-name" (name(MAX)) and
1451 "requesting-user-uri" (uri) and
1452 "requesting-user-vcard" (1setOf text(MAX)):

1453 The Client SHOULD supply and the System MUST support all three of these
1454 attributes.

1455 **6.2.1.2 Cancel-Resource Response**

1456 The following groups of attributes are part of a Cancel-Resource response.

1457 Group 1: Operation Attributes

1458 "attributes-charset" (charset) and
1459 "attributes-natural-language" (naturalLanguage):

1460 The System MUST return both of these attributes.

1461 "status-message" (text(255)) and/or
1462 "detailed-status-message" (text(MAX)):

1463 The System MAY return one or both of these attributes.

1464 Group 2: Unsupported Attributes

1465 See [RFC8011] for details on returning Unsupported Attributes.

1466 **6.2.2 Create-Resource-Subscriptions**

1467 This REQUIRED operation allows an authorized Operator or Administrator to create one or
1468 more System Subscription objects on Resources.

1469 This operation is semantically analogous to the Create-Job-Subscriptions operation defined
1470 in [RFC3995].

1471 The Client supplies one or more Subscription Attributes groups, each containing one or more
1472 of the Subscription Template Attributes defined in section 5.3 Table 1 of [RFC3995]. The
1473 System MUST support all of the Subscription Template Attributes defined in section 5.3
1474 Table 1 of [RFC3995]. If the Resource object's "resource-state" is 'canceled' or 'aborted' or
1475 "resource-state-reasons" includes 'cancel-requested', then the System MUST return a
1476 "status-code" of 'client-error-not-possible'.

1477 If accepted, the System MUST create the requested Subscription objects. This operation
1478 does not change the state of the System itself.

1479 **6.2.2.1 Create-Resource-Subscriptions Request**

1480 The following groups of attributes are part of a Create-Resource-Subscriptions request.

1481 Group 1: Operation Attributes

1482 "attributes-charset" (charset) and
1483 "attributes-natural-language" (naturalLanguage):

1484 The Client MUST supply and the System MUST support both of these
1485 attributes.

1486 "system-uri" (uri):

1487 The Client MUST supply and the System MUST support the "system-uri"
1488 operation attribute which is the target System for the operation.

1489 "resource-id" (integer(1:MAX)):

1490 The Client MUST supply and the System MUST support this attribute which
1491 is the target Resource for the operation.

1492 "requesting-user-name" (name(MAX)) and
1493 "requesting-user-uri" (uri) and
1494 "requesting-user-vcard" (1setOf text(MAX)):

1495 The Client SHOULD supply and the System MUST support all three of these
1496 attributes.

1497 Groups 2-N: Subscription Attributes

1498 See [RFC3995] for details on supplying Subscription Attributes.

1499 **6.2.2.2 Create-Resource-Subscriptions Response**

1500 The following groups of attributes are part of a Create-Resource-Subscriptions response.

1501 Group 1: Operation Attributes

1502 "attributes-charset" (charset) and
1503 "attributes-natural-language" (naturalLanguage):

1504 The System MUST return both of these attributes.

1505 "status-message" (text(255)) and/or
1506 "detailed-status-message" (text(MAX)):

1507 The System MAY return one or both of these attributes.

1508 Group 2: Unsupported Attributes

1509 See [RFC8011] for details on returning Unsupported Attributes.

1510 Groups 3-N: Subscription Attributes

1511 See [RFC3995] for details on returning Subscription Attributes.

1512 **6.2.3 Get-Resource-Attributes**

1513 This REQUIRED operation allows an authorized Operator or Administrator to retrieve some
1514 or all of the attributes the target Resource object. For Resources, the possible names of
1515 attribute groups for the "requested-attributes" operation attribute are:

- 1516 'resource-description': The subset of Resource Description attributes.
- 1517 'resource-status': The subset of Resource Status attributes.
- 1518 'all': All Resource attributes.
- 1519 This operation is semantically equivalent to the GetResourceElements operation defined in
1520 [PWG5108.03]. This operation is also semantically analogous the Get-Job-Attributes and
1521 Get-Printer-Attributes operations defined in [RFC8011].
- 1522 If accepted, the System MUST return the requested attributes for the selected Resource
1523 object. This operation does not change the state of any Resource or the System itself.
- 1524 **6.2.3.1 Get-Resource-Attributes Request**
- 1525 The following groups of attributes are part of a Get-Resource-Attributes request.
- 1526 Group 1: Operation Attributes
- 1527 "attributes-charset" (charset) and
1528 "attributes-natural-language" (naturalLanguage):
- 1529 The Client MUST supply and the System MUST support both of these
1530 attributes.
- 1531 "system-uri" (uri):
- 1532 The Client MUST supply and the System MUST support the "system-uri"
1533 operation attribute which is the target System for the operation.
- 1534 "resource-id (integer(1:MAX))):
- 1535 The Client MUST supply and the System MUST support the "resource-id"
1536 operation attribute which is the target Resource for the operation.
- 1537 "requesting-user-name" (name(MAX)) and
1538 "requesting-user-uri" (uri) and
1539 "requesting-user-vcard" (1setOf text(MAX)):
- 1540 The Client SHOULD supply and the System MUST support all three of these
1541 attributes.
- 1542 "requested-attributes" (1setOf type2 keyword):
- 1543 The Client MAY supply and the System MUST support this attribute. If this
1544 operation attribute is NOT supplied, then the System MUST only return the
1545 value of the "system-configured-resources" entry for each selected

1546 Resource. See section “system-configured-resources” in section 7.3 System
1547 Status Attributes.

1548 **6.2.3.2 Get-Resource-Attributes Response**

1549 The following groups of attributes are part of a Get-Resource-Attributes response.

1550 Group 1: Operation Attributes

1551 "attributes-charset" (charset) and
1552 "attributes-natural-language" (naturalLanguage):

1553 The System MUST return both of these attributes.

1554 "status-message" (text(255)) and/or
1555 "detailed-status-message" (text(MAX)):

1556 The System MAY return one or both of these attributes.

1557 Group 2: Unsupported Attributes

1558 See [RFC8011] for details on returning Unsupported Attributes.

1559 Group 3: Resource Attributes

1560 See [RFC8011] for details on returning analogous Printer Attributes.

1561 “resource-id” (integer(1:MAX)):

1562 The System MUST return this attribute.

1563 “resource-uuid” (uri(45)):

1564 The System MUST return this attribute.

1565 “resource-state” (type1 enum) and
1566 “resource-state-reasons” (1setOf type2 keyword):

1567 The System MUST return both of these attributes.

1568 **6.2.4 Install-Resource**

1569 This REQUIRED operation allows an authorized Operator or Administrator to install an
1570 existing Resource object for use on the target System object.

1571 This operation is semantically analogous to the StoreResource operation defined in
1572 [PWG5108.03] (except that the Resource object is separately created with a previous Create-
1573 Resource operation and Resource data is separately uploaded with a previous Send-Resource-
1574 Data operation).

1575 If the Resource object's "resource-state" is not 'available' or "resource-state-reasons"
1576 includes 'install-requested', then the System MUST return a "status-code" of 'client-error-
1577 not-possible'. The System MUST validate any Resource signature supplied in a previous
1578 Send-Resource-Data operation or embedded in the Resource data, for example as
1579 described in US NIST Digital Signature Standard [FIPS186-4], ENISA Algorithms, Key Size
1580 and Parameters Report [ENISAALG], ETSI Electronic Signatures and Infrastructures (ESI)
1581 Signature validation procedures and policies [TS102853], and IETF XML-Signature Syntax
1582 and Processing [RFC3275]. The System MUST validate the Resource format and type. The
1583 System SHOULD validate the

1584 If accepted, the System MUST set the "resource-state" to 'installed' or leave "resource-state"
1585 unchanged and add 'install-requested' to "resource-state-reasons" (e.g., if this is an
1586 executable Resource and requires a System reboot to complete the installation). This
1587 operation does not change the "system-state" of the System itself.

1588 See section 4.6 Resource Object and section 4.6.1 Resource History for more details.

1589 **6.2.4.1 Install-Resource Request**

1590 The following groups of attributes are part of an Install-Resource request.

1591 Group 1: Operation Attributes

1592 "attributes-charset" (charset) and
1593 "attributes-natural-language" (naturalLanguage):

1594 The Client MUST supply and the System MUST support both of these
1595 attributes.

1596 "system-uri" (uri):

1597 The Client MUST supply and the System MUST support the "system-uri"
1598 operation attribute which is the target System for the operation.

1599 "resource-id" (integer(1:MAX)):

1600 The Client MUST supply and the System MUST support this attribute which
1601 is the target Resource for the operation.

1602 "requesting-user-name" (name(MAX)) and
1603 "requesting-user-uri" (uri) and
1604 "requesting-user-vcard" (1setOf text(MAX)):

1605 The Client SHOULD supply and the System MUST support all three of these
1606 attributes.

1607 6.2.4.2 Install-Resource Response

1608 The following groups of attributes are part of an Install-Resource response.

1609 Group 1: Operation Attributes

1610 "attributes-charset" (charset) and
1611 "attributes-natural-language" (naturalLanguage):

1612 The System MUST return both of these attributes.

1613 "status-message" (text(255)) and/or
1614 "detailed-status-message" (text(MAX)):

1615 The System MAY return one or both of these attributes.

1616 Group 2: Unsupported Attributes

1617 See [RFC8011] for details on returning Unsupported Attributes.

1618 Group 3: Resource Object Attributes

1619 This is the same set of attributes described in the Create-Resource response in
1620 section 6.2.2.1.

1621 6.2.5 Send-Resource-Data

1622 This REQUIRED operation allows an authorized Operator or Administrator to upload
1623 Resource data for an existing Resource object on the target System object.

1624 This operation is semantically analogous to the StoreResource operation defined in
1625 [PWG5108.03] (except that the Resource object is separately created with a previous Create-
1626 Resource operation and Resource is separately installed with a subsequent Install-Resource-
1627 Data operation).

1628 If the Resource object's "resource-state" is not 'pending', then the System MUST return a
1629 "status-code" of 'client-error-not-possible'. The System SHOULD validate any Resource
1630 signature supplied or embedded in the Resource data - see section 12.5 for
1631 recommendations. The System SHOULD validate the Resource format and type. The
1632 System SHOULD validate the Resource data contents.

1633 If accepted, the System MUST set the "resource-state" to 'available'. This operation does
1634 not change the "system-state" of the System itself.

1635 This operation is semantically analogous to the Send-Document operation defined in
1636 [RFC8011] and semantically analogous to the StoreResource operation defined in
1637 [PWG5108.03] (except that the Resource object is separately created with a previous Create-

1638 Resource operation and installed for use with a subsequent Install-Resource operation). See
1639 section 4.6 Resource Object and section 4.6.1 Resource History for more details.

1640 **6.2.5.1 Send-Resource-Data Request**

1641 The following groups of attributes are part of a Send-Resource-Data request.

1642 Group 1: Operation Attributes

1643 "attributes-charset" (charset) and
1644 "attributes-natural-language" (naturalLanguage):

1645 The Client MUST supply and the System MUST support both of these
1646 attributes.

1647 "system-uri" (uri):

1648 The Client MUST supply and the System MUST support the "system-uri"
1649 operation attribute which is the target System for the operation.

1650 "resource-id" (integer(1:MAX)):

1651 The Client MUST supply and the System MUST support this attribute which
1652 is the target Resource for the operation.

1653 "requesting-user-name" (name(MAX)) and
1654 "requesting-user-uri" (uri) and
1655 "requesting-user-vcard" (1setOf text(MAX)):

1656 The Client SHOULD supply and the System MUST support all three of these
1657 attributes.

1658 "resource-format" (mimeType):

1659 The Client MUST supply and the System MUST support this attribute.

1660 "resource-signature" (1setOf octetString):

1661 The Client MAY supply and the System MUST support this attribute which is
1662 the out-of-band digital signature for the Resource data.

1663 Group 2: Resource Content

1664 The Client MUST supply the Resource data.

1665 **6.2.5.2 Send-Resource-Data Response**

1666 The following groups of attributes are part of a Send-Resource-Data response.

1667 Group 1: Operation Attributes

1668 "attributes-charset" (charset) and
1669 "attributes-natural-language" (naturalLanguage):

1670 The System MUST return both of these attributes.

1671 "status-message" (text(255)) and/or
1672 "detailed-status-message" (text(MAX)):

1673 The System MAY return one or both of these attributes.

1674 Group 2: Unsupported Attributes

1675 See [RFC8011] for details on returning Unsupported Attributes.

1676 Group 3: Resource Object Attributes

1677 This is the same set of attributes described in the Create-Resource response in
1678 section 6.2.2.1.

1679 **6.2.6 Set-Resource-Attributes**

1680 This REQUIRED operation allows an authorized Operator or Administrator to set the values
1681 of Resource Description attributes listed in "resource-settable-attributes-supported" (see
1682 section 7.2). For Client support for localization see "system-strings-languages-supported"
1683 and "system-strings-uri" in section 7.2. If one or more of the supplied
1684 Resource Description attributes and/or values are not actually settable, then the System
1685 MUST reject the entire request, indicating which attributes and/or values cannot be set, and
1686 return a "status-code" of 'client-error-not-possible'. If the Resource object's "resource-state"
1687 is either 'canceled' or 'aborted' or "resource-state-reasons" contains 'cancel-requested', then
1688 the System MUST reject the entire request and return a "status-code" of 'client-error-not-
1689 possible'. See additional validation rules in section 4.1 Set-Printer-Attributes of [RFC3380].

1690 This operation is semantically equivalent to the SetResourceElements operation defined in
1691 [PWG5108.03] and semantically analogous to the Set-Printer-Attributes operation defined
1692 in [RFC3380].

1693 If accepted, the System MUST set every supplied Resource Description attribute to exactly
1694 the supplied value. The System MUST NOT partially set a subset of the supplied attributes.
1695 The System MUST accept this operation when the supplied attributes are valid and the value
1696 of "resource-state" (see section 7.7) is 'installed'. The System SHOULD accept this
1697 operation when the supplied attributes are valid and the value of "resource-state" (see
1698 section 7.3) is either 'pending' or 'available'. This operation does not change the "system-
1699 state" of the System itself.

1700 6.2.6.1 Set-Resource-Attributes Request

1701 The following groups of attributes are part of a Set-Resource-Attributes request.

1702 Group 1: Operation Attributes

1703 "attributes-charset" (charset) and
1704 "attributes-natural-language" (naturalLanguage):

1705 The Client MUST supply and the System MUST support both of these
1706 attributes.

1707 "system-uri" (uri):

1708 The Client MUST supply and the System MUST support the "system-uri"
1709 operation attribute which is the target System for the operation.

1710 "resource-id (integer(1:MAX))):

1711 The Client MUST supply and the System MUST support the "resource-id"
1712 operation attribute which is the target Resource for the operation.

1713 "requesting-user-name" (name(MAX)) and
1714 "requesting-user-uri" (uri) and
1715 "requesting-user-vcard" (1setOf text(MAX)):

1716 The Client SHOULD supply and the System MUST support all three of these
1717 attributes.

1718 Group 2: Resource Attributes

1719 The IPP Client MUST supply a set of Resource attributes with one or more values
1720 (including explicitly allowed out-of-band values) as defined in [RFC8011] and section
1721 7.2 of this document.

1722 See [RFC3380] for details on setting analogous Printer Attributes.

1723 6.2.6.2 Set-Resource-Attributes Response

1724 The following groups of attributes are part of a Set-Resource-Attributes response.

1725 Group 1: Operation Attributes

1726 "attributes-charset" (charset) and
1727 "attributes-natural-language" (naturalLanguage):

1728 The System MUST return both of these attributes.

1729 "status-message" (text(255)) and/or
1730 "detailed-status-message" (text(MAX)):

1731 The System MAY return one or both of these attributes.

1732 Group 2: Unsupported Attributes

1733 See [RFC8011] for details on returning Unsupported Attributes.

1734 Group 3: Resource Attributes

1735 See [RFC8011] and [RFC3380] for details on returning analogous Printer Attributes.

1736 "resource-id" (integer(1:MAX)):

1737 The System MUST return this attribute.

1738 "resource-uuid" (uri(45)):

1739 The System MUST return this attribute.

1740 "resource-state" (type1 enum) and

1741 "resource-state-reasons" (1setOf type2 keyword):

1742 The System MUST return both of these attributes.

1743 6.3 System Operations

1744 IPP System Service operations on single System objects or multiple Printer objects are
1745 defined in this section.

1746 Note: The System MUST copy the value of any supplied "system-message-from-operator"
1747 operation attribute to "printer-message-from-operator" for any affected Printer objects (for
1748 [Disable, Enable, Pause, Resume, Shutdown, Startup]All-Printers, Pause-All-Printers-After-
1749 Current-Job, and Restart-System.

1750 6.3.1 Create-Printer

1751 This REQUIRED operation allows an authorized Operator or Administrator to create a new
1752 Printer object (i.e., Job processing service) on the target System object and optionally also
1753 create one or more new per-Printer Subscription objects.

1754 This operation is semantically equivalent to the Create operation for a Printer object defined
1755 in ISO "Document Printing Application (DPA) Part 3: Management Abstract Service Definition
1756 and Procedures" [ISO10175-3] (where a newly created Printer object had the special initial state
1757 of 'unknown', which is NOT defined or used in this specification). This operation is semantically
1758 analogous to the Create-Job operation defined in [RFC8011].

1759 If accepted, the System MUST create and initialize a new Printer object with the “printer-
1760 state” set to ‘stopped’ (i.e., no Jobs can be processed and intervention is required), “printer-
1761 is-accepting-jobs” set to ‘false’ (i.e., no incoming Jobs accepted), and the ‘paused’ value
1762 added to “printer-state-reasons” (i.e., no Job processing output allowed). This operation
1763 does not change the “system-state” of the System itself.

1764 One or more per-Printer Subscription objects can also be created. The Client can then send
1765 one or more Set-Printer-Attributes operations to modify the configuration of the Printer,
1766 followed by Resume-Printer (to remove ‘paused’ from “printer-state-reasons”) and Enable-
1767 Printer (to change “printer-is-accepting-jobs” to ‘true’) to change “printer-state” to ‘idle’
1768 (unless there is another reason for the Printer to stay in the ‘stopped’ state).

1769 Note: When the first Print Service is created on a System, the System MUST set the value
1770 of “system-default-printer-id” to reference that Print Service.

1771 Note: Printer-scope Resource objects MAY be:

- 1772 1. Created **before** the related Create-Printer operation and then associated with a
1773 given Printer using a Create-Printer operation via the “resource-ids” operation
1774 attribute to update the “printer-resource-ids” Printer Status attribute;
1775 2. Created **after** the related Create-Printer operation and then associated with a
1776 given Printer using an Allocate-Printer-Resources operation via the “resource-
1777 ids” operation attribute to update the “printer-resource-ids” Printer Status
1778 attribute; or
1779 3. Created **after** the related Create-Printer operation and then associated with a
1780 given Printer using an HTTP PUT request [RFC7230] as defined in section 4.1.9
1781 Resources of IPP Shared Infrastructure Extensions [PWG5100.18] to update the
1782 “printer-resource-ids” Printer Status attribute.

1783 Note: Printer-scope Subscription objects MUST be created after the related Create-Printer
1784 operation, so that “notify-printer-id” can be correctly specified.

1785 Note: Appropriate Subunits are automatically associated with a new Printer object based
1786 on “printer-service-type”, inherent System capabilities, (out-of-band) System policies.
1787 Subunits are also associated by configured service capabilities (e.g., “sides-supported” and
1788 duplexer, “finishings-supported” and finishers, “print-color-mode-supported” and colorants, etc.
1789 – association by intent and not by explicit identification/listing of Subunits.

1790 6.3.1.1 Create-Printer Request

1791 The following groups of attributes are part of a Create-Printer request.

1792 Group 1: Operation Attributes

1793 “attributes-charset” (charset) and
1794 “attributes-natural-language” (naturalLanguage):

- 1795 The Client MUST supply and the System MUST support both of these
1796 attributes.
- 1797 “system-uri” (uri):
- 1798 The Client MUST supply and the System MUST support the “system-uri”
1799 operation attribute which is the target System for the operation.
- 1800 “requesting-user-name” (name(MAX)) and
1801 “requesting-user-uri” (uri) and
1802 “requesting-user-vcard” (1setOf text(MAX)):
- 1803 The Client SHOULD supply and the System MUST support all three of these
1804 attributes.
- 1805 “printer-service-type” (type2 keyword):
- 1806 The Client MUST supply and the System MUST support this attribute.
- 1807 “printer-message-from-operator” (text(127)):
- 1808 The Client MAY supply and the System MUST support this attribute.
- 1809 [“printer-xri-requested” \(1setOf collection\):](#)
- 1810 [The Client MAY supply and the System MUST support this attribute.](#)
- 1811 “resource-ids” (1setOf integer(1:MAX)):
- 1812 The Client MAY supply and the System MUST support this attribute.
- 1813 Group 2: Printer Description Attributes
- 1814 <all mandatory Printer Description attributes>
- 1815 The Client MUST supply and the System MUST support all of the attributes
1816 listed in “system-mandatory-printer-attributes”
- 1817 <any other Printer Description attribute>
- 1818 The Client MAY supply and the System ~~MUST~~ support [all of the](#) attributes
1819 [listed in “printer-creation-attributes-supported”](#).
- 1820 Groups 3-N: Subscription Attributes
- 1821 See [RFC3995] for details on supplying Subscription Attributes.

Deleted: AY**Deleted:** these**Deleted:** . See**Deleted:** settable**Deleted:** defined in [RFC3380].

1827 6.3.1.2 Create-Printer Response

1828 The following groups of attributes are part of a Create-Printer response.

1829 Group 1: Operation Attributes

1830 "attributes-charset" (charset) and
1831 "attributes-natural-language" (naturalLanguage):

1832 The System MUST return both of these attributes.

1833 "status-message" (text(255)) and/or
1834 "detailed-status-message" (text(MAX)):

1835 The System MAY return one or both of these attributes.

1836 Group 2: Unsupported Attributes

1837 See [RFC8011] for details on returning Unsupported Attributes.

1838 Groups 3: Printer Attributes

1839 See [RFC8011] for details on returning Printer Attributes.

1840 "printer-id" (integer(1:65535)):

1841 The System MUST return this attribute.

1842 "printer-uuid" (uri(45)):

1843 The System MUST return this attribute.

1844 "printer-xri-supported" (1setOf collection)

1845 The System MUST return this attribute.

1846 "printer-state" (type1 enum) and
1847 "printer-state-reasons" (1setOf type2 keyword) and
1848 "printer-is-accepting-jobs" (boolean):

1849 The System MUST return all three of these attributes.

1850 Groups 4-N: Subscription Attributes

1851 See [RFC3995] for details on returning Subscription Attributes.

1852 Group N+1: System Attributes

1853 See [RFC8011] and [RFC3380] for details on returning analogous Printer Attributes.

1854 “system-uuid” (uri(45)):

1855 The System MUST return this attribute.

1856 “system-xri-supported” (1setOf collection)

1857 The System MUST return this attribute.

1858 “system-state” (type1 enum) and

1859 “system-state-reasons” (1setOf type2 keyword):

1860 The System MUST return both of these attributes.

1861 6.3.2 Create-Resource

1862 This REQUIRED operation allows an authorized Operator or Administrator to create a new
1863 Resource object on the target System object and optionally also create one or more new
1864 per-Resource Subscription objects.

1865 This operation is semantically analogous to the StoreResource operation defined in
1866 [PWG5108.03] (except that the Resource data is separately transferred with a subsequent Send-
1867 Resource-Data operation and installed for use with a subsequent Install-Resource operation).

1868 If accepted, the System MUST create and initialize a new Resource object with the
1869 “resource-state” set to ‘pending’ (i.e., no Resource data has been associated yet). This
1870 operation does not change the “system-state” of the System itself. One or more per-
1871 Resource Subscription objects can also be created. The Client can then use one or more
1872 Set-Resource-Attributes operations to modify the Resource object, followed by a Send-
1873 Resource-Data operation (i.e., upload the associated Resource data) to change the
1874 “resource-state” to ‘available’. During processing of the Send-Resource-Data operation, the
1875 System can keep the “resource-state” of ‘pending’ and also add ‘resource-incoming’ to
1876 “resource-state-reasons” if the upload completion is delayed. The Client can then use an
1877 Install-Resource operation to install the Resource, which will either change “resource-state”
1878 to ‘installed’ or add ‘install-requested’ to “resource-state-reasons”. See section 7.7.12
1879 resource-state for a discussion of Resource object states and lifecycle phases.

1880 Note: The Client MUST use both the Send-Resource-Data and Install-Resource operations
1881 for all “resource-type” values, which simplifies the Resource state machine.

1882 Note: Printer-scope Resource objects MAY be:

- 1883 1. Created **before** the related Create-Printer operation and then associated with a
1884 given Printer using a Create-Printer operation via the “resource-ids” operation
1885 attribute to update the “printer-resource-ids” Printer Status attribute;
- 1886 2. Created **after** the related Create-Printer operation and then associated with a
1887 given Printer using an Allocate-Printer-Resources operation via the “resource-
1888 ids” operation attribute to update the “printer-resource-ids” Printer Status
1889 attribute; or

Commented [MS7]: DISCUSS: Why return system-uuid or system-xri-supported when the only thing we care about are the system-state/-reasons values?

1890 3. Created **after** the related Create-Printer operation and then associated with a
1891 given Printer using an HTTP PUT request [RFC7230] as defined in section 4.1.9
1892 Resources of IPP Shared Infrastructure Extensions [PWG5100.18] to update the
1893 “printer-resource-ids” Printer Status attribute.

1894 Note: Job-scope Resource objects MUST be created **before** the Job creation operation and
1895 then associated with a given Job via the “resource-ids” Job creation operation attribute to
1896 update the “job-resource-ids” Job Status attribute.

1897 Note: Resource-scope Subscription objects MUST be created **after** the related Create-
1898 Resource operation, so that “notify-resource-id” can be correctly specified.

1899 6.3.2.1 Create-Resource Request

1900 The following groups of attributes are part of a Create-Resource request.

1901 Group 1: Operation Attributes

1902 “attributes-charset” (charset) and
1903 “attributes-natural-language” (naturalLanguage):

1904 The Client MUST supply and the System MUST support both of these
1905 attributes.

1906 “system-uri” (uri):

1907 The Client MUST supply and the System MUST support the “system-uri”
1908 operation attribute which is the target System for the operation.

1909 “requesting-user-name” (name(MAX)) and
1910 “requesting-user-uri” (uri) and
1911 “requesting-user-vcard” (1setOf text(MAX)):

1912 The Client SHOULD supply and the System MUST support all three of these
1913 attributes.

1914 “resource-type” (type2 keyword):

1915 The Client MUST supply and the System MUST support this attribute.

1916 Group 2: Resource Description Attributes

1917 <any Resource Description attribute>

1918 The Client MAY supply and the System MAY support these attributes.

1919 Groups 3-N: Subscription Attributes

1920 See [RFC3995] for details on supplying Subscription Attributes.

1921 **6.3.2.2 Create-Resource Response**

1922 The following groups of attributes are part of a Create-Resource response.

1923 Group 1: Operation Attributes

1924 "attributes-charset" (charset) and
1925 "attributes-natural-language" (naturalLanguage):

1926 The System MUST return both of these attributes.

1927 "status-message" (text(255)) and/or
1928 "detailed-status-message" (text(MAX)):

1929 The System MAY return one or both of these attributes.

1930 "resource-format-accepted" (1setOf mimeType)

1931 This System MUST return this list of accepted Resource formats (for use in
1932 Send-Resource-Data) based on the "resource-type" specified in the Create-
1933 Response request.

1934 Group 2: Unsupported Attributes

1935 See [RFC8011] for details on returning Unsupported Attributes.

1936 Groups 3: Resource Attributes

1937 See [RFC8011] for details on returning analogous Printer Attributes.

1938 "resource-id" (integer(1:MAX)):

1939 The System MUST return this attribute.

1940 "resource-uuid" (uri(45)):

1941 The System MUST return this attribute.

1942 "resource-state" (type1 enum) and
1943 "resource-state-reasons" (1setOf type2 keyword):

1944 The System MUST return both of these attributes.

1945 Groups 4-N: Subscription Attributes

1946 See [RFC3995] for details on returning Subscription Attributes.

1947 **6.3.3 Create-System-Subscriptions**

1948 This REQUIRED operation allows an authorized Operator or Administrator to create one or
1949 more System Subscription objects.

1950 This operation is semantically analogous to the Create-Printer-Subscriptions operation
1951 defined in [RFC3995].

1952 The Client supplies one or more Subscription Attributes groups, each containing one or more
1953 of the Subscription Template Attributes defined in section 5.3 Table 1 of [RFC3995]. The
1954 System MUST support all of the Subscription Template Attributes defined in section 5.3
1955 Table 1 of [RFC3995].

1956 If accepted, the System MUST create the requested Subscription objects. This operation
1957 does not change the state of the System itself.

1958 **6.3.3.1 Create-System-Subscriptions Request**

1959 The following groups of attributes are part of a Create-System-Subscriptions request.

1960 Group 1: Operation Attributes

1961 "attributes-charset" (charset) and
1962 "attributes-natural-language" (naturalLanguage):

1963 The Client MUST supply and the System MUST support both of these
1964 attributes.

1965 "system-uri" (uri):

1966 The Client MUST supply and the System MUST support the "system-uri"
1967 operation attribute which is the target System for the operation.

1968 "requesting-user-name" (name(MAX)) and
1969 "requesting-user-uri" (uri) and
1970 "requesting-user-vcard" (1setOf text(MAX)):

1971 The Client SHOULD supply and the System MUST support all three of these
1972 attributes.

1973 Groups 2-N: Subscription Attributes

1974 See [RFC3995] for details on supplying Subscription Attributes.

1975 **6.3.3.2 Create-System-Subscriptions Response**

1976 The following groups of attributes are part of a Create-System-Subscriptions response.

1977 Group 1: Operation Attributes

1978 "attributes-charset" (charset) and
1979 "attributes-natural-language" (naturalLanguage):

1980 The System MUST return both of these attributes.

1981 "status-message" (text(255)) and/or
1982 "detailed-status-message" (text(MAX)):

1983 The System MAY return one or both of these attributes.

1984 Group 2: Unsupported Attributes

1985 See [RFC8011] for details on returning Unsupported Attributes.

1986 Groups 3-N: Subscription Attributes

1987 See [RFC3995] for details on returning Subscription Attributes.

1988 **6.3.4 Delete-Printer**

1989 This REQUIRED operation allows an authorized Operator or Administrator to delete a Printer
1990 object, i.e., Job processing service, on the target System object.

1991 This operation is semantically equivalent to the Delete operation for a Printer object defined in
1992 ISO "Document Printing Application (DPA) Part 3: Management Abstract Service Definition and
1993 Procedures" [ISO10175-3].

1994 If accepted, the System MUST shutdown the Printer and delete the Printer object from the
1995 System.

1996 Because the Printer may require time to cancel a currently printing Job, the Printer MAY not
1997 be deleted immediately. The System indicates this is the case by adding the 'moving-to-
1998 paused' keyword to the "printer-state-reasons" attribute returned in the response. If the
1999 Printer is deleted immediately, the System returns a value of 'stopped' in the "printer-state"
2000 attribute and 'deleted' in the "printer-state-reasons" attribute in the response.

2001 This operation can change the "system-state" of the System itself depending on the state of
2002 any other Printer objects.

2003 **6.3.4.1 Delete-Printer Request**

2004 The following groups of attributes are part of a Delete-Printer request.

2005 Group 1: Operation Attributes

- 2006 "attributes-charset" (charset) and
2007 "attributes-natural-language" (naturalLanguage):
- 2008 The Client MUST supply and the System MUST support both of these
2009 attributes.
- 2010 "system-uri" (uri) and "printer-id" (integer(1:65535)):
- 2011 The Client MUST supply and the System MUST support the "system-uri" and
2012 "printer-id" operation attributes which specify the target Printer for the
2013 operation.
- 2014 "requesting-user-name" (name(MAX)) and
2015 "requesting-user-uri" (uri) and
2016 "requesting-user-vcard" (1setOf text(MAX)):
- 2017 The Client SHOULD supply and the System MUST support all three of these
2018 attributes.
- 2019 **6.3.4.2 Delete-Printer Response**
- 2020 The following groups of attributes are part of a Delete-Printer response.
- 2021 Group 1: Operation Attributes
- 2022 "attributes-charset" (charset) and
2023 "attributes-natural-language" (naturalLanguage):
- 2024 The System MUST return both of these attributes.
- 2025 "status-message" (text(255)) and/or
2026 "detailed-status-message" (text(MAX)):
- 2027 The System MAY return one or both of these attributes.
- 2028 Group 2: Printer Attributes
- 2029 "printer-state" (type1 enum):
- 2030 The current state of the Printer. A Printer that has been deleted will have the
2031 state 'stopped'.
- 2032 "printer-state-reasons" (1setOf type2 keyword):
- 2033 The current state reasons of the Printer. A Printer that has been deleted will
2034 have a single keyword value of 'deleted' in this attribute. A Printer that is in
2035 the process of being deleted will have a keyword value of 'moving-to-paused'
2036 in this attribute.

2037 Group 3: System Attributes

2038 See [RFC8011] and [RFC3380] for details on returning analogous Printer Attributes.

2039 “system-uuid” (uri(45)):

2040 The System MUST return this attribute.

2041 “system-xri-supported” (1setOf collection)

2042 The System MUST return this attribute.

2043 “system-state” (type1 enum) and

2044 “system-state-reasons” (1setOf type2 keyword):

2045 The System MUST return both of these attributes.

2046 **6.3.5 Disable-All-Printers**

2047 This REQUIRED operation allows an authorized Operator or Administrator to pause all
2048 configured Printer objects (i.e., Job processing services) on the target System object. If no
2049 Printers are configured on the System, then the System MUST return a “status-code” of
2050 'successful-ok'.

2051 This operation is semantically equivalent to the DisableAllServices operation defined in
2052 [PWG5108.06]. This operation is also semantically equivalent to a sequence of Disable-
2053 Printer operations [RFC3398] to each configured Printer object.

2054 If accepted, the System MUST disable each configured Printer with “printer-is-accepting-
2055 jobs” set to ‘false’ but the value of “printer-state” or “printer-state-reasons” is not affected by
2056 the Disable-All-Printers operation. This operation does not change the System state.

2057 **6.3.5.1 Disable-All-Printers Request**

2058 The following groups of attributes are part of a Disable-All-Printers request.

2059 Group 1: Operation Attributes

2060 “attributes-charset” (charset) and

2061 “attributes-natural-language” (naturalLanguage):

2062 The Client MUST supply and the System MUST support both of these
2063 attributes.

2064 “system-uri” (uri):

2065 The Client MUST supply and the System MUST support the “system-uri”
2066 operation attribute which is the target System for the operation.

2067 "requesting-user-name" (name(MAX)) and
2068 "requesting-user-uri" (uri) and
2069 "requesting-user-vcard" (1setOf text(MAX)):

2070 The Client SHOULD supply and the System MUST support all three of these
2071 attributes.

2072 "system-message-from-operator" (text(127)):

2073 The Client MAY supply and the System MUST support this attribute.

2074 **6.3.5.2 Disable-All-Printers Response**

2075 The following groups of attributes are part of a Disable-All-Printers response.

2076 Group 1: Operation Attributes

2077 "attributes-charset" (charset) and
2078 "attributes-natural-language" (naturalLanguage):

2079 The System MUST return both of these attributes.

2080 "status-message" (text(255)) and/or
2081 "detailed-status-message" (text(MAX)):

2082 The System MAY return one or both of these attributes.

2083 Group 2: Unsupported Attributes

2084 See [RFC8011] for details on returning Unsupported Attributes.

2085 Groups 3-N: Printer Attributes

2086 See [RFC8011] for details on returning Printer Attributes.

2087 "printer-id" (integer(1:65535)):

2088 The System MUST return this attribute.

2089 "printer-uuid" (uri(45)):

2090 The System MUST return this attribute.

2091 "printer-xri-supported" (1setOf collection)

2092 The System MUST return this attribute.

2093 “printer-state” (type1 enum) and
2094 “printer-state-reasons” (1setOf type2 keyword) and
2095 “printer-is-accepting-jobs” (boolean):

2096 The System MUST return all three of these attributes.

2097 **6.3.6 Enable-All-Printers**

2098 This REQUIRED operation allows an authorized Operator or Administrator to enable all
2099 configured Printer objects (i.e., Job processing services) on the target System object. If no
2100 Printers are configured on the System, then the System MUST return a “status-code” of
2101 'successful-ok'.

2102 This operation is semantically equivalent to the EnableAllServices operation defined in
2103 [PWG5108.06]. This operation is also semantically equivalent to a sequence of Enable-
2104 Printer operations [RFC3398] to each configured Printer object.

2105 If accepted, the System MUST enable each configured Printer with “printer-is-accepting-
2106 jobs” set to ‘true’ but the value of “printer-state” or “printer-state-reasons” is not affected by
2107 the Enable-All-Printers operation. This operation does not change the System state.

2108 **6.3.6.1 Enable-All-Printers Request**

2109 The following groups of attributes are part of a Enable-All-Printers request.

2110 Group 1: Operation Attributes

2111 “attributes-charset” (charset) and
2112 “attributes-natural-language” (naturalLanguage):

2113 The Client MUST supply and the System MUST support both of these
2114 attributes.

2115 “system-uri” (uri):

2116 The Client MUST supply and the System MUST support the “system-uri”
2117 operation attribute which is the target System for the operation.

2118 “requesting-user-name” (name(MAX)) and
2119 “requesting-user-uri” (uri) and
2120 “requesting-user-vcard” (1setOf text(MAX)):

2121 The Client SHOULD supply and the System MUST support all three of these
2122 attributes.

2123 “system-message-from-operator” (text(127)):

2124 The Client MAY supply and the System MUST support this attribute.

2125 6.3.6.2 Enable-All-Printers Response

2126 The following groups of attributes are part of a Enable-All-Printers response.

2127 Group 1: Operation Attributes

2128 "attributes-charset" (charset) and
2129 "attributes-natural-language" (naturalLanguage):

2130 The System MUST return both of these attributes.

2131 "status-message" (text(255)) and/or
2132 "detailed-status-message" (text(MAX)):

2133 The System MAY return one or both of these attributes.

2134 Group 2: Unsupported Attributes

2135 See [RFC8011] for details on returning Unsupported Attributes.

2136 Groups 3-N: Printer Attributes

2137 See [RFC8011] for details on returning Printer Attributes.

2138 "printer-id" (integer(1:65535)):

2139 The System MUST return this attribute.

2140 "printer-uuid" (uri(45)):

2141 The System MUST return this attribute.

2142 "printer-xri-supported" (1setOf collection)

2143 The System MUST return this attribute.

2144 "printer-state" (type1 enum) and
2145 "printer-state-reasons" (1setOf type2 keyword) and
2146 "printer-is-accepting-jobs" (boolean):

2147 The System MUST return all three of these attributes.

2148 6.3.7 Get-Resources

2149 This REQUIRED operation allows an authorized Operator or Administrator to retrieve a
2150 filtered list of some or all of the Resource objects on the target System object. If no
2151 Resources match the specified filter criteria, then the System MUST return a "status-code"
2152 of 'successful-ok'. For Resources, the possible names of attribute groups for the "requested-
2153 attributes" operation attribute are:

- 2154 'resource-description': The subset of Resource Description attributes.
- 2155 'resource-status': The subset of Resource Status attributes.
- 2156 'all': All Resource attributes.
- 2157 This operation is semantically equivalent to the ListResources operation defined in
2158 [PWG5108.03]. This operation is also semantically analogous the Get-Jobs operation
2159 defined in [RFC8011].
- 2160 If accepted, the System MUST return the “resource-id” for each matching Resource object.
2161 This operation does not change the state of any Resource or the System itself.
- 2162 **6.3.7.1 Get-Resources Request**
- 2163 The following groups of attributes are part of a Get-Resources request.
- 2164 Group 1: Operation Attributes
- 2165 "attributes-charset" (charset) and
2166 "attributes-natural-language" (naturalLanguage):
- 2167 The Client MUST supply and the System MUST support both of these
2168 attributes.
- 2169 “system-uri” (uri):
- 2170 The Client MUST supply and the System MUST support the “system-uri”
2171 operation attribute which is the target System for the operation.
- 2172 “resource-ids (1setOf (integer(1:MAX)))”:
- 2173 The Client MAY supply and the System MUST support the “resource-ids”
2174 operation attribute which is the list of target Resources for the operation.
- 2175 "requesting-user-name" (name(MAX)) and
2176 "requesting-user-uri" (uri) and
2177 “requesting-user-vcard” (1setOf text(MAX)):
- 2178 The Client SHOULD supply and the System MUST support all three of these
2179 attributes.
- 2180 “first-index” (integer(1:MAX)):
- 2181 The Client MAY supply and the System MUST support this attribute.
- 2182 "limit" (integer(1:MAX)):

2183 The Client MAY supply and the System MUST support this attribute.

2184 "requested-attributes" (1setOf type2 keyword):

2185 The Client MAY supply and the System MUST support this attribute. If this
2186 operation attribute is NOT supplied, then the System MUST only return the
2187 value of the "system-configured-resources" entry for each selected
2188 Resource. See section "system-configured-resources" in section 7.3 System
2189 Status Attributes.

2190 "resource-formats" (1setOf (mimeMediaType)):

2191 The Client MAY supply and the System MUST support this attribute. If this
2192 operation attribute is supplied, then the System MUST return the attributes
2193 and values for the selected Resources. See "resource-format" in section 7.7
2194 Resource Status Attributes.

2195 "resource-states" (1setOf (type1 enum)):

2196 The Client MAY supply and the System MUST support this attribute. If this
2197 operation attribute is supplied, then the System MUST return the attributes
2198 and values for the selected Resources. See "resource-state" in section 7.7
2199 Resource Status Attributes.

2200 "resource-types" (1setOf (type2 keyword)):

2201 The Client MAY supply and the System MUST support this attribute. If this
2202 operation attribute is supplied, then the System MUST return the attributes
2203 and values for the selected Resources. See "resource-type" in section 7.7
2204 Resource Status Attributes.

2205 6.3.7.2 Get-Resources Response

2206 The following groups of attributes are part of a Get-Resources response. The System returns
2207 a Get-Resources operation response to the Client up to the number specified by the "limit"
2208 operation attribute that match the filter criteria as supplied by the Client in the request.

2209 Group 1: Operation Attributes

2210 "attributes-charset" (charset) and
2211 "attributes-natural-language" (naturalLanguage):

2212 The System MUST return both of these attributes, unless no Printers match
2213 the filter criteria specified by the Client.

2214 "status-message" (text(255)) and/or
2215 "detailed-status-message" (text(MAX)):

2216 The System MAY return one or both of these attributes.

2217 Group 2: Unsupported Attributes

2218 See [RFC8011] for details on returning Unsupported Attributes.

2219 Groups 3 to N: Resource Attributes

2220 See [RFC8011] for details on returning analogous Printer Attributes.

2221 “resource-id” (integer(1:MAX)):

2222 The System MUST return this attribute.

2223 “resource-uuid” (uri(45)):

2224 The System MUST return this attribute.

2225 “resource-state” (type1 enum) and

2226 “resource-state-reasons” (1setOf type2 keyword):

2227 The System MUST return both of these attributes.

2228 6.3.8 Get-System-Attributes

2229 This REQUIRED operation allows an authorized Operator or Administrator to retrieve some
2230 or all of the attributes the target System object. For the System, the possible names of
2231 attribute groups for the “requested-attributes” operation attribute are:

2232 ‘resource-template’: The subset of Resource Template attributes.

2233 ‘system-description’: The subset of System Description attributes.

2234 ‘system-status’: The subset of System Status attributes.

2235 ‘all’: All System attributes.

2236 This operation is semantically equivalent to the GetSystemElements operation defined in
2237 [PWG5108.06]. This operation is also semantically analogous the Get-Job-Attributes and
2238 Get-Printer-Attributes operations defined in [RFC8011].

2239 If accepted, the System MUST return the requested attributes for the target System object.

2240 This operation does not change the state of the System itself.

2241 6.3.8.1 Get-System-Attributes Request

2242 The following groups of attributes are part of a Get-System-Attributes request.

2243 Group 1: Operation Attributes

- 2244 "attributes-charset" (charset) and
2245 "attributes-natural-language" (naturalLanguage):
- 2246 The Client MUST supply and the System MUST support both of these
2247 attributes.
- 2248 "system-uri" (uri):
- 2249 The Client MUST supply and the System MUST support the "system-uri"
2250 operation attribute which is the target System for the operation.
- 2251 "requesting-user-name" (name(MAX)) and
2252 "requesting-user-uri" (uri) and
2253 "requesting-user-vcard" (1setOf text(MAX)):
- 2254 The Client SHOULD supply and the System MUST support all three of these
2255 attributes.
- 2256 "requested-attributes" (1setOf type2 keyword):
- 2257 The Client MAY supply and the System MUST support this attribute. If this
2258 operation attribute is NOT supplied, then the System MUST return all of the
2259 System attributes except for "power-[xxx]" (System power details), "system-
2260 configured-printers" and "system-configured-resources". See sections
2261 "power-[xxx]" in section 7.2 System Description Attributes. See also sections
2262 "power-[xxx]", "system-configured-printers" and "system-configured-
2263 resources" in section 7.3 System Status Attributes.
- 2264 **6.3.8.2 Get-System-Attributes Response**
- 2265 The following groups of attributes are part of a Get-System-Attributes response.
- 2266 Group 1: Operation Attributes
- 2267 "attributes-charset" (charset) and
2268 "attributes-natural-language" (naturalLanguage):
- 2269 The System MUST return both of these attributes.
- 2270 "status-message" (text(255)) and/or
2271 "detailed-status-message" (text(MAX)):
- 2272 The System MAY return one or both of these attributes.
- 2273 Group 2: Unsupported Attributes
- 2274 See [RFC8011] for details on returning Unsupported Attributes.

2275 Group 3: System Attributes

2276 See [RFC8011] for details on returning analogous Printer Attributes.

2277 “system-uuid” (uri(45)):

2278 The System MUST return this attribute.

2279 “system-xri-supported” (1setOf collection)

2280 The System MUST return this attribute.

2281 “system-state” (type1 enum) and

2282 “system-state-reasons” (1setOf type2 keyword):

2283 The System MUST return both of these attributes.

2284 **6.3.9 Get-System-Supported-Values**

2285 This REQUIRED operation allows an authorized Operator or Administrator to request the
2286 values that the System allows in the Set-System-Attributes operation for “xxx-supported”
2287 attributes. For the System, the possible names of attribute groups for the “requested-
2288 attributes” operation attribute are:

2289 'resource-template': The subset of Resource Template attributes.

2290 'system-description': The subset of System Description attributes.

2291 'all': All System attributes.

2292 This operation is semantically analogous to the Get-Printer-Supported-Values operation
2293 defined in [RFC3380].

2294 If accepted, the System MUST return the requested attributes for the target System object.
2295 This operation does not change the state of the System itself.

2296 **6.3.9.1 Get-System-Supported-Values Request**

2297 The following groups of attributes are part of a Get-System-Supported-Values request.

2298 Group 1: Operation Attributes

2299 “attributes-charset” (charset) and

2300 “attributes-natural-language” (naturalLanguage):

2301 The Client MUST supply and the System MUST support both of these
2302 attributes.

2303 “system-uri” (uri):

- 2304 The Client MUST supply and the System MUST support the “system-uri”
2305 operation attribute which is the target System for the operation.
- 2306 “requesting-user-name” (name(MAX)) and
2307 “requesting-user-uri” (uri) and
2308 “requesting-user-vcard” (1setOf text(MAX)):
- 2309 The Client SHOULD supply and the System MUST support all three of these
2310 attributes.
- 2311 “requested-attributes” (1setOf type2 keyword):
- 2312 The Client MAY supply and the System MUST support this attribute. If this
2313 operation attribute is NOT supplied, then the System MUST return all of the
2314 System “xxx-supported” attributes.
- 2315 **6.3.9.2 Get-System-Supported-Values Response**
- 2316 The following groups of attributes are part of a Get-System-Supported-Values response.
- 2317 Group 1: Operation Attributes
- 2318 “attributes-charset” (charset) and
2319 “attributes-natural-language” (naturalLanguage):
- 2320 The System MUST return both of these attributes.
- 2321 “status-message” (text(255)) and/or
2322 “detailed-status-message” (text(MAX)):
- 2323 The System MAY return one or both of these attributes.
- 2324 Group 2: Unsupported Attributes
- 2325 See [RFC8011] for details on returning Unsupported Attributes.
- 2326 Group 3: System Attributes
- 2327 See [RFC8011] for details on returning analogous Printer Attributes.
- 2328 “system-uuid” (uri(45)):
- 2329 The System MUST return this attribute.
- 2330 “system-xri-supported” (1setOf collection)
- 2331 The System MUST return this attribute.

2332 "system-state" (type1 enum) and
2333 "system-state-reasons" (1setOf type2 keyword):

2334 The System MUST return both of these attributes.

2335 6.3.10 Pause-All-Printers

2336 This REQUIRED operation allows an authorized Operator or Administrator to pause all
2337 configured Printer objects (i.e., Job processing services) on the target System object. If no
2338 Printers are configured on the System, then the System MUST return a "status-code" of
2339 'successful-ok'.

2340 This operation is semantically equivalent to the PauseAllServices operation defined in
2341 [PWG5108.06]. This operation is also semantically equivalent to a sequence of Pause-
2342 Printer operations [RFC8011] to each configured Printer object.

2343 If accepted, the System MUST pause each configured Printer with the "printer-state" set to
2344 'stopped' and the 'paused' value added to "printer-state-reasons" (unless there is another
2345 reason for the Printer to stay in the 'idle' or 'processing' state, in which case the 'moving-to-
2346 paused' value is added to "printer-state-reasons"). This operation will change the state of
2347 the System itself to 'stopped' when all configured Printers have completed pause and moved
2348 to the 'stopped' state (with the 'moving-to-paused' value removed from their "printer-state-
2349 reasons").

2350 6.3.10.1 Pause-All-Printers Request

2351 The following groups of attributes are part of a Pause-All-Printers request.

2352 Group 1: Operation Attributes

2353 "attributes-charset" (charset) and
2354 "attributes-natural-language" (naturalLanguage):

2355 The Client MUST supply and the System MUST support both of these
2356 attributes.

2357 "system-uri" (uri):

2358 The Client MUST supply and the System MUST support the "system-uri"
2359 operation attribute which is the target System for the operation.

2360 "requesting-user-name" (name(MAX)) and
2361 "requesting-user-uri" (uri) and
2362 "requesting-user-vcard" (1setOf text(MAX)):

2363 The Client SHOULD supply and the System MUST support all three of these
2364 attributes.

2365 "system-message-from-operator" (text(127)):

2366 The Client MAY supply and the System MUST support this attribute.

2367 **6.3.10.2 Pause-All-Printers Response**

2368 The following groups of attributes are part of a Pause-All-Printers response.

2369 Group 1: Operation Attributes

2370 "attributes-charset" (charset) and
2371 "attributes-natural-language" (naturalLanguage):

2372 The System MUST return both of these attributes.

2373 "status-message" (text(255)) and/or
2374 "detailed-status-message" (text(MAX)):

2375 The System MAY return one or both of these attributes.

2376 Group 2: Unsupported Attributes

2377 See [RFC8011] for details on returning Unsupported Attributes.

2378 Groups 3-N: Printer Attributes

2379 See [RFC8011] for details on returning Printer Attributes.

2380 "printer-id" (integer(1:65535)):

2381 The System MUST return this attribute.

2382 "printer-uuid" (uri(45)):

2383 The System MUST return this attribute.

2384 "printer-xri-supported" (1setOf collection)

2385 The System MUST return this attribute.

2386 "printer-state" (type1 enum) and
2387 "printer-state-reasons" (1setOf type2 keyword) and
2388 "printer-is-accepting-jobs" (boolean):

2389 The System MUST return all three of these attributes.

2390 Group N+1: System Attributes

2391 See [RFC8011] and [RFC3380] for details on returning analogous Printer Attributes.

2392 “system-uuid” (uri(45)):

2393 The System MUST return this attribute.

2394 “system-xri-supported” (1setOf collection)

2395 The System MUST return this attribute.

2396 “system-state” (type1 enum) and

2397 “system-state-reasons” (1setOf type2 keyword):

2398 The System MUST return both of these attributes.

2399 **6.3.11 Pause-All-Printers-After-Current-Job**

2400 This REQUIRED operation allows an authorized Operator or Administrator to pause all
2401 configured Printer objects (i.e., Job processing services) on the target System object after
2402 all currently processing Jobs have completed (but prevent new Jobs from starting). If no
2403 Printers are configured on the System, then the System MUST return a “status-code” of
2404 'successful-ok'.

2405 This operation is semantically equivalent to the PauseAllServicesAfterCurrentJob operation
2406 defined in [PWG5108.06]. This operation is also semantically equivalent to a sequence of
2407 Pause-Printer operations [RFC8011] to each configured Printer object.

2408 If accepted, the System MUST pause each configured Printer with the “printer-state” set to
2409 'stopped' and the 'paused' value added to “printer-state-reasons” (unless there is another
2410 reason for the Printer to stay in the 'idle' or 'processing' state, in which case the 'moving-to-
2411 paused' value is added to “printer-state-reasons”) after all currently Processing Jobs have
2412 completed. This operation will change the state of the System itself to 'stopped' when all
2413 configured Printers have completed pause and moved to the 'stopped' state (with the 'moving-
2414 to-paused' value removed from their “printer-state-reasons”).

2415 **6.3.11.1 Pause-All-Printers-After-Current-Job Request**

2416 The following groups of attributes are part of a Pause-All-Printers-After-Current-Job request.

2417 Group 1: Operation Attributes

2418 “attributes-charset” (charset) and

2419 “attributes-natural-language” (naturalLanguage):

2420 The Client MUST supply and the System MUST support both of these
2421 attributes.

2422 “system-uri” (uri):

- 2423 The Client MUST supply and the System MUST support the "system-uri"
2424 operation attribute which is the target System for the operation.
- 2425 "requesting-user-name" (name(MAX)) and
2426 "requesting-user-uri" (uri) and
2427 "requesting-user-vcard" (1setOf text(MAX)):
- 2428 The Client SHOULD supply and the System MUST support all three of these
2429 attributes.
- 2430 "system-message-from-operator" (text(127)):
- 2431 The Client MAY supply and the System MUST support this attribute.
- 2432 **6.3.11.2 Pause-All-Printers-After-Current-Job Response**
- 2433 The following groups of attributes are part of a Pause-All-Printers-After-Current-Job
2434 response.
- 2435 Group 1: Operation Attributes
- 2436 "attributes-charset" (charset) and
2437 "attributes-natural-language" (naturalLanguage):
- 2438 The System MUST return both of these attributes.
- 2439 "status-message" (text(255)) and/or
2440 "detailed-status-message" (text(MAX)):
- 2441 The System MAY return one or both of these attributes.
- 2442 Group 2: Unsupported Attributes
- 2443 See [RFC8011] for details on returning Unsupported Attributes.
- 2444 Groups 3-N: Printer Attributes
- 2445 See [RFC8011] for details on returning Printer Attributes.
- 2446 "printer-id" (integer(1:65535)):
- 2447 The System MUST return this attribute.
- 2448 "printer-uuid" (uri(45)):
- 2449 The System MUST return this attribute.
- 2450 "printer-xri-supported" (1setOf collection)

2451 The System MUST return this attribute.

2452 “printer-state” (type1 enum) and
2453 “printer-state-reasons” (1setOf type2 keyword) and
2454 “printer-is-accepting-jobs” (boolean):

2455 The System MUST return all three of these attributes.

2456 Group N+1: System Attributes

2457 See [RFC8011] and [RFC3380] for details on returning analogous Printer Attributes.

2458 “system-uuid” (uri(45)):

2459 The System MUST return this attribute.

2460 “system-xri-supported” (1setOf collection)

2461 The System MUST return this attribute.

2462 “system-state” (type1 enum) and
2463 “system-state-reasons” (1setOf type2 keyword):

2464 The System MUST return both of these attributes.

2465 **6.3.12 Register-Output-Device**

2466 This CONDITIONALLY REQUIRED operation allows an authorized Proxy to register an
2467 Output Device with the target System object. Systems that conform to the IPP Shared
2468 Infrastructure Extensions [PWG5100.18] MUST support this operation.

2469 The Register-Output-Device operation returns a Printer object of the specified type that
2470 accepts Jobs on behalf of the Output Device. How these Printer objects are created or
2471 provisioned is implementation-specific.

2472 Access Rights: The authenticated user (see section 9.3 of [RFC8011]) performing this
2473 operation MUST be a Proxy of the System object. Otherwise, the System MUST reject the
2474 operation and return 'client-error-forbidden', 'client-error-not-authenticated', or 'client-error-
2475 not-authorized' as appropriate.

2476 **6.3.12.1 Register-Output-Device Request**

2477 The following groups of attributes are part of a Register-Output-Device request.

2478 Group 1: Operation Attributes

2479 “attributes-charset” (charset) and
2480 “attributes-natural-language” (naturalLanguage):

- 2481 The Client MUST supply and the System MUST support both of these
2482 attributes.
- 2483 "system-uri" (uri):
- 2484 The Client MUST supply and the System MUST support the "system-uri"
2485 operation attribute which is the target System for the operation.
- 2486 "output-device-uuid" (uri(45)):
- 2487 The Proxy MUST supply this attribute and the Infrastructure Printer MUST
2488 support this attribute. It provides the identity of the Output Device for the
2489 request.
- 2490 "requesting-user-name" (name(MAX)) and
2491 "requesting-user-uri" (uri) and
2492 "requesting-user-vcard" (1setOf text(MAX)):
- 2493 The Client SHOULD supply and the System MUST support all three of these
2494 attributes.
- 2495 "printer-service-type" (type2 keyword):
- 2496 The Client MUST supply and the System MUST support this attribute.
- 2497 "printer-xri-requested" (1setOf collection):
- 2498 The Client MAY supply and the System MUST support this attribute.
- 2499 **6.3.12.2 Register-Output-Device Response**
- 2500 The following groups of attributes are part of a Register-Output-Device response.
- 2501 Group 1: Operation Attributes
- 2502 "attributes-charset" (charset) and
2503 "attributes-natural-language" (naturalLanguage):
- 2504 The System MUST return both of these attributes.
- 2505 "status-message" (text(255)) and/or
2506 "detailed-status-message" (text(MAX)):
- 2507 The System MAY return one or both of these attributes.
- 2508 Group 2: Unsupported Attributes
- 2509 See [RFC8011] for details on returning Unsupported Attributes.

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(uri(45)):¶
The Proxy MUST supply this attribute and the
Infrastructure Printer MUST support this
attribute. It provides the identity of the Output
Device for the request.¶

2516 Group 3: Printer Attributes

2517 See [RFC8011] for details on returning Printer Attributes.

2518 “printer-id” (integer(1:65535)):

2519 The System MUST return this attribute.

2520 “printer-uuid” (uri(45)):

2521 The System MUST return this attribute.

2522 “printer-xri-supported” (1setOf collection)

2523 The System MUST return this attribute.

2524 “printer-state” (type1 enum) and

2525 “printer-state-reasons” (1setOf type2 keyword) and

2526 “printer-is-accepting-jobs” (boolean):

2527 The System MUST return all three of these attributes.

2528 **6.3.13 Restart-System**

2529 This REQUIRED operation allows an authorized Operator or Administrator to restart an
2530 entire System with existing firmware or different firmware (from Install-Resource after
2531 Create-Resource and Send-Resource-Data). Figure 1 shows how this operation is
2532 processed.

2533 This operation can be used to restore the System to a known state when one or more
2534 configured Printers have become non-responsive or corrupted. This operation can also be
2535 used periodically to accomplish “software rejuvenation”, a proactive technique that was
2536 identified as a cost-effective solution during research at the AT&T Bell Laboratories on fault-
2537 tolerant software in the 1990s [REJUVENATION].

2538 This operation is semantically analogous to the Startup-Printer operation defined in
2539 [RFC3998].

2540 If accepted, the System MUST:

- 2541 1) Send a response to the Client (to confirm acceptance of the operation) that includes the
2542 “restart-get-interval (integer(0:MAX))” (section 7.1.19) operation attribute;
2543 4. Shutdown each configured Printer;
2544 5. Install pending Resources;
2545 6. Restart the entire System; and
2546 7. Startup each configured Printer with the “printer-state” set to ‘stopped’ (unless
2547 there is another reason for the Printer to stay in the ‘idle’ or ‘processing’ state, in
2548 which case the ‘starting’ value is added to “printer-state-reasons”), “printer-is-

2549 accepting-jobs” set to ‘false’ (i.e., no incoming Jobs accepted), and the ‘paused’
2550 value added to “printer-state-reasons” (i.e., no Job processing output allowed).

2551 This operation will change the “system-state” of the System itself to ‘stopped’ when all
2552 Printers have completed shutdown and later started and moved to the ‘stopped’ state with
2553 the ‘starting’ value removed from “printer-state-reasons”.

2554 The Client can later send one or more Set-System-Attributes operations to modify the
2555 configuration of the System.

2556 Note 1: After a restart, all Printers must be enabled and resumed to continue processing
2557 Jobs. This is typically done using the Enable-All-Printers and Resume-All-Printers
2558 operations.

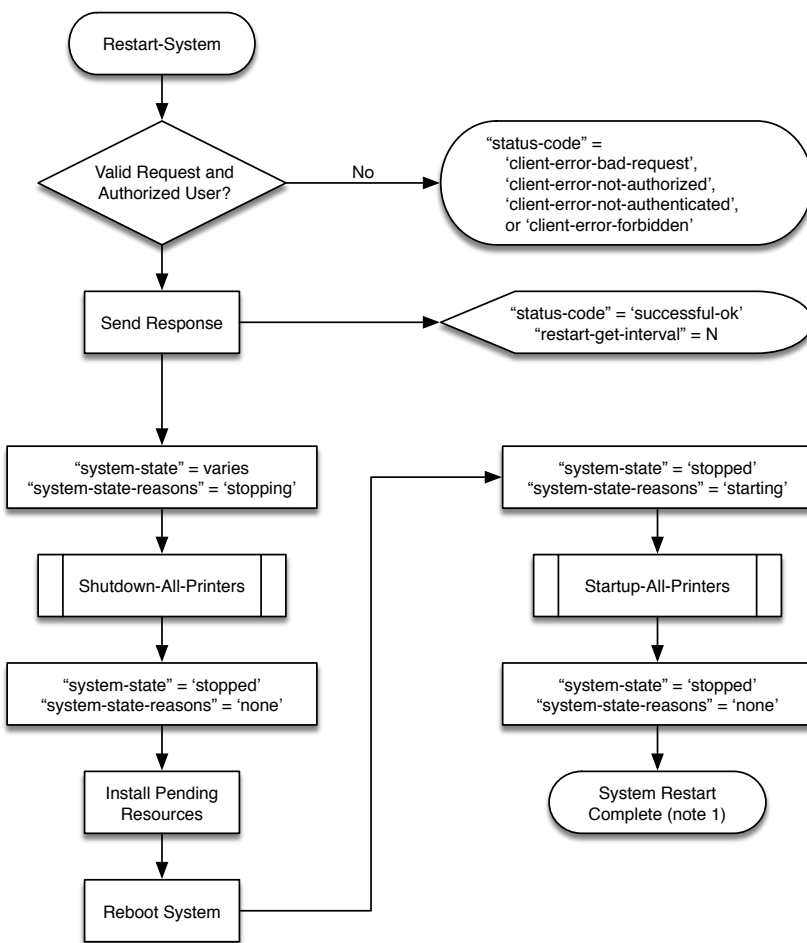


Figure 1 - Restart-System Flow Chart

2562 6.3.13.1 Restart-System Request

2563 The following groups of attributes are part of a Restart-System request.

2564 Group 1: Operation Attributes

2565 "attributes-charset" (charset) and
2566 "attributes-natural-language" (naturalLanguage):

2567 The Client MUST supply and the System MUST support both of these
2568 attributes.

2569 "system-uri" (uri):

2570 The Client MUST supply and the System MUST support the "system-uri"
2571 operation attribute which is the target System for the operation.

2572 "requesting-user-name" (name(MAX)) and
2573 "requesting-user-uri" (uri) and
2574 "requesting-user-vcard" (1setOf text(MAX)):

2575 The Client SHOULD supply and the System MUST support all three of these
2576 attributes.

2577 "system-message-from-operator" (text(127)):

2578 The Client MAY supply and the System MUST support this attribute.

2579 6.3.13.2 Restart-System Response

2580 The following groups of attributes are part of a Restart-System response.

2581 Group 1: Operation Attributes

2582 "attributes-charset" (charset) and
2583 "attributes-natural-language" (naturalLanguage):

2584 The System MUST return both of these attributes.

2585 "status-message" (text(255)) and/or
2586 "detailed-status-message" (text(MAX)):

2587 The System MAY return one or both of these attributes.

2588 "restart-get-interval" (integer(0:MAX)):

2589 If successful, the System MUST return this attribute which contains the
2590 number of seconds that the Client SHOULD wait before trying a Get-System-
2591 Attributes operation to confirm the completion of the System restart.

2592 Group 2: Unsupported Attributes

2593 See [RFC8011] for details on returning Unsupported Attributes.

2594 Group 3: System Attributes

2595 See [RFC8011] and [RFC3380] for details on returning analogous Printer Attributes.

2596 “system-uuid” (uri(45)):

2597 The System MUST return this attribute.

2598 “system-xri-supported” (1setOf collection)

2599 The System MUST return this attribute.

2600 “system-state” (type1 enum) and

2601 “system-state-reasons” (1setOf type2 keyword):

2602 The System MUST return both of these attributes.

2603 **6.3.14 Resume-All-Printers**

2604 This REQUIRED operation allows an authorized Operator or Administrator to resume all
2605 configured Printer objects (i.e., Job processing services) on the target System object. If no
2606 Printers are configured on the System, then the System MUST return a “status-code” of
2607 'successful-ok'.

2608 This operation is semantically equivalent to the ResumeAllServices operation defined in
2609 [PWG5108.06]. This operation is also semantically equivalent to a sequence of Resume-
2610 Printer operations [RFC8011] to each configured Printer object.

2611 If accepted, the System MUST resume each configured Printer with the “printer-state” set to
2612 ‘idle’ and the ‘paused’ value removed from “printer-state-reasons” (unless there is another
2613 reason for the Printer to stay in the ‘stopped’ state, in which case the ‘resuming’ value is
2614 added to “printer-state-reasons”). This operation will change the “system-state” of the
2615 System itself to ‘idle’ when all configured Printers have completed resume and moved to the
2616 ‘idle’ state (with the ‘resuming’ value removed from “printer-state-reasons”).

2617 **6.3.14.1 Resume-All-Printers Request**

2618 The following groups of attributes are part of a Resume-All-Printers request.

2619 Group 1: Operation Attributes

2620 "attributes-charset" (charset) and
2621 "attributes-natural-language" (naturalLanguage):

2622 The Client MUST supply and the System MUST support both of these
2623 attributes.

2624 "system-uri" (uri):

2625 The Client MUST supply and the System MUST support the "system-uri"
2626 operation attribute which is the target System for the operation.

2627 "requesting-user-name" (name(MAX)) and
2628 "requesting-user-uri" (uri) and
2629 "requesting-user-vcard" (1setOf text(MAX)):

2630 The Client SHOULD supply and the System MUST support all three of these
2631 attributes.

2632 "system-message-from-operator" (text(127)):

2633 The Client MAY supply and the System MUST support this attribute.

2634 **6.3.14.2 Resume-All-Printers Response**

2635 The following groups of attributes are part of a Resume-All-Printers response.

2636 Group 1: Operation Attributes

2637 "attributes-charset" (charset) and
2638 "attributes-natural-language" (naturalLanguage):

2639 The System MUST return both of these attributes.

2640 "status-message" (text(255)) and/or
2641 "detailed-status-message" (text(MAX)):

2642 The System MAY return one or both of these attributes.

2643 Group 2: Unsupported Attributes

2644 See [RFC8011] for details on returning Unsupported Attributes.

2645 Groups 3-N: Printer Attributes

2646 See [RFC8011] for details on returning Printer Attributes.

2647 "printer-id" (integer(1:65535)):

2648 The System MUST return this attribute.

2649 “printer-uuid” (uri(45)):

2650 The System MUST return this attribute.

2651 “printer-xri-supported” (1setOf collection)

2652 The System MUST return this attribute.

2653 “printer-state” (type1 enum) and

2654 “printer-state-reasons” (1setOf type2 keyword) and

2655 “printer-is-accepting-jobs” (boolean):

2656 The System MUST return all three of these attributes.

2657 Group N+1: System Attributes

2658 See [RFC8011] and [RFC3380] for details on returning analogous Printer Attributes.

2659 “system-uuid” (uri(45)):

2660 The System MUST return this attribute.

2661 “system-xri-supported” (1setOf collection)

2662 The System MUST return this attribute.

2663 “system-state” (type1 enum) and

2664 “system-state-reasons” (1setOf type2 keyword):

2665 The System MUST return both of these attributes.

2666 6.3.15 Set-System-Attributes

2667 This REQUIRED operation allows an authorized Operator or Administrator to set the values
2668 of System Description attributes listed in “system-settable-attributes-supported” (see section
2669 7.2). For Client support for localization see “system-strings-languages-supported” and
2670 “system-strings-uri” in section 7.2. If one or more of the supplied System Description
2671 attributes and/or values are not actually settable, then the System MUST reject the entire
2672 request, indicating which attributes and/or values cannot be set, and return a “status-code”
2673 of 'client-error-not-possible'. See additional validation rules in section 4.1 Set-Printer-
2674 Attributes of [RFC3380].

2675 This operation is semantically equivalent to the SetSystemElements operation defined in
2676 [PWG5108.06] and semantically analogous to the Set-Printer-Attributes operation defined
2677 in [RFC3380].

2678 If accepted, the System MUST set every supplied System Description attribute to exactly
2679 the supplied value. The System MUST NOT partially set a subset of the supplied attributes.

2680 The System MUST accept this operation when the supplied attributes are valid and the value
2681 of “system-state” (see section 7.3) is either ‘idle’ or ‘stopped’. The System SHOULD accept
2682 this operation when the supplied attributes are valid and the value of “system-state” (see
2683 section 7.3) is ‘processing’. This operation does not change the “system-state” of the System
2684 itself.

2685 **6.3.15.1 Set-System-Attributes Request**

2686 The following groups of attributes are part of a Set-System-Attributes request.

2687 Group 1: Operation Attributes

2688 "attributes-charset" (charset) and
2689 "attributes-natural-language" (naturalLanguage):

2690 The Client MUST supply and the System MUST support both of these
2691 attributes.

2692 “system-uri” (uri):

2693 The Client MUST supply and the System MUST support the “system-uri”
2694 operation attribute which is the target System for the operation.

2695 "requesting-user-name" (name(MAX)) and
2696 "requesting-user-uri" (uri) and
2697 "requesting-user-vcard" (1setOf text(MAX)):

2698 The Client SHOULD supply and the System MUST support all three of these
2699 attributes.

2700 Group 2: System Attributes

2701 The IPP Client MUST supply a set of System attributes with one or more values
2702 (including explicitly allowed out-of-band values) as defined in [RFC8011] and
2703 section 7.2 of this document.

2704 See [RFC3380] for details on setting analogous Printer Attributes.

2705 **6.3.15.2 Set-System-Attributes Response**

2706 The following groups of attributes are part of a Set-System-Attributes response.

2707 Group 1: Operation Attributes

2708 "attributes-charset" (charset) and
2709 "attributes-natural-language" (naturalLanguage):

2710 The System MUST return both of these attributes.

- 2711 "status-message" (text(255)) and/or
2712 "detailed-status-message" (text(MAX)):
- 2713 The System MAY return one or both of these attributes.
- 2714 Group 2: Unsupported Attributes
- 2715 See [RFC8011] for details on returning Unsupported Attributes.
- 2716 Group 3: System Attributes
- 2717 See [RFC8011] and [RFC3380] for details on returning analogous Printer Attributes.
- 2718 "system-uuid" (uri(45)):
- 2719 The System MUST return this attribute.
- 2720 "system-xri-supported" (1setOf collection)
- 2721 The System MUST return this attribute.
- 2722 "system-state" (type1 enum) and
2723 "system-state-reasons" (1setOf type2 keyword):
- 2724 The System MUST return both of these attributes.
- 2725 **6.3.16 Shutdown-All-Printers**
- 2726 This REQUIRED operation allows an authorized Operator or Administrator to shutdown all
2727 configured Printer objects (i.e., Job processing services) on the target System object. If no
2728 Printers are configured on the System, then the System MUST return a "status-code" of
2729 'successful-ok'.
- 2730 This operation is semantically equivalent to the ShutdownAllServices operation defined in
2731 [PWG5108.06]. This operation is also semantically equivalent to a sequence of Shutdown-
2732 Printer operations [RFC3998] to each configured Printer object (except for the resulting
2733 "printer-state" of 'stopped' rather than 'idle').
- 2734 If accepted, the System MUST shutdown each configured Printer that has not already been
2735 shut down with the "printer-state" set to 'stopped' (unless there is another reason for the
2736 Printer to stay in the 'idle' or 'processing' state, in which case the 'stopping' value is added
2737 to "printer-state-reasons") and the 'shutdown' value added to "printer-state-reasons". This
2738 operation will change the "system-state" of the System itself to 'stopped' when configured
2739 Printers have completed shutdown and moved to the 'stopped' state with the 'stopping' value
2740 removed from "printer-state-reasons".

2741 The Client can later send a Startup-All-Printers operation (preferred) or a sequence of
2742 Startup-One-Printer operations (preferred) or Startup-Printer operations [RFC3998] to each
2743 Printer to start up all of the configured Printers.

2744 **6.3.16.1 Shutdown-All-Printers Request**

2745 The following groups of attributes are part of a Shutdown-All-Printers request.

2746 Group 1: Operation Attributes

2747 "attributes-charset" (charset) and
2748 "attributes-natural-language" (naturalLanguage):

2749 The Client MUST supply and the System MUST support both of these
2750 attributes.

2751 "system-uri" (uri):

2752 The Client MUST supply and the System MUST support the "system-uri"
2753 operation attribute which is the target System for the operation.

2754 "requesting-user-name" (name(MAX)) and
2755 "requesting-user-uri" (uri) and
2756 "requesting-user-vcard" (1setOf text(1023)):

2757 The Client SHOULD supply and the System MUST support all three of these
2758 attributes.

2759 "system-message-from-operator" (text(127)):

2760 The Client MAY supply and the System MUST support this attribute.

2761 **6.3.16.2 Shutdown-All-Printers Response**

2762 The following groups of attributes are part of a Shutdown-All-Printers response.

2763 Group 1: Operation Attributes

2764 "attributes-charset" (charset) and
2765 "attributes-natural-language" (naturalLanguage):

2766 The System MUST return both of these attributes.

2767 "status-message" (text(255)) and/or
2768 "detailed-status-message" (text(MAX)):

2769 The System MAY return one or both of these attributes.

2770 Group 2: Unsupported Attributes

2771 See [RFC8011] for details on returning Unsupported Attributes.

2772 Groups 3-N: Printer Attributes

2773 See [RFC8011] for details on returning Printer Attributes.

2774 “printer-id” (integer(1:65535)):

2775 The System MUST return this attribute.

2776 “printer-uuid” (uri(45)):

2777 The System MUST return this attribute.

2778 “printer-xri-supported” (1setOf collection)

2779 The System MUST return this attribute.

2780 “printer-state” (type1 enum) and

2781 “printer-state-reasons” (1setOf type2 keyword) and

2782 “printer-is-accepting-jobs” (boolean):

2783 The System MUST return all three of these attributes.

2784 Group N+1: System Attributes

2785 See [RFC8011] and [RFC3380] for details on returning analogous Printer Attributes.

2786 “system-uuid” (uri(45)):

2787 The System MUST return this attribute.

2788 “system-xri-supported” (1setOf collection)

2789 The System MUST return this attribute.

2790 “system-state” (type1 enum) and

2791 “system-state-reasons” (1setOf type2 keyword):

2792 The System MUST return both of these attributes.

2793 **6.3.17 Startup-All-Printers**

2794 This REQUIRED operation allows an authorized Operator or Administrator to startup or
2795 restart all configured Printer objects (i.e., Job processing services) on the target System
2796 object. If no Printers are configured on the System, then the System MUST return a “status-
2797 code” of 'successful-ok'.

2798 This operation is semantically equivalent to the StartupAllServices operation defined in
2799 [PWG5108.06]. This operation is also semantically equivalent to a sequence of Startup-One-
2800 Printer operations for each configured Printer object.

2801 If accepted, the System MUST startup or restart each configured Printer with the “printer-
2802 state” set to ‘stopped’ (unless there is another reason for the Printer to stay in the ‘idle’ or
2803 ‘processing’ state, in which case the ‘starting’ value is added to “printer-state-reasons”),
2804 “printer-is-accepting-jobs” set to ‘false’ (i.e., no incoming Jobs accepted), and the ‘paused’
2805 value added to “printer-state-reasons” (i.e., no Job processing output allowed). This
2806 operation will change the “system-state” of the System itself to ‘stopped’ when all Printers
2807 have completed startup and moved to the ‘stopped’ state with the ‘starting’ value removed
2808 from “printer-state-reasons”.

2809 The Client can later send one or more Set-Printer-Attributes operations to modify the
2810 configuration of each Printer, followed by Resume-Printer (i.e., remove ‘paused’ from
2811 “printer-state-reasons”) and Enable-Printer (i.e., change “printer-is-accepting-jobs” to ‘true’).

2812 **6.3.17.1 Startup-All-Printers Request**

2813 The following groups of attributes are part of a Startup-All-Printers request.

2814 Group 1: Operation Attributes

2815 "attributes-charset" (charset) and
2816 "attributes-natural-language" (naturalLanguage):

2817 The Client MUST supply and the System MUST support both of these
2818 attributes.

2819 “system-uri” (uri):

2820 The Client MUST supply and the System MUST support the “system-uri”
2821 operation attribute which is the target System for the operation.

2822 "requesting-user-name" (name(MAX)) and
2823 "requesting-user-uri" (uri) and
2824 “requesting-user-vcard” (1setOf text(MAX)):

2825 The Client SHOULD supply and the System MUST support all three of these
2826 attributes.

2827 “system-message-from-operator” (text(127)):

2828 The Client MAY supply and the System MUST support this attribute.

2829 **6.3.17.2 Startup-All-Printers Response**

2830 The following groups of attributes are part of a Startup-All-Printers response.

2831 Group 1: Operation Attributes

2832 "attributes-charset" (charset) and
2833 "attributes-natural-language" (naturalLanguage):

2834 The System MUST return both of these attributes.

2835 "status-message" (text(255)) and/or
2836 "detailed-status-message" (text(MAX)):

2837 The System MAY return one or both of these attributes.

2838 Group 2: Unsupported Attributes

2839 See [RFC8011] for details on returning Unsupported Attributes.

2840 Groups 3-N: Printer Attributes

2841 See [RFC8011] for details on returning Printer Attributes.

2842 "printer-id" (integer(1:65535)):

2843 The System MUST return this attribute.

2844 "printer-uuid" (uri(45)):

2845 The System MUST return this attribute.

2846 "printer-xri-supported" (1setOf collection)

2847 The System MUST return this attribute.

2848 "printer-state" (type1 enum) and
2849 "printer-state-reasons" (1setOf type2 keyword) and
2850 "printer-is-accepting-jobs" (boolean):

2851 The System MUST return all three of these attributes.

2852 Group N+1: System Attributes

2853 See [RFC8011] and [RFC3380] for details on returning analogous Printer Attributes.

2854 "system-uuid" (uri(45)):

2855 The System MUST return this attribute.

2856 "system-xri-supported" (1setOf collection)

2857 The System MUST return this attribute.

2858 “system-state” (type1 enum) and
2859 “system-state-reasons” (1setOf type2 keyword):
2860 The System MUST return both of these attributes.

2861 7. IPP Attributes

2862 7.1 Operation Attributes

2863 The following operation attributes can be applicable to one or more System, Printer,
2864 Resource, Job, or Subscription operations.

2865 7.1.1 job-resource-ids (1setOf integer(1:MAX))

2866 This operation attribute specifies a list of Printer resource IDs that are to be allocated to a
2867 created Job. The successfully allocated resource IDs are copied to the corresponding "job-
2868 resource-ids" Job Status attribute (section 7.4.2).

2869 7.1.2 printer-id (integer(1:65535))

2870 This operation attribute specifies the target Printer object as used in Get-Printer-Attributes
2871 and some other Printer operations defined in section 6 and is semantically equivalent to the
2872 ServiceSummary element ID defined in [PWG5108.06] and semantically analogous to the
2873 “job-id” attribute defined in [RFC8011]. See “printer-id” in section 7.5 Printer Status
2874 Attributes.

2875 7.1.3 printer-ids (1setOf (integer(1:65535)))

2876 This operation attribute specifies the list of “printer-id” values for target Printer objects as
2877 used in Get-Printers and some other Printer operations defined in section 6 and is
2878 semantically equivalent a list of the ServiceSummary element ID defined in [PWG5108.06]
2879 and semantically analogous a list of the “job-id” attribute defined in [RFC8011]. See “printer-
2880 id” in section 7.5 Printer Status Attributes.

2881 7.1.4 printer-geo-location (uri)

2882 This operation attribute specifies a filter for the applicable Printers as used in Get-Printers
2883 defined in section 6 and is semantically analogous to the “printer-geo-location” attribute
2884 defined in [PWG5100.13].

2885 7.1.5 printer-location (text(127))

2886 This operation attribute specifies a filter for the applicable Printers as used in Get-Printers
2887 defined in section 6 and is semantically analogous to the “printer-location” attribute defined
2888 in [RFC8011].

2889 7.1.6 printer-service-type (1setOf (type2 keyword))

2890 This operation attribute specifies the service type for a Printer as used in Create-Printer or
2891 a filter for the applicable Printers as used in Get-Printers defined in section 6 and is
2892 semantically equivalent to the ServiceSummary element ServiceType defined in
2893 [PWG5108.06]. See “printer-service-type” in section 7.5 Printer Status Attributes.

2894 7.1.7 printer-xri-requested (1setOf type2 collection)

2895 [This operation attribute specifies the type of authentication \("xri-authentication \(type2
2896 keyword\)" member attribute\) and security \("xri-security \(type2 keyword\)" member attribute\)
2897 that is wanted for newly created Printers using the Create-Printer operation \(section 6.3.1\).
2898 The "xri-uri \(uri\)" member attribute MUST NOT be included in the collection since the System
2899 assigns that value.](#)

2900 7.1.8 ~~requesting~~-user-vcard (1setOf text(MAX))

2901 This operation attribute contains the System, Printer, Resource, or Job Owner vCard
2902 [RFC6350] for a Set-System-Attributes, Create-Printer, Create-Resource, or Job Creation
2903 operation and is semantically analogous to the Service object's OwnerVCard defined in
2904 [PWG5108.01]. See “printer-owner-col” (section 7.4) and “resource-owner-col” (section 7.6)
2905 description attributes for updates via subsequent Set-Printer-Attributes or Set-Resource-
2906 Attributes operations.

2907 The recorded values System, Printer, Resource, or Job Owner MUST identify the most
2908 authenticated user information. As with “requesting-user-name” [RFC8011], the most
2909 authenticated user information is copied to the System, Printer, Resource, or Job object.

2910 7.1.9 resource-format (mimeMediaType)

2911 This operation attribute specifies the format for a Resource as used in Send-Resource-Data
2912 request or a filter for the applicable Resources as used in Get-Resources defined in section
2913 6 and is semantically equivalent to the ResourceFormat element defined in [PWG5108.03]
2914 and semantically analogous to the “document-format” attribute defined in [RFC8011]. See
2915 “resource-format” in section 7.7 Resource Status Attributes.

2916 7.1.10 resource-format-accepted (1setOf mimeMediaType)

2917 This operation attribute specifies the accepted formats for a Resource as used in Create-
2918 Resource response and is semantically analogous to the ResourceFormat element defined
2919 in [PWG5108.03] and semantically analogous to the “document-format” attribute defined in
2920 [RFC8011]. See “resource-format” in section 7.7 Resource Status Attributes.

2921 7.1.11 resource-formats (1setOf (mimeMediaType))

2922 This operation attribute specifies a filter for the applicable Resources as used in Get-
2923 Resources defined in section 6 and is semantically analogous to the ResourceFormat
2924 element defined in [PWG5108.03] and semantically analogous to the “document-format”

Commented [MS8]: Do we want this?

2925 attribute defined in [RFC8011]. See “resource-format” in section 7.7 Resource Status
2926 Attributes.

2927 **7.1.12 resource-id (integer(1:MAX))**

2928 This operation attribute specifies the target Resource object as used in Get-Resource-
2929 Attributes and other Resource operations defined in section 6 and is semantically equivalent
2930 to the ResourceId element defined in [PWG5108.03] and semantically analogous to the “job-
2931 id” attribute defined in [RFC8011]. See “resource-id” in section 7.7 Resource Status
2932 Attributes.

2933 **7.1.13 resource-ids (1setOf integer(1:MAX))**

2934 This operation attribute specifies the list of “resource-id” values for associated Resource
2935 objects as used in the Create-Printer and Allocate-Printer-Resources operations defined in
2936 section 6 or in a Job Creation operation (Create-Job, Print-Job, or Print-URI) defined in
2937 [RFC8011] and is semantically analogous to the “job-printer-uri” attribute defined in
2938 [RFC8011]. See “resource-id” in section 7.7 Resource Status Attributes.

2939 **7.1.14 resource-k-octets (integer(0:MAX))**

2940 This operation attribute specifies the size of the data for a Resource as used in Create-
2941 Resource/Send-Resource-Data defined in section 6 and is semantically analogous to the
2942 “job-k-octets” attribute defined in [RFC8011]. See “resource-k-octets” in section 7.7
2943 Resource Status Attributes.

2944 **7.1.15 resource-signature (1setOf octetString)**

2945 This operation attribute specifies an out-of-band digital signature for Resource data as used
2946 in Send-Resource-Data defined in section 6.2.5, when the particular Resource data format
2947 does not include an embedded digital signature.

2948 A Client MAY also supply this operation attribute with an out-of-band digital signature to
2949 request override of an embedded digital signature in the Resource data (e.g., when the
2950 embedded signature has been invalidated due to compromised keys, compromised
2951 algorithms, compromised CAs, etc.). An IPP System SHOULD support this method of
2952 signature override for long-term stability.

2953 See section 12 Security Considerations for details of digital signature handling in IPP System
2954 Service.

2955 **7.1.16 resource-states (1setOf (type1 enum))**

2956 This operation attribute specifies a filter for the applicable Resources as used in Get-
2957 Resources defined in section 6 and is semantically analogous to the “job-state” attribute
2958 defined in [RFC8011] and replaces the semantically analogous DateTimeAtExpiration
2959 (Resource lease time) and ResourceIsExpired elements defined in [PWG5108.03]. See
2960 “resource-state” in section 7.7 Resource Status Attributes.

2961 7.1.17 resource-type (type2 keyword)

2962 This operation attribute specifies a type for the new Resource as used in Create-Resource
2963 defined in section 6 and replaces the semantically analogous DateTimeAtExpiration
2964 (Resource lease time) element defined in [PWG5108.03]. See “resource-type” in section 7.7
2965 Resource Status Attributes.

2966 7.1.18 resource-types (1setOf (type2 keyword))

2967 This operation attribute specifies a filter for the applicable Resources as used in Get-
2968 Resources defined in section 6 and replaces the semantically analogous
2969 DateTimeAtExpiration (Resource lease time) element defined in [PWG5108.03]. See
2970 “resource-type” in section 7.7 Resource Status Attributes.

2971 7.1.19 restart-get-interval (integer(0:MAX))

2972 This operation attribute specifies an interval in seconds that the Client SHOULD wait before
2973 querying the System with a Get-System-Attributes operation to confirm completion of the
2974 restart requested by a Restart-System operation and is semantically analogous to the
2975 “notify-get-interval” attribute defined in [RFC3996].

2976 7.1.20 system-uri (uri)

2977 This operation attribute specifies the target System object as used in Get-Printers and all
2978 other operations defined in section 6 and is semantically analogous to the “printer-uri”
2979 attribute defined in [RFC8011] and semantically equivalent to the “SystemURI” attribute
2980 defined in [PWG5108.06].

2981 7.1.21 which-printers (type2 keyword):

2982 This operation attribute specifies a filter for the applicable Printers as used in Get-Printers
2983 defined in section 6 and is semantically analogous to the “which-jobs” attribute defined in
2984 [RFC8011].

2985 Standard keyword values for this attribute include:

2986 ‘accepting’: All Printers with “printer-state” of ‘idle’ or ‘processing’ and “printer-is-
2987 accepting-jobs” of ‘true’.

2988 ‘all’: All Printers configured on this System object, regardless of their state.

2989 ‘idle’: All Printers with “printer-state” of ‘idle’.

2990 ‘not-accepting’: All Printers with “printer-is-accepting-jobs” of ‘false’.

2991 ‘processing’: All Printers with “printer-state” of ‘processing’.

2992 'shutdown': All Printers with "printer-state" of 'stopped' and "printer-state-reasons"
2993 of 'shutdown'.

2994 'stopped': All Printers with "printer-state" of 'stopped', but do not have "printer-state-
2995 reasons" of 'shutdown' or 'testing'.

2996 'testing': All Printers with "printer-state" of 'stopped' and "printer-state-reasons" of
2997 testing'.

2998 7.2 System Description Attributes

2999 System Description attributes are typically READ-WRITE and can potentially be set by an
3000 Operator or Administrator using the Set-System-Attributes operation (see section 6).
3001 Writable System Description attributes are listed in the value of "system-settable-attributes-
3002 supported" (see section 7.2).

3003 7.2.1 Power States and Policies

3004 This specification imports (and renames for clarity and common usage) the normative
3005 definitions and semantics of System power states from the PWG Power Management Model
3006 for Imaging Systems 1.0 [PWG5106.4], which is aligned with DMTF CIM and ACPI power
3007 state definitions and semantics.

3008 7.2.1.1 IEEE 1621 Power Modes

3009 [IEEE1621] (which is primarily concerned with a simple user interface) defines 3 basic power
3010 modes: Off Mode, Sleep Mode, and On Mode. These power modes in turn can be qualified
3011 with "soft / hard", "light / deep", and "graceful" to describe specific power states (see the
3012 following sections on DMTF stable and ephemeral power states).

3013 Off Mode – the set of power states where incoming jobs cannot be accepted
3014 immediately and existing jobs cannot be processed immediately (i.e., without a long
3015 delay for a power state transition to On Mode).

3016 On Mode – the set of power states where incoming jobs can be accepted
3017 immediately and existing jobs can be processed immediately (i.e., with no delay for
3018 a power state transition).

3019 Sleep Mode – the set of power states where incoming jobs MAY be accepted
3020 immediately, but existing jobs cannot be processed immediately (i.e., without a
3021 short delay for a power state transition to On Mode).

3022 7.2.1.2 DMTF Stable Power States

3023 This specification imports (and renames for clarity and common usage) the normative
3024 definitions and semantics of the following DMTF CIM [DSP1027] stable power states. All

Commented [MS9]: DISCUSS: Should we make all of the type1 keywords into type1 enums with corresponding ordering since the values have an implied order and cannot be extended?

3025 other DMTF CIM power states are ephemeral (orderly shutdowns and power resets) and will
3026 eventually result in one of the stable power states defined below.

3027 'hibernate': DMTF "Hibernate (Off-Soft)" (7) and ACPI S4. The stable "Off Mode"
3028 power state where all kernel and application programs and data have been saved
3029 (e.g., to a hard disk) such that a transition to On allows recovery and continued
3030 processing without any loss of jobs or data. Limited auxiliary power is consumed
3031 (e.g., console lights), no network interfaces are operational, and human intervention
3032 is required to power up the system.

3033 'off-hard': DMTF "Off-Hard" (6) and ACPI G3. The stable "Off Mode" power state
3034 where System power is mechanically or electrically turned off. No power is
3035 consumed, no network interfaces are operational, and human intervention is
3036 required to power up the System.

3037 'off-soft': DMTF "Off-Soft" (8) and ACPI G2 or S5. The stable "Off Mode" power
3038 state where only limited auxiliary power is consumed (e.g., console lights), no
3039 network interfaces are operational, and human intervention is required to power up
3040 the system.

3041 'on': DMTF "On" (2) – ACPI G0 or S0 – the stable "On Mode" power state where
3042 the System is in 'idle', 'processing', or 'stopped' operational states, with no delay
3043 required for a power state transition before processing incoming jobs.

3044 'standby': DMTF "Sleep-Light" (3) and ACPI S1 or S2. The stable "Sleep Mode"
3045 power state with the shortest wake-up transition to the 'on' power state. Typically,
3046 mechanical elements (motors, lamps, heaters, etc.) are turned off or turned down,
3047 but processors and network interfaces are fully active (e.g., normal clock rate).

3048 'suspend': DMTF "Sleep-Deep" (4) and ACPI S3. The stable "Sleep Mode" power
3049 state with the lowest power consumption of any "Sleep Mode" power state.
3050 Typically, mechanical elements (motors, lamps, heaters, etc.) are turned off, but
3051 processors and network interfaces are partially active (e.g., lower clock rate). Kernel
3052 and application programs and data are preserved (i.e., periodically refreshed) in
3053 main memory and at least one network interface is operational.

3054 Additional vendor-specific power sub-states are defined as qualifiers of the stable power
3055 states 'hibernate', 'off-soft', 'on', 'standby', and 'suspend' (but not 'off-hard'). These
3056 additional power sub-state keywords are all of the form '<base>-vendorN' where 'N' is from
3057 '1' to '5' and the semantics MUST be exactly the same as those defined for these power
3058 sub-states as defined in [PWG5106.4]. Vendor-specific power sub-states MUST be used in
3059 strict order according to their nominal power consumption, e.g., 'standby-vendor2' MUST
3060 consume power equal to or higher than 'standby-vendor1' and 'standby-vendor1' MUST
3061 consume power equal to or higher than 'standby' (the base state).

3062 7.2.1.3 DMTF Ephemeral Power States

3063 This specification imports (and renames for clarity and common usage) the normative
3064 definitions and semantics of the following DMTF CIM [DSP1027] ephemeral (transitional)
3065 power states that initiate orderly shutdowns (e.g., 'off-soft-graceful') and power resets (e.g.,
3066 'reset-hard'). All DMTF CIM ephemeral power state transitions will eventually result in one
3067 of the stable power states defined in section 7.2.1.2 above.

3068 'off-hard-graceful': DMTF "Off-Hard Graceful" (13) and ACPI G3. The ephemeral
3069 power state that performs a graceful hard power off (orderly shutdown, followed by
3070 a hard power off cycle) and completes in the 'off-hard' power state.

3071 'off-soft-graceful': DMTF "Off-Soft Graceful" (12) and ACPI G2 or S5. The
3072 ephemeral power state that performs a graceful soft power off (orderly shutdown,
3073 followed by a soft power off cycle) and completes in the 'off-soft' power state.

3074 'reset-hard': DMTF "Power Cycle (Off-Hard)" (9) and ACPI G0 to G3, then S0. The
3075 ephemeral power state that performs a hard power reset (hard power off cycle,
3076 followed by normal power on cycle) and completes in the 'on' power state.

3077 'reset-hard-graceful': DMTF "Power Cycle Off-Soft Graceful" (16) and ACPI G3,
3078 then S0. The ephemeral power state that performs a graceful hard power reset
3079 (orderly shutdown, followed by a hard power reset) and completes in the 'on' power
3080 state.

3081 'reset-init': DMTF "Diagnostic Interrupt (INIT)" (17) and ACPI S5, then S0. The
3082 ephemeral power state (based on a diagnostic interrupt) that performs a hard power
3083 reset (hard power off cycle, followed by normal power on cycle) and completes in
3084 the 'on' power state.

3085 'reset-mbr': DMTF "Master Bus Reset" (10) and ACPI S5, then S0. The ephemeral
3086 power state (based on a master bus reset) that performs a hard power reset (hard
3087 power off cycle, followed by normal power on cycle) and completes in the 'on' power
3088 state.

3089 'reset-mbr-graceful': DMTF "Master Bus Reset Graceful" (14) and ACPI S5, then
3090 S0. The ephemeral power state that performs an orderly shutdown, followed by an
3091 MBR reset, and completes in the 'on' power state.

3092 'reset-nmi': DMTF "Diagnostic Interrupt (NMI)" (11) and ACPI S5, then S0. The
3093 ephemeral power state (based on a non-maskable interrupt) that performs a hard
3094 power reset (hard power off cycle, followed by normal power on cycle) and
3095 completes in the 'on' power state.

3096 'reset-soft': DMTF "Power Cycle (Off-Soft)" (5) and ACPI G2 or S5, then S0 w/ lost
3097 context. The ephemeral power state that performs a soft power reset (soft power
3098 off, followed by normal power on cycle) and completes in the 'on' power state.

3099 'reset-soft-graceful': DMTF "Power Cycle Off-Soft Graceful" (16) and ACPI G2 or
 3100 S5, then S0 w/ lost context. The ephemeral power state that performs a graceful
 3101 soft power reset (orderly shutdown, followed by a soft power reset) and completes
 3102 in the 'on' power state.

3103 7.2.1.4 Power Policies

3104 Power state transition policies can be scheduled by an Operator or Administrator in "power-
 3105 calendar-policy-col", "power-event-policy-col", and "power-timeout-policy-col" System
 3106 attributes. These policies can use triggers based on calendar times (e.g., 1st day of month),
 3107 named events (e.g., 'jam'), or elapsed time (e.g., 5 minutes of inactivity after entering
 3108 'standby' power state resulting in a further transition to 'suspend' power state).

3109 System administrative operations can also invoke System power state transitions (e.g.,
 3110 Restart-System can invoke a 'reset-soft-graceful' transition). Job creation operations can be
 3111 delayed in some System power states (e.g., during the warm up transition from 'suspend' to
 3112 'on'). Job creation operations can also be prohibited in some System power states (e.g., in
 3113 'hibernate' and 'off-soft').

3114 Note: This specification intentionally does not define any explicit operations for changing
 3115 System power states. System power policies can be used instead to schedule power state
 3116 transitions.

3117 An example of an automated System power state transition to 'hibernate' at 6pm every
 3118 Friday evening could be scheduled in "power-calendar-policy-col" as follows:

```
3119     calendar-id=32      # arbitrary unique value for calendar policy
3120     day-of-week=6       # Friday is 6th day counting from Sunday
3121     hour=18             # 6pm is 18:00 on a 24-hour clock
3122     request-power-state='hibernate'
3123                       # target power state
```

3124 In the above example, the irrelevant "day-of-month", "minute", "month", and "run-once"
 3125 member attributes have been omitted.

3126 An example of a Restart-System operation implementation could be as follows:

- 3127 1. 'stopping' is added to "system-state-reasons" for the System.
- 3128 2. 'stopping' is added to "printer-state-reasons" for each configured Printer.
- 3129 3. 'processing-to-stop-point' is added to "job-state-reasons" for each active Job.
- 3130 4. All active Jobs complete normally (because the stop point is a Job boundary)
 3131 and 'processing-to-stop-point' is removed from "job-state-reasons" for each
 3132 completed Job.
- 3133 5. 'stopping' is removed from "printer-state-reasons" and "printer-state" is changed
 3134 to 'stopped' for each configured Printer.
- 3135 6. 'stopping' is removed from "system-state-reasons" and "system-state" is
 3136 changed to 'stopped' for the System.

- 3137 7. The System executes a 'reset-soft-graceful' transition, resulting in "power-state"
3138 in "power-state-monitor-col" values: on → standby → off-soft → standby → on.
3139 8. "system-state" is changed to 'idle' for the System and "printer-state" is changed
3140 to 'idle' for each configured Printer.
3141 9. Job processing resumes normally on all Printers.

3142 **7.2.2 charset-configured (charset)**

3143 This REQUIRED System attribute identifies the charset that is used to represent attributes
3144 with 'text' and 'name' attribute syntaxes and is semantically analogous to the "charset-
3145 configured" Printer attribute defined in [RFC8011]. The value of the "charset-configured"
3146 attribute MUST be one of the values of the "charset-supported" attribute defined in section
3147 7.2.2.

3148 **7.2.3 charset-supported (1setOf charset)**

3149 This REQUIRED System attribute lists the charsets that are supported for values of
3150 attributes with 'text' and 'name' attribute syntaxes and is semantically analogous to the
3151 "charset-supported" Printer attribute defined in [RFC8011]. The value 'utf-8' MUST be
3152 present, since IPP objects MUST support the UTF-8 [RFC3629] charset.

3153 **[7.2.4 document-format-supported \(1setOf mimeType\)](#)**

3154 [This REQUIRED System attribute lists the Document formats that are supported by Printers](#)
3155 [managed by the System.](#)

3156 **[7.2.5 ippget-event-life \(integer\(15:MAX\)\)](#)**

3157 [This REQUIRED System attribute specifies the Event Life value that the System assigns to](#)
3158 [each Event and is semantically equivalent to the "ippget-event-life" Printer attribute defined](#)
3159 [in \[RFC3996\].](#)

3160 **7.2.6 ipp-features-supported (1setOf type2 keyword)**

3161 This REQUIRED System attribute lists the IPP extension features that are supported by the
3162 System and is semantically analogous to the "ipp-features-supported" Printer attribute
3163 defined in [PWG5100.13]. Standard keyword values are listed in the IANA IPP Registry. The
3164 value 'none' MUST be reported if no extension features are supported and MUST NOT be
3165 reported otherwise.

3166 **7.2.7 ipp-versions-supported (1setOf type2 keyword)**

3167 This REQUIRED System attribute identifies the supported IPP protocol version(s) and is
3168 semantically analogous to the "ipp-versions-supported" Printer attribute defined in
3169 [RFC8011].

3170 **7.2.8 multiple-document-printers-supported (boolean)**

3171 [This REQUIRED System attribute specifies whether Printers managed by the System are](#)
3172 [capable of supporting multiple Document Jobs and is semantically analogous to the](#)
3173 ["multiple-document-jobs-supported" Printer Description attribute \[RFC8011\].](#)

3174 **7.2.9 natural-language-configured (naturalLanguage)**

3175 This REQUIRED System attribute identifies the natural language that is used for System-
3176 generated attribute values with 'text' and 'name' attribute syntaxes and is semantically
3177 analogous to the "natural-language-configured" Printer attribute defined in [RFC8011].

3178 **7.2.10 generated-natural-language-supported (1setOf naturalLanguage)**

3179 This REQUIRED System attribute lists the natural language(s) that are supported for
3180 System-generated attribute values with 'text' and 'name' attribute syntaxes and is
3181 semantically analogous to the "generated-natural-language-supported" Printer attribute
3182 defined in [RFC8011].

3183 Note: The natural language(s) supported for System-generated values depends on
3184 implementation and/or configuration. However, unlike charsets, System objects MUST
3185 accept requests with any natural language or any Natural Language Override whether or not
3186 the natural language is supported for System-generated attribute values.

3187 Note: A System that supports multiple natural languages, often has separate catalogs of
3188 messages, one for each natural language supported.

3189 **7.2.11 notify-attributes-supported (1setOf keyword)**

3190 [This REQUIRED System attribute lists additional attributes that can be included in an event](#)
3191 [notification and is semantically equivalent to the Printer attribute of the same name defined](#)
3192 [in \[RFC3995\].](#)

3193 **7.2.12 notify-events-default (1setOf type2 keyword)**

3194 [This REQUIRED System attribute lists the default events for new Subscriptions and is](#)
3195 [semantically equivalent to the Printer attribute of the same name defined in \[RFC3995\].](#)

3196 **7.2.13 notify-events-supported (1setOf type2 keyword)**

3197 [This REQUIRED System attribute lists the supported "notify-events" values and is](#)
3198 [semantically equivalent to the Printer attribute of the same name defined in \[RFC3995\].](#)

3199 **7.2.14 notify-lease-duration-default (integer(0:67108863))**

3200 [This REQUIRED System attribute specifies the default lease duration for a new Subscription](#)
3201 [object and is semantically equivalent to the Printer attribute of the same name defined in](#)
3202 [\[RFC3995\].](#)

3203 **7.2.15 notify-lease-duration-supported (1setOf (integer(0:67108863) |**
 3204 **rangeOfInteger(0: 67108863)))**

3205 This REQUIRED System attribute lists the supported lease duration values and is
 3206 semantically equivalent to the Printer attribute of the same name defined in [RFC3995].

3207 **7.2.16 notify-max-events-supported (integer(2:MAX))**

3208 This REQUIRED System attribute specifies the maximum number of events that can be
 3209 specified in the "notify-events" Subscription Template attribute and is semantically
 3210 equivalent to the Printer attribute of the same name defined in [RFC3995].

3211 **7.2.17 notify-pull-method-supported (1setOf type2 keyword)**

3212 This REQUIRED System attribute lists the supported pull notification methods and is
 3213 semantically equivalent to the Printer attribute of the same name defined in [RFC3995].
 3214 Systems MUST support the 'ippget' pull notification method.

3215 **7.2.18 notify-schemes-supported (1setOf uriScheme)**

3216 This CONDITIONALLY REQUIRED System attribute lists push notification schemes that are
 3217 supported by the System and is semantically equivalent to the Printer attribute of the same
 3218 name defined in [RFC3995]. This attribute MUST be supported if the System supports push
 3219 notifications.

3220 **7.2.19 operations-supported (1setOf type2 enum)**

3221 This REQUIRED System attribute lists the supported System operations and is semantically
 3222 analogous to the "operations-supported" Printer attribute defined in [RFC8011].

3223 **7.2.20 power-calendar-policy-col (1setOf collection)**

3224 This OPTIONAL System attribute lists the configured System calendar-based power state
 3225 change policies and is semantically equivalent to the Power Calendar group defined in
 3226 [PWG5106.4]. If "power-calendar-policy-col" is supported, then all member attributes in this
 3227 collection are REQUIRED for the System but are OPTIONAL for the Client to supply.

3228 For example, an automated System power state transition to 'hibernate' at 6pm every Friday
 3229 evening could be scheduled in "power-calendar-policy-col" as follows:

```
3230     calendar-id=32      # arbitrary unique value for calendar policy
3231     day-of-week=6      # Friday is 6th day counting from Sunday
3232     hour=18            # 6pm is 18:00 on a 24-hour clock
3233     request-power-state='hibernate'
3234                       # target power state
```

3235 In the above example, the irrelevant "day-of-month", "minute", "month", and "run-once"
 3236 member attributes have been omitted.

3237 7.2.20.1 calendar-id (integer(1:MAX))

3238 This REQUIRED member attribute contains the unique key of this calendar policy and is
3239 semantically equivalent to the CalendarID element in the Power Calendar group defined in
3240 [PWG5106.4].

3241 7.2.20.2 day-of-month (integer(1:31))

3242 This REQUIRED member attribute specifies the trigger day of the month for this calendar
3243 policy and is semantically equivalent to the CalendarDay element in the Power Calendar
3244 group defined in [PWG5106.4]. The value '1' represents the first day of the month.

3245 See "system-current-time" defined above for the relevant System date, time, and time zone
3246 values.

3247 7.2.20.3 day-of-week (integer(1:7))

3248 This REQUIRED member attribute specifies the trigger day of the week for this calendar
3249 policy and is semantically equivalent to the CalendarDayOfWeek element in the Power
3250 Calendar group defined in [PWG5106.4]. The value '1' represents Sunday.

3251 See "system-current-time" defined above for the relevant System date, time, and time zone
3252 values.

3253 7.2.20.4 hour (integer(0:23))

3254 This REQUIRED member attribute specifies the trigger hour for this calendar policy and is
3255 semantically equivalent to the CalendarHour element in the Power Calendar group defined
3256 in [PWG5106.4]. The value '0' represents the first hour of the day (i.e., 12:00-12:59am).
3257 Midnight (i.e., 12:00am) is specified by a value of zero for "hour" and a value of zero for
3258 "minute".

3259 See "system-current-time" defined above for the relevant System date, time, and time zone
3260 values.

3261 Note: Due to local time zone changes (summer time to standard time or vice versa), it's
3262 possible that a given hour will not occur in a given month.

3263 7.2.20.5 minute (integer(0:59))

3264 This REQUIRED member attribute specifies the trigger minute for this calendar policy and
3265 is semantically equivalent to the CalendarMinute element in the Power Calendar group
3266 defined in [PWG5106.4]. The value '0' represents the first minute of the hour (e.g., 7:00am).

3267 See "system-current-time" defined above for the relevant System date, time, and time zone
3268 values.

3269 7.2.20.6 month (integer(1:12))

3270 This REQUIRED member attribute specifies the trigger month for this calendar policy and is
 3271 semantically equivalent to the CalendarMonth element in the Power Calendar group defined
 3272 in [PWG5106.4]. The value of '1' represents January.

3273 See "system-current-time" defined above for the relevant System date, time, and time zone
 3274 values.

3275 7.2.20.7 request-power-state (type1 keyword)

3276 This REQUIRED member attribute specifies the requested stable or ephemeral (transitional)
 3277 power state for this calendar policy and is semantically equivalent to the RequestPowerState
 3278 element in the Power Calendar group defined in [PWG5106.4].

3279 Standard values and constraints on vendor extension values are defined in section 7.2.1
 3280 Power States and Policies.

3281 7.2.20.8 run-once (boolean)

3282 This REQUIRED member attribute specifies whether this calendar policy should be run once
 3283 (single execution) or repeatedly (multiple executions) and is semantically equivalent to the
 3284 CalendarRunOnce element in the Power Calendar group defined in [PWG5106.4].

3285 7.2.21 power-event-policy-col (1setOf collection)

3286 This OPTIONAL System attribute lists the configured System event-based power state
 3287 change policies and is semantically equivalent to the Power Event group defined in
 3288 [PWG5106.4].

3289 For example, an automated System power state transition to 'standby' upon every 'jam'
 3290 condition could be scheduled in "power-event-policy-col" as follows:

```
3291     event-id=11           # arbitrary unique value for event policy
3292     event-name='jam'      # name of event
3293     request-power-state='standby'
3294                        # target power state
```

3295 7.2.21.1 event-id (integer(1:MAX))

3296 This REQUIRED member attribute contains the unique key of this event policy and is
 3297 semantically equivalent to the EventID element in the Power Event group defined in
 3298 [PWG5106.4].

3299 7.2.21.2 event-name (name(127))

3300 This REQUIRED member attribute specifies the trigger event name of this event policy and
 3301 is semantically equivalent to the EventName element in the Power Event group defined in
 3302 [PWG5106.4].

3303 Event names MUST be either: (a) the exact case-sensitive label (starting with a lowercase
3304 character) of an enumerated value in the `PrtAlertCodeTC` textual convention in the IANA
3305 Printer MIB [IANAPRT] (e.g., 'jam'); or (b) a case-sensitive vendor event name (starting with
3306 an uppercase character, e.g., 'ExamplePowerEvent'). Event names MUST be specified in
3307 US-ASCII [ISO646] (for interoperability).

3308 7.2.21.3 request-power-state (type1 keyword)

3309 This REQUIRED member attribute specifies the requested stable or ephemeral (transitional)
3310 power state for this event policy and is semantically equivalent to the `RequestPowerState`
3311 element in the Power Event group defined in [PWG5106.4].

3312 Standard values and constraints on vendor extension values are defined in section 7.2.1
3313 Power States and Policies.

3314 7.2.22 power-timeout-policy-col (1setOf collection)

3315 This RECOMMENDED System attribute lists the configured System timeout-based power
3316 state change policies and is semantically equivalent to the Power Timeout group defined in
3317 [PWG5106.4].

3318 For example, an automated System power state transition to 'standby' upon 5 minutes of
3319 inactivity in 'on' power state could be scheduled in "power-timeout-policy-col" as follows:

```
3320     request-power-state='standby'
3321                               # target power state
3322     start-power-state='on'    # starting power state
3323     timeout-id=23             # arbitrary unique value for timeout policy
3324     timeout-predicate='inactivity'
3325                               # predicate of system inactivity
3326     timeout-seconds=300       # duration before transition to target power state
```

3327 7.2.22.1 request-power-state (type1 keyword)

3328 This REQUIRED member attribute specifies the requested stable or ephemeral (transitional)
3329 power state for this timeout policy and is semantically equivalent to the `RequestPowerState`
3330 element in the Power Timeout group defined in [PWG5106.4].

3331 Standard values and constraints on vendor extension values are defined in section 7.2.1
3332 Power States and Policies.

3333 7.2.22.2 start-power-state (type1 keyword)

3334 This REQUIRED member attribute specifies the trigger starting stable power state for this
3335 timeout policy and is semantically equivalent to the `StartPowerState` element in the Power
3336 Timeout group defined in [PWG5106.4]. Note: Ephemeral (transitional) power states cannot
3337 be specified as triggers for timeout policies.

3338 Standard values and constraints on vendor extension values for stable power states are
 3339 defined in section 7.2.1 Power States and Policies.

3340 7.2.22.3 timeout-id (integer(1:MAX))

3341 This REQUIRED member attribute contains the unique key of this timeout policy and is
 3342 semantically equivalent to the TimeoutID element in the Power Timeout group defined in
 3343 [PWG5106.4].

3344 7.2.22.4 timeout-predicate (type1 keyword)

3345 This REQUIRED member attribute specifies the trigger predicate (i.e., pre-condition) for this
 3346 timeout policy and is semantically equivalent to the TimeoutPredicate element in the Power
 3347 Timeout group defined in [PWG5106.4].

3348 The standard keyword values for this attribute are:

3349 'activity' (i.e., incoming Job, console input, etc.)

3350 'inactivity' (i.e., no incoming, queued, or processing Jobs, console input, etc.)

3351 'none'

3352 7.2.22.5 timeout-seconds (integer(0:MAX))

3353 This REQUIRED member attribute specifies the trigger timeout interval in seconds (or zero
 3354 for an immediate trigger controlled by the other trigger member attributes) for this timeout
 3355 policy and is semantically equivalent to the TimeoutSeconds element in the Power
 3356 Timeout group defined in [PWG5106.4].

3357 7.2.23 printer-creation-attributes-supported (1setOf keyword)

3358 This REQUIRED System attribute lists Printer Description attributes supported for the
 3359 Create-Printer operation and is semantically analogous to the "job-creation-attributes-
 3360 supported" Printer Description attribute defined in [PWG5100.11]. [Table 9 lists the minimum
 3361 Printer Description attributes that SHOULD be included in this attribute.](#)

3362 **Table 9 – Common Printer Creation Attributes**

IPP Attribute Name	Reference
document-format-default	[RFC8011]
document-format-supported	[RFC8011]
multiple-document-jobs-supported	[RFC8011]
natural-language-configured	[RFC8011]
printer-geo-location	[PWG5100.13]
printer-info	[RFC8011]
printer-location	[RFC8011]
printer-make-and-model	[RFC8011]

Commented [MS10]: DISCUSS: Shouldn't this be a type1 enum?

Moved (insertion) [1]

Deleted: Recommended-to-Supply

Deleted: charset-configured ... [2]

Deleted: pdl-override-supported ... [3]

printer-name	[RFC8011]
--------------	-----------

3366 **7.2.24 printer-service-type-supported (1setOf type2 keyword)**

3367 This REQUIRED System attribute lists the supported "printer-service-type" values for the
3368 Create-Printer (section 6.3.1) operation.

3369 **7.2.25 resource-format-supported (1setOf mimeType)**

3370 This REQUIRED System attribute lists Resource formats supported for Send-Resource-
3371 Data operations and is semantically analogous to the "document-format-supported" attribute
3372 defined in [RFC8011].

3373 **7.2.26 resource-type-supported (1setOf type2 keyword)**

3374 This REQUIRED System attribute lists Resource types supported for Create-Resource and
3375 Send-Resource-Data operations and is semantically analogous to the "document-format-
3376 supported" attribute defined in [RFC8011].

3377 **7.2.27 resource-settable-attributes-supported (1setOf keyword)**

3378 This REQUIRED System attribute lists Resource Description attributes supported for
3379 READ-WRITE access and can be configured by an Operator or Administrator. See
3380 "system-strings-languages-supported" and "system-strings-uri" below for Client localization
3381 support.

3382 **7.2.28 system-current-time (dateTime)**

3383 This REQUIRED System attribute specifies the current date and time for the System and is
3384 semantically equivalent to the CurrentTime element defined in [PWG5108.06].

3385 **7.2.29 system-default-printer-id (integer(1:65535) | no-value)**

3386 This REQUIRED System attribute identifies the unique identifier of the default Print Service
3387 configured by the Operator, Administrator, or manufacturer (used by the End User operation
3388 Get-Printer-Attributes defined in this specification) and is semantically analogous to the
3389 "printer-uri-supported" and "job-printer-uri" attributes defined in [RFC8011]. When a System
3390 has no configured Print Services, that System MUST return the 'no-value' out-of-band value
3391 defined in [RFC8011] for "system-default-printer-id". For a related use case, see section
3392 3.2.5 Bootstrap Client Access to Default Print Service.

3393 Note: When the first Print Service is created on a System, the System MUST set the value
3394 of "system-default-printer-id" to reference that Print Service.

3395 **7.2.30 system-device-id (text(MAX))**

3396 Editor's note: Do we even want this attribute?

3397 This REQUIRED System attribute specifies the IEEE 1284 Device ID of the overall System
3398 as defined in [IEEE1284] and further refined in [PWG5107.2] and is semantically analogous
3399 to the "printer-device-id" Printer attribute defined in [PWG5107.2].

3400 7.2.31 system-geo-location (uri | unknown)

3401 This REQUIRED System attribute specifies the System geographic location using the "geo:"
3402 URI scheme [RFC5870] and is semantically analogous to the "printer-geo-location" Printer
3403 attribute defined in [PWG5100.13]. When the location is unknown, Systems MUST return
3404 the 'unknown' out-of-band value defined in [RFC8011]. Systems MUST allow the Operator
3405 or Administrator to [configure](#) the geographic location manually.

Deleted: set

3406 7.2.32 system-info (text(127))

3407 This REQUIRED System attribute specifies System descriptive information, e.g., "This
3408 System can be used for printing color transparencies for HR presentations," and is
3409 semantically analogous to the "printer-info" Printer attribute defined in [RFC8011].

3410 7.2.33 system-location (text(127))

3411 This REQUIRED System attribute identifies the System location, e.g., "This System is in
3412 Room 123A, second floor of building XYZ," and is semantically analogous to the "printer-
3413 location" Printer attribute defined in [RFC8011].

3414 7.2.34 system-mandatory-printer-attributes (1setOf type2 keyword)

3415 This REQUIRED System attribute identifies the mandatory-to-supply Printer Description
3416 attributes for a Create-Printer operation on this System and is semantically analogous to the
3417 "printer-mandatory-job-attributes" Printer Description attribute defined in [PWG5100.13].
3418 This REQUIRED System attribute lists the minimum Printer and operation attributes that are
3419 required for a successful Create-Printer operation. The System MUST include in this
3420 attribute the 'printer-name' [value](#).

Deleted: values

Deleted: and 'printer-xri-supported' and
SHOULD include the values in Table 9 below

Moved up [1]: Table 9 – Recommended-to-
Supply Printer Creation Attributes
IPP Attribute Name

3422 7.2.35 system-make-and-model (text(127))

3423 This REQUIRED System attribute identifies the System make and model and is semantically
3424 analogous to the "printer-make-and-model" Printer attribute defined in [RFC8011]. The
3425 manufacturer can initially populate this attribute.

3433 **7.2.36 system-message-from-operator (text(127))**

3434 This OPTIONAL System attribute provides a message from an Operator, Administrator, or
 3435 "intelligent" process to indicate the reasons for modification or other System management
 3436 action and is semantically analogous to the "printer-message-from-operator" Printer attribute
 3437 defined in [RFC8011].

3438 **7.2.37 system-name (name(127))**

3439 This REQUIRED System attribute contains the System name and is semantically analogous
 3440 to the "printer-name" Printer attribute defined in [RFC8011].

3441 **7.2.38 system-owner-col (collection | unknown)**

3442 This REQUIRED System attribute identifies the System Owner. [Table 10 lists the "system-](#)
 3443 [owner-col" member attributes. When specified in a Set-System-Attributes operation, the](#)
 3444 [collection value MUST contain all REQUIRED member attributes as the entire collection](#)
 3445 [value is replaced.](#)

3446 **Table 10: "xxx-owner-col" Member Attributes**

Conformance	Member Attribute
???	owner-uri (uri)
???	owner-name (name(MAX))
???	owner-vcard (1setOf text(MAX))

3447

3448 **7.2.38.1 owner-uri (uri)**

3449 This REQUIRED/RECOMMENDED/OPTIONAL member attribute contains a System Owner
 3450 URI, e.g., "mailto:bob@example.com," and is semantically analogous to the Service object's
 3451 OwnerURI defined in [PWG5108.01].

3452 **7.2.38.2 owner-name (name(MAX))**

3453 [This REQUIRED/RECOMMENDED/OPTIONAL member attribute contains the name of the](#)
 3454 [System Owner, e.g., "Bob Smith".](#)

3455 **7.2.38.3 owner-vcard (1setOf text(MAX))**

3456 This REQUIRED/RECOMMENDED/OPTIONAL member attribute contains a System Owner
 3457 vCard [RFC6350] and is semantically analogous to the Service object's OwnerVCard
 3458 defined in [PWG5108.01].

3459 **7.2.39 system-settable-attributes-supported (1setOf keyword)**

3460 This REQUIRED System attribute lists [the System Description attributes that can be](#)
 3461 [changed using the Set-System-Attributes operation \(section 6.3.15\).](#) [The 'none' value can](#)

Deleted: If specified in a Set-System-Attributes operation, then the "owner-vcard" member attribute MUST also be specified (to preserve consistency).

Deleted: 1023

Deleted: If specified in a Set-System-Attributes operation, then the "owner-uri" member attribute MUST also be specified (to preserve consistency).

Deleted: supported

Deleted: for READ-WRITE access and can be configured by an Operator or Administrator.

3474 [be returned by itself to indicate that no System Description attributes can be changed](#). See
3475 “system-strings-languages-supported” and “system-strings-uri” below for Client localization
3476 support.

Commented [MS11]: Do we need to talk about localization here?

3477 7.2.40 system-strings-languages-supported (1setOf naturalLanguage)

3478 This RECOMMENDED System attribute lists natural languages supported for the “system-
3479 strings-uri” System attribute and is semantically analogous to the “printer-strings-languages-
3480 supported” Printer attribute defined in [PWG5100.13].

3481 This attribute MUST be supported if the “system-strings-uri” attribute is supported.

3482 7.2.41 system-strings-uri (uri | no-value)

3483 This RECOMMENDED System attribute provides a “text/strings” message catalog file using
3484 “http:” or “https:” URIs that SHOULD be System-resident so that Client interaction with the
3485 System does not require access to external networks and is semantically analogous to the
3486 “printer-strings-uri” Printer attribute defined in [PWG5100.13]. Systems SHOULD provide
3487 localizations for all supported System attributes, keywords, and enums, so that a Client may
3488 present a consistent user interface to the User.

3489 This attribute MUST be supported if the “system-strings-uri” attribute is supported.

3490 7.2.42 system-xri-supported (1setOf collection)

3491 This REQUIRED System attribute lists supported XRI (URI, authentication, and security
3492 tuples) for the System and is semantically analogous to the “printer-xri-supported” Printer
3493 attribute defined in [RFC3380] and semantically analogous to Service object’s XriSupported
3494 defined in [PWG5108.01].

3495 7.2.42.1 xri-uri (uri)

3496 This REQUIRED member attribute specifies an “ipp:” [RFC3510] or “ipps:” [RFC7472] URI
3497 for [the](#) System and is semantically analogous to a value of the “xri-uri” member attribute
3498 defined in [RFC3380].

Deleted: this

3499 7.2.42.2 xri-authentication (type2 keyword)

3500 This REQUIRED member attribute specifies the IPP Client [authentication](#) mechanism
3501 associated with the corresponding value of “xri-uri” and is semantically analogous to a value
3502 of the “xri-authentication” member attribute defined in [RFC3380]. The original standard
3503 values for this attribute are defined in [RFC8011] and extension values are registered in the
3504 IANA IPP Registry [IANAIPP].

Deleted: Authentication

Deleted: above

3505 7.2.42.3 xri-security (type2 keyword)

3506 This REQUIRED member attribute specifies the IPP [transport](#) security mechanism
3507 associated with the corresponding value of “xri-uri” and is semantically analogous to a value

Deleted: above

3512 of the “xri-security” member attribute defined in [RFC3380]. The original standard values for
3513 this attribute are defined in [RFC8011] and extension values are registered in the IANA IPP
3514 Registry [IANAIPP].

3515 7.3 System Status Attributes

3516 All of the System Status attributes are READ-ONLY and cannot be changed directly by the
3517 Set-System-Attributes operation.

3518 7.3.1 power-log-col (1setOf collection)

3519 This RECOMMENDED System attribute lists System power log entries (for events) and is
3520 semantically equivalent to the Power Log group defined in [PWG5106.4].

3521 Systems SHOULD minimize the number of power log entries in this attribute for reliability.
3522 Systems MUST record all final stable power state transitions in this attribute for every
3523 sequence invoked by an ephemeral requested power state such as 'reset-nmi'. Systems
3524 MAY omit intermediate state transitions invoked by such ephemeral requested states as
3525 'reset-nmi'.

3526 7.3.1.1 log-id (integer(1:MAX))

3527 This REQUIRED member attribute contains the unique key of this power log entry and is
3528 semantically equivalent to the LogID element in the Power Log group defined in
3529 [PWG5106.4].

3530 7.3.1.2 power-state (type1 keyword)

3531 This REQUIRED member attribute identifies the recorded stable or ephemeral (transitional)
3532 power state for this power log entry and is semantically equivalent to the PowerState element
3533 in the Power Log group defined in [PWG5106.4].

3534 Standard values and constraints on vendor extension values are defined in section 7.2.1
3535 Power States and Policies.

3536 7.3.1.3 power-state-date-time (dateTime)

3537 This REQUIRED member attribute identifies the date and time of transition into the recorded
3538 power state for this power log entry and is semantically equivalent to the
3539 PowerStateDateAndTime element in the Power Log group defined in [PWG5106.4].

3540 7.3.1.4 power-state-message (text (255))

3541 This OPTIONAL member attribute contains a human-readable string in UTF-8 [RFC3629]
3542 that describes, explains, or qualifies the logged power state and is semantically equivalent
3543 to the PowerStateMessage element in the Power Log group defined in [PWG5106.4]. For
3544 example, "standby - System is shutting down by user request (2W)" when transitioning to final
3545 'off-soft' power state.

3546 Usage: This attribute: (a) MUST identify the power state; (b) SHOULD identify the method
3547 of entry to the power state, e.g., "from timeout trigger" or "from user request"; (c) SHOULD

3548 identify the nominal power consumption, e.g., “(34 watts)”; and (d) MAY include any other
3549 power-related information, e.g., “can accept jobs” or “can process jobs”.

3550 **7.3.2 power-state-capabilities-col (1setOf collection)**

3551 This OPTIONAL System attribute lists System supported power capabilities for each stable
3552 power state and is semantically equivalent to the Power Support group defined in
3553 [PWG5106.4].

3554 **7.3.2.1 can-accept-jobs (boolean)**

3555 This REQUIRED member identifies whether the System can accept new incoming Jobs in
3556 this stable power state, unless the System or has been disabled by an Operator or
3557 Administrator, and is semantically equivalent to the CanAcceptJobs element in the Power
3558 Support group defined in [PWG5106.4].

3559 **7.3.2.2 can-process-jobs (boolean)**

3560 This REQUIRED member identifies whether the System can process new incoming Jobs or
3561 existing queued Jobs in this stable power state and is semantically equivalent to the
3562 CanProcessJobs element in the Power Support group defined in [PWG5106.4].

3563 **7.3.2.3 power-active-watts (integer(0:MAX))**

3564 This REQUIRED member attribute identifies the nominal power consumption in watts for this
3565 stable power state when the System is in an active operational state (i.e., ‘processing’) and
3566 is semantically equivalent to the PowerActiveWatts element in the Power Support group
3567 defined in [PWG5106.4].

3568 **7.3.2.4 power-inactive-watts (integer(0:MAX))**

3569 This REQUIRED member attribute identifies the nominal power consumption in watts for this
3570 stable power state when the System is in an inactive operational state (i.e., ‘idle’ or ‘stopped’)
3571 and is semantically equivalent to the PowerInactiveWatts element in the Power Support
3572 group defined in [PWG5106.4].

3573 **7.3.2.5 power-state (type1 keyword)**

3574 This REQUIRED member attribute identifies a System supported stable power state that is
3575 the unique key of this power state capability entry and is semantically equivalent to the
3576 PowerState element in the Power Support group defined in [PWG5106.4].

3577 Standard values and constraints on vendor extension values are defined in section 7.2.1
3578 Power States and Policies.

3579 **7.3.3 power-state-counters-col (1setOf collection)**

3580 This OPTIONAL System attribute lists System power state transition counters and is
3581 semantically equivalent to the Power Counter group defined in [PWG5106.4].

3582 **7.3.3.1 hibernate-transitions (integer(0:MAX))**

3583 This REQUIRED member attribute contains the System lifetime number of transitions into
3584 the 'hibernate' power state and is semantically equivalent to the HibernateTransitions
3585 element in the Power Counter group defined in [PWG5106.4].

3586 **7.3.3.2 on-transitions (integer(0:MAX))**

3587 This REQUIRED member attribute contains the System lifetime number of transitions into
3588 the 'on' power state and is semantically equivalent to the OnTransitions element in the Power
3589 Counter group defined in [PWG5106.4].

3590 **7.3.3.3 standby-transitions (integer(0:MAX))**

3591 This REQUIRED member attribute contains the System lifetime number of transitions into
3592 the 'standby' power state and is semantically equivalent to the StandbyTransitions element
3593 in the Power Counter group defined in [PWG5106.4].

3594 **7.3.3.4 suspend-transitions (integer(0:MAX))**

3595 This REQUIRED member attribute contains the System lifetime number of transitions into
3596 the 'suspend' power state and is semantically equivalent to the SuspendTransitions element
3597 in the Power Counter group defined in [PWG5106.4].

3598 **7.3.4 power-state-monitor-col (collection)**

3599 This RECOMMENDED System attribute contains the System power state and is
3600 semantically equivalent to the Power General, Power Meters, and Power Monitor groups
3601 defined in [PWG5106.4].

3602 Note: Power consumption attribute values are volatile and typically change regularly at
3603 implementation-defined intervals.

3604 **7.3.4.1 current-month-kwh (integer(0:MAX))**

3605 This REQUIRED member attribute contains the current month's System power consumption
3606 in kilowatt hours and is semantically equivalent to the PowerCurrentMonthKWH element in
3607 the Power Meter group defined in [PWG5106.4]. The System MUST reset the value of this
3608 attribute to zero at the beginning of every month.

3609 7.3.4.2 current-watts (integer(0:MAX))

3610 This REQUIRED member attribute contains the current System instantaneous power
3611 consumption in watts and is semantically equivalent to the PowerCurrentWatts element in
3612 the Power Meter group defined in [PWG5106.4].

3613 Note: The value of this attribute is typically determined by software estimation instead of
3614 actual current measurement.

3615 7.3.4.3 lifetime-kwh (integer(0:MAX))

3616 This REQUIRED member attribute contains the lifetime System power consumption in
3617 kilowatt hours and is semantically equivalent to the PowerLifetimeKWH element in the
3618 Power Meter group defined in [PWG5106.4].

3619 7.3.4.4 meters-are-actual (boolean)

3620 This REQUIRED member attribute identifies whether or not System power meter attributes
3621 are based on actual measurement (true) or software estimation (false) and is semantically
3622 equivalent to the PowerMetersAreActual element in the Power Meter group defined in
3623 [PWG5106.4].

3624 7.3.4.5 power-state (type1 keyword)

3625 This REQUIRED member attribute identifies the current stable or ephemeral (transitional)
3626 System power state and is semantically equivalent to the PowerState element in the Power
3627 Monitor group defined in [PWG5106.4].

3628 Standard values and constraints on vendor extension values are defined in section 7.2.1
3629 Power States and Policies.

3630 7.3.4.6 power-state-message (text (255))

3631 This OPTIONAL member attribute contains a human-readable string in UTF-8 [RFC3629]
3632 that describes, explains, or qualifies the current System power state (e.g.,) and is
3633 semantically equivalent to the PowerStateMessage element in the Power Monitor group
3634 defined in [PWG5106.4]. For example, "standby - System is shutting down by user request
3635 (2W)" when transitioning to final 'off-soft' power state.

3636 Usage: This attribute: (a) MUST identify the power state; (b) SHOULD identify the method
3637 of entry to the power state, e.g., "from timeout trigger" or "from user request"; (c) SHOULD
3638 identify the nominal power consumption, e.g., "(34 watts)"; and (d) MAY include any other
3639 power-related information, e.g., "can accept jobs" or "can process jobs".

3640 7.3.4.7 power-usage-is-rms-watts (boolean)

3641 This REQUIRED member attribute identifies whether or not the power consumption
3642 properties for this System use units of Root Mean Square (RMS) watts (true) or

3643 unnormalized so-called peak watts (false) and is semantically equivalent to the
3644 PowerUsagelsRMSWatts element in the Power General group defined in
3645 [PWG5106.4].valid-request-power-states (1setOf (type1 keyword))

3646 This REQUIRED member attribute identifies all of the stable and ephemeral power states
3647 that can be requested (in policies) on this System and is semantically equivalent to the
3648 CanRequestPowerStates element in the Power General group defined in [PWG5106.4].

3649 Standard values and constraints on vendor extension values are defined in section 7.2.1
3650 Power States and Policies.

3651 **7.3.5 power-state-transitions-col (1setOf collection)**

3652 This OPTIONAL System attribute lists valid System power state transitions and is
3653 semantically equivalent to the Power Transition group defined in [PWG5106.4].

3654 **7.3.5.1 end-power-state (type1 keyword)**

3655 This REQUIRED member attribute identifies the ending stable System power state for this
3656 valid power state transition and is semantically equivalent to the EndPowerState element in
3657 the Power Transition group defined in [PWG5106.4].

3658 Standard values and constraints on vendor extension values are defined in section 7.2.1
3659 Power States and Policies.

3660 **7.3.5.2 start-power-state (type1 keyword)**

3661 This REQUIRED member attribute identifies the starting stable System power state for this
3662 valid power state transition and is semantically equivalent to the EndPowerState element in
3663 the Power Transition group defined in [PWG5106.4].

3664 Standard values and constraints on vendor extension values are defined in section 7.2.1
3665 Power States and Policies.

3666 **7.3.5.3 state-transition-seconds (integer(0:MAX))**

3667 This REQUIRED member attribute contains the nominal duration in seconds for this valid
3668 power state transition and is semantically equivalent to the StateChangeSeconds element
3669 in the Power Transition group defined in [PWG5106.4].

3670 **7.3.6 system-config-change-date-time (dateTime)**

3671 This REQUIRED System attribute contains the value of “system-current-time” (date and
3672 time) for the most recent System configuration change.

3673 7.3.7 system-config-change-time (integer(0:MAX))

3674 This REQUIRED System attribute contains the value of “system-up-time” (seconds since
3675 System startup) for the most recent System configuration change or zero if no System
3676 configuration change has occurred.

3677 7.3.8 system-config-changes (integer(0:MAX))

3678 This REQUIRED System attribute contains the count of configuration changes for the
3679 System and is semantically equivalent to the SystemConfigChangeNumber element defined
3680 in [PWG5108.06] and semantically analogous to the prtGeneralConfigChanges object
3681 defined in [RFC3805]. Each time a Set-System-Attributes operation is performed that
3682 changes the value of any attribute and each time the System changes the value of any
3683 attribute outside of an operation, the System MUST increment value of the “system-config-
3684 changes” attribute by exactly one. Each time that the System performs a power cycle (from
3685 ‘off’ to ‘on’), the System MUST reset the value of this attribute to zero.

3686 7.3.9 system-configured-printers (1setOf collection [no-value](#))

3687 This REQUIRED System attribute contains the summary of all configured Printers for the
3688 System and is semantically equivalent to the ConfiguredServices element defined in
3689 [PWG5108.06]. [Table 11 lists the member attributes for collection values. If there are no](#)
3690 [configured Printers for the System, the 'no-value' out-of-band value is returned.](#)

3691 Table 11 – “system-configured-printers” Member Attributes

Conformance	IPP Attribute Name	Reference
REQUIRED	printer-id	[PWG5100.SYS]
REQUIRED	printer-info	[RFC8011]
REQUIRED	printer-is-accepting-jobs	[RFC8011]
REQUIRED	printer-name	[RFC8011]
REQUIRED	printer-service-type	[PWG5100.SYS]
REQUIRED	printer-state	[RFC8011]
REQUIRED	printer-state-reasons	[RFC8011]
REQUIRED	printer-xri-supported	[RFC3380]

Deleted: Member Attributes of

3692 7.3.9.1 printer-id (integer(1:65535))

3693 This REQUIRED member attribute uniquely identifies the Printer within the System and is
3694 semantically equivalent to the ServiceSummary element ID defined in [PWG5108.06] and
3695 semantically analogous to the “job-id” attribute defined in [RFC8011]. See “printer-id” in
3696 section 7.6.2.

Deleted: 7.5 Printer Status Attributes

3699 7.3.9.2 printer-info (text(127))

3700 This REQUIRED member attribute contains the description of the Printer and is semantically
3701 equivalent to the "printer-info" Printer attribute defined in [RFC8011] but is not included in
3702 the ServiceSummary element defined in [PWG5108.06].

3703 7.3.9.3 printer-is-accepting-jobs (boolean)

3704 This REQUIRED member attribute identifies whether the Printer is currently ~~accepting~~
3705 incoming Jobs and is semantically equivalent to the "printer-is-accepting-jobs" Printer
3706 attribute defined in [RFC8011] and semantically equivalent to the ServiceSummary element
3707 IsAcceptingJobs defined in [PWG5108.06].

Deleted: able to

3708 7.3.9.4 printer-name (name(127))

3709 This REQUIRED member attribute identifies the name of the Printer and is semantically
3710 equivalent to the "printer-name" Printer attribute defined in [RFC8011] and semantically
3711 equivalent to the ServiceSummary element ServiceName defined in [PWG5108.06].

3712 7.3.9.5 printer-service-type (type2 keyword)

3713 This REQUIRED member attribute identifies the service type of the Printer and is
3714 semantically equivalent to the "printer-service-type" Printer attribute defined in section 7.6.9
3715 and semantically equivalent to the ServiceSummary element ServiceType defined in
3716 [PWG5108.06].

Deleted: 7.5.2

3717 7.3.9.6 printer-state (type1 enum)

3718 This REQUIRED member attribute contains the current state of the Printer and is
3719 semantically equivalent to the "printer-state" Printer attribute defined in [RFC8011] and
3720 semantically equivalent to the ServiceSummary element State defined in [PWG5108.06].

3721 7.3.9.7 printer-state-reasons (1setOf type2 keyword)

3722 This REQUIRED member attribute contains additional detail about the current state of the
3723 Printer and is semantically equivalent to the "printer-state-reasons" Printer attribute defined
3724 in [RFC8011] and semantically equivalent to the ServiceSummary element StateReasons
3725 defined in [PWG5108.06].

3726 7.3.9.8 printer-xri-supported (1setOf collection)

3727 This REQUIRED member attribute lists ~~the~~ supported URI, authentication, and security
3728 tuples for the Printer and is semantically equivalent to the "printer-xri-supported" Printer
3729 attribute defined in [RFC3380] and semantically equivalent to the ServiceSummary element
3730 ServiceXriSupported defined in [PWG5108.06].

Deleted: XRI (

Deleted:)

3735 7.3.10 system-configured-resources (1setOf collection | no-value)

3736 This REQUIRED System attribute contains the summary of all configured Resources for the
 3737 System and is semantically equivalent to the ConfiguredResources element defined in
 3738 [PWG5108.06]. Table 12 list the member attributes for collection values. If there are no
 3739 configured Resources for the System, the 'no-value' out-of-band value is returned.

3740 Table 12 – "system-configured-resources" Member Attributes

Conformance	IPP Attribute Name	Reference
REQUIRED	resource-format	[PWG5100.SYS]
REQUIRED	resource-id	[PWG5100.SYS]
REQUIRED	resource-info	[PWG5100.SYS]
REQUIRED	resource-name	[PWG5100.SYS]
REQUIRED	resource-state	[PWG5100.SYS]
REQUIRED	resource-state-reasons	[PWG5100.SYS]
REQUIRED	resource-type	[PWG5100.SYS]

Deleted: Member attributes of

3741 7.3.10.1 resource-format (mimeMediaType)

3742 This REQUIRED member attribute identifies the format of the Resource and is semantically
 3743 equivalent to the "resource-format" Resource attribute defined in section 7.8.5 and
 3744 semantically equivalent to the ResourceSummary element ResourceFormat defined in
 3745 [PWG5108.06].

Deleted: 7.7.7

3746 7.3.10.2 resource-id (integer(1:MAX))

3747 This REQUIRED member attribute contains the unique identifier of the Resource and is
 3748 semantically equivalent to the "resource-id" Resource attribute defined in section 7.8.6 and
 3749 semantically equivalent to the ResourceSummary element ResourceId defined in
 3750 [PWG5108.06].

Deleted: 7.7.8

3751 7.3.10.3 resource-info (text(127))

3752 This REQUIRED member attribute contains the description of the Resource and is
 3753 semantically equivalent to the "resource-info" Resource attribute defined in section 7.7.1 but
 3754 is not included in the original ResourceSummary element defined in [PWG5108.06].

Deleted: 7.6.1

3755 7.3.10.4 resource-name (name(127))

3756 This REQUIRED member attribute identifies the name of the Resource and is semantically
 3757 equivalent to the "resource-name" Resource attribute defined in section 7.7.2 and
 3758 semantically equivalent to the ResourceSummary element ResourceName defined in
 3759 [PWG5108.06].

Deleted: 7.6.2

3765 **7.3.10.5 resource-state (type1 enum)**

3766 This REQUIRED member attribute contains the current state of the Resource and is
 3767 semantically equivalent to the "resource-state" Resource attribute defined in section 7.8.8
 3768 but is not included in the original ResourceSummary element defined in [PWG5108.06].

Deleted: 7.7.12

3769 **7.3.10.6 resource-state-reasons (1setOf type2 keyword)**

3770 This REQUIRED member attribute contains a list of state reasons for the Resource [and is](#)
 3771 [semantically equivalent to the "resource-state-reasons" Resource attribute defined in section](#)
 3772 [7.8.10](#) but is not included in the original Resource object defined in [PWG5108.03].

Deleted: and is semantically analogous to the "job-state-reasons" attribute defined in [RFC8011]. Any applicable "job-state-reasons" keyword value can be used in "resource-state-reasons"

3773 **7.3.10.7 resource-type (type2 keyword)**

3774 This REQUIRED member attribute identifies the type of the Resource and is semantically
 3775 equivalent to the "resource-type" Resource attribute defined in section 7.8.12 and
 3776 semantically equivalent to the ResourceSummary element ResourceType defined in
 3777 [PWG5108.06].

Deleted: 7.7.16

3778 **[7.3.11 system-impressions-completed \(integer\(0:MAX\)\)](#)**

3779 [This RECOMMENDED System attribute provides the total number of impressions processed](#)
 3780 [by all configured Printers, corresponding to the icImpressionTotalImps property defined in](#)
 3781 [the PWG Imaging System State and Counter MIB v2.0 \[PWG5106.3\].](#)

3782 **[7.3.12 system-impressions-completed-col \(collection\)](#)**

3783 [This RECOMMENDED System attribute provides a breakdown of the total number of](#)
 3784 [impressions processed by all configured Printers. Table 13 lists the member attributes that](#)
 3785 [correspond to the PWG Imaging System State and Counter MIB v2.0 \[PWG5106.3\]](#)
 3786 [properties.](#)

3787 **[Table 13 - "xxx-impressions-completed-col" Member Attributes](#)**

IPP Member Attribute	Counter MIB Equivalent
blank (integer(0:MAX))	icImpressionBlankImps
blank-two-sided (integer(0:MAX))	icTwoSidedBlankImps
full-color (integer(0:MAX))	icImpressionFullColorImps
full-color-two-sided (integer(0:MAX))	icTwoSidedFullColorImps
highlight-color (integer(0:MAX))	icImpressionHighlightColorImps
highlight-color-two-sided (integer(0:MAX))	icTwoSidedHighlightColorImps
monochrome (integer(0:MAX))	icImpressionMonochromeImps
monochrome-two-sided (integer(0:MAX))	icTwoSidedMonochromeImps

3795 **7.3.13 system-media-sheets-completed (integer(0:MAX))**

3796 [This RECOMMENDED System attribute provides the total number of media sheets](#)
 3797 [processed by all configured Printers, corresponding to the icMediaUsedTotalSheets](#)
 3798 [property defined in the PWG Imaging System State and Counter MIB v2.0 \[PWG5106.3\].](#)

3799 **7.3.14 system-media-sheets-completed-col (collection)**

3800 [This RECOMMENDED System attribute provides a breakdown of the total number of media](#)
 3801 [sheets processed by all configured Printers. Table 14 lists the member attributes that](#)
 3802 [correspond to the PWG Imaging System State and Counter MIB v2.0 \[PWG5106.3\]](#)
 3803 [properties.](#)

3804 **Table 14 - "xxx-media-sheets-completed-col" Member Attributes**

IPP Member Attribute	Counter MIB Equivalent
blank (integer(0:MAX))	icMediaUsedBlankSheets
full-color (integer(0:MAX))	icMediaUsedFullColorSheets
highlight-color (integer(0:MAX))	icMediaUsedHighlightColorSheets
monochrome (integer(0:MAX))	icMediaUsedMonochromeSheets

3805 **7.3.15 system-pages-completed (integer(0:MAX))**

3806 [This RECOMMENDED System attribute provides the total number of pages processed by](#)
 3807 [all configured Printers, corresponding to the icImpressionTotalImps property defined in the](#)
 3808 [PWG Imaging System State and Counter MIB v2.0 \[PWG5106.3\].](#)

3809 **7.3.16 system-pages-completed-col (collection)**

3810 [This RECOMMENDED System attribute provides a breakdown of the total number of pages](#)
 3811 [processed by all configured Printers. Table 15 lists the member attributes that correspond](#)
 3812 [to the PWG Imaging System State and Counter MIB v2.0 \[PWG5106.3\] properties.](#)

3813 **Table 15 - "xxx-pages-completed-col" Member Attributes**

IPP Member Attribute	Counter MIB Equivalent
full-color (integer(0:MAX))	icImageMonochromeImages
monochrome (integer(0:MAX))	icImageFullColorImages

3814 **7.3.17 system-serial-number (text(255))**

3815 [This OPTIONAL System attribute identifies the serial number for the System and is](#)
 3816 [semantically equivalent to the SerialNumber element defined in \[PWG5108.06\] and](#)
 3817 [semantically analogous to the prtGeneralSerialNumber element defined in \[RFC3805\].](#)

3818 7.3.18 system-state (type1 enum)

3819 This REQUIRED System attribute contains the current state for the System and is
3820 semantically equivalent to the State element defined in [PWG5108.06] and semantically
3821 analogous to the “printer-state” attribute defined in [RFC8011].

3822 Standard values for this attribute are:

3823 'idle' (3): Indicates that one or more Printers are in the 'idle' state and none are in
3824 the 'processing' state.

Deleted: all

3825 'processing' (4): Indicates that one or more Printers are in the 'processing' state.

Deleted: Jobs

3826 'stopped' (5): Indicates that all Printers are in the 'stopped' state.

3827 7.3.19 system-state-change-date-time (dateTime)

3828 This REQUIRED System attribute contains the value of “system-current-time” (date and
3829 time) for the most recent System state change and is semantically analogous to the “printer-
3830 state-change-date-time” attribute defined in [RFC3995].

3831 7.3.20 system-state-change-time (integer(0:MAX))

3832 This REQUIRED System attribute contains the value of “system-up-time” (seconds since
3833 System startup) for the most recent System state change or zero if no System state change
3834 has occurred and is semantically analogous to the “printer-state-change-time” attribute
3835 defined in [RFC3995].

3836 7.3.21 system-state-message (text(MAX))

3837 Editor's note: There is no clear way to do roll-up of all printer-state-message values here,
3838 nor does it make much sense. Should we remove this attribute, or make it RECOMMENDED
3839 with some guidance about the value? 5108.06 makes this the equivalent of a "system-state-
3840 messages (1setOf text(MAX))" attribute but provides no guidance.

3841 This REQUIRED System attribute contains a state message for the System and is
3842 semantically analogous to the StateMessages element defined in [PWG5108.06] and
3843 semantically analogous to the “printer-state-message” attribute defined in [RFC8011].

3844 7.3.22 system-state-reasons (1setOf type2 keyword)

3845 This REQUIRED System attribute contains a list of state reasons for the System and is
3846 semantically equivalent to the StateReasons element defined in [PWG5108.06] and
3847 semantically analogous to the “printer-state-reasons” attribute defined in [RFC8011]. Any
3848 applicable “printer-state-reasons” keyword value can be used in “system-state-reasons”.

3849 Editor's note: We need to provide guidance on how to do roll-up of the "printer-state-reasons"
3850 values.

3853 7.3.23 system-up-time (integer(1:MAX))

3854 This REQUIRED System attribute contains the time in seconds since last boot for the
3855 System and is semantically equivalent to the UpTime element defined in [PWG5108.06].

3856 7.3.24 system-uuid (uri(45))

3857 This REQUIRED System attribute identifies the UUID as a URI [RFC4122] for the System
3858 and is semantically equivalent to the ServiceUuid element defined in [PWG5108.01].

3859 [7.3.25 xri-authentication-supported \(1setOf type2 keyword\)](#)

3860 [This REQUIRED System attribute lists the supported "xri-authentication" member attribute](#)
3861 [values and is semantically equivalent to the Printer Status attribute of the same name.](#)

3862 [7.3.26 xri-security-supported \(1setOf type2 keyword\)](#)

3863 [This REQUIRED System attribute lists the supported "xri-security" member attribute values](#)
3864 [and is semantically equivalent to the Printer Status attribute of the same name.](#)

3865 [7.3.27 xri-uri-scheme-supported \(1setOf uriScheme\)](#)

3866 [This REQUIRED System attribute lists the supported "xri-uri" member attribute URI schemes](#)
3867 [and is semantically equivalent to the Printer Status attribute of the same name.](#)

3868 [7.4 Job Status Attributes](#)

3869 [All Job Status attributes are READ-ONLY and cannot be directly updated by the Set-Job-](#)
3870 [Attributes operation.](#)

3871 [7.4.1 job-owner-col \(collection | unknown\)](#)

3872 [This **RECOMMENDED** Job attribute identifies the Job Owner. Table 10 lists the "job-owner-](#)
3873 [col" member attributes, which are the same as the "system-owner-col" System Description](#)
3874 [attribute \(section 7.2.38\).](#)

3875 7.4.2 job-resource-ids (1setOf integer(1:MAX))

3876 This REQUIRED Job attribute lists the Printer resource IDs allocated to the Job. The value(s)
3877 are the actual resource IDs copied from the "job-resource-ids" (section 7.1.1) operation
3878 attribute from the Job Creation request.

3879 7.5 Printer Description Attributes

3880 Printer Description attributes are typically READ-WRITE and can potentially be set by an
3881 Operator or Administrator using the Set-Printer-Attributes operation [RFC3380]. Writable

Commented [MS12]: At most recommended since we already have "job-originating-user-xxx" and "job-recipient-name". Discuss whether we need it and what purpose it serves.

Other xxx-owner-col attributes provide a contact person for the administration of the (shared) object, but access control is typically for "all administrators and operators" vs. "job owner".

3882 Printer Description attributes are listed in the value of “printer-settable-attributes-supported”
3883 [RFC3380].

3884 7.5.1 printer-owner-col (collection | unknown)

3885 This REQUIRED Printer attribute identifies the Printer Owner. [Table 10 lists the "printer-](#)
3886 [owner-col" member attributes, which are the same as the "system-owner-col" System](#)
3887 [Description attribute \(section 7.2.38\).](#)

3888 7.6 Printer Status Attributes

3889 All of the Printer Status attributes are READ-ONLY and cannot be set directly by the Set-
3890 Printer-Attributes operation.

3891 7.6.1 printer-config-changes (integer(0:MAX))

3892 This REQUIRED Printer attribute identifies the number of configuration changes (in Printer
3893 Description attributes) for a Printer semantically equivalent to the Monitoring element
3894 ConfigChanges defined in [PWG5106.1] and semantically equivalent to
3895 “prtGeneralConfigChanges” in IETF Printer MIB v2 [RFC3805]. The value of this attribute
3896 MUST be incremented by one for each operation that changes the Printer configuration
3897 (rather than incrementing by one for each configuration attribute that was changed by the
3898 single operation).

3899 7.6.2 printer-id (integer(1:65535))

3900 This REQUIRED Printer attribute uniquely identifies the Printer within the System and is
3901 semantically equivalent to the ServiceSummary element ID defined in [PWG5108.06] and
3902 semantically analogous to the “job-id” attribute defined in [RFC8011].

3903 7.6.3 printer-impressions-completed (integer(0:MAX))

3904 [This RECOMMENDED Printer attribute provides the total number of impressions processed](#)
3905 [by the Printer, corresponding to the icImpressionTotalImps property defined in the PWG](#)
3906 [Imaging System State and Counter MIB v2.0 \[PWG5106.3\].](#)

3907 7.6.4 printer-impressions-completed-col (collection)

3908 [This RECOMMENDED Printer attribute provides a breakdown of the total number of](#)
3909 [impressions processed by the Printer. Table 13 lists the member attributes that correspond](#)
3910 [to the PWG Imaging System State and Counter MIB v2.0 \[PWG5106.3\] properties.](#)

3911 7.6.5 printer-media-sheets-completed (integer(0:MAX))

3912 [This RECOMMENDED Printer attribute provides the total number of media sheets](#)
3913 [processed by the Printer, corresponding to the icMediaUsedTotalSheets property defined in](#)
3914 [the PWG Imaging System State and Counter MIB v2.0 \[PWG5106.3\].](#)

Deleted: ¶
owner-uri (uri)¶
This REQUIRED member attribute contains a
Printer Owner URI, e.g.,
“mailto:bob@example.com,” and is semantically
analogous to the Service object’s OwnerURI
defined in [PWG5108.01]. If specified in a Set-
Printer-Attributes operation, then the “owner-
vcard” member attribute MUST also be
specified (to preserve consistency).
owner-vcard (1setOf text(1023))¶
This REQUIRED member attribute contains a
Printer Owner vCard [RFC6350] and is
semantically analogous to the Service object’s
OwnerVCard defined in [PWG5108.01]. If
specified in a Set-Printer-Attributes operation,
then the “owner-uri” member attribute MUST
also be specified (to preserve consistency).

3933 **7.6.6 printer-media-sheets-completed-col (collection)**

3934 [This RECOMMENDED Printer attribute provides a breakdown of the total number of media](#)
3935 [sheets processed by the Printer. Table 14 lists the member attributes that correspond to the](#)
3936 [PWG Imaging System State and Counter MIB v2.0 \[PWG5106.3\] properties.](#)

3937 **7.6.7 printer-pages-completed (integer(0:MAX))**

3938 [This RECOMMENDED Printer attribute provides the total number of pages processed by](#)
3939 [the Printer, corresponding to the iclmpressionTotalImps property defined in the PWG](#)
3940 [Imaging System State and Counter MIB v2.0 \[PWG5106.3\].](#)

3941 **7.6.8 printer-pages-completed-col (collection)**

3942 [This RECOMMENDED Printer attribute provides a breakdown of the total number of pages](#)
3943 [processed by the Printer. Table 15 lists the member attributes that correspond to the PWG](#)
3944 [Imaging System State and Counter MIB v2.0 \[PWG5106.3\] properties.](#)

3945 **7.6.9 printer-service-type (type2 keyword)**

3946 This REQUIRED Printer attribute identifies the service type for a Printer as used in Create-
3947 Printer defined in section 6 and is semantically equivalent to the Service Summary element
3948 ServiceType defined in [PWG5108.06]. Vendor-specific service types SHOULD be
3949 keywords constructed in the form “smiNNN-name”, where “NNN” is the vendor’s enterprise
3950 SMI number assigned by IANA. Vendor-specific service types SHOULD be registered with
3951 IANA.

3952 Standard keyword values for this attribute include:

3953 ‘copy’: A Copy service defined in [PWG5108.04].

3954 ‘faxin’: A FaxIn service defined in [RFC2707] and [PWG5108.01].

3955 ‘faxout’: A FaxOut service defined in [PWG5100.15].

3956 ‘print’: A Print service defined in [RFC8011].

3957 ‘print3d’: A 3D Print service defined in [PWG5100.21]

3958 ‘scan’: A Scan service defined in [PWG5100.17].

3959 ‘transform’: A Transform service defined in [PWG5108.01].

3960 **7.7 Resource Description Attributes**

3961 Resource Description attributes are typically READ-WRITE and can potentially be set by an
3962 Operator or Administrator using the Set-Resource-Attributes operation (see section 6).

3963 Writable Resource Description attributes are listed in the value of “resource-settable-
3964 attributes-supported” System Description attribute defined above in section 7.2.

3965 7.7.1 resource-info (text([MAX](#)))

Deleted: 127

3966 This REQUIRED Resource attribute contains the description of the Resource and is
3967 semantically equivalent to the ResourceInfo element defined in [PWG5108.03] and
3968 semantically analogous to the “printer-info” Printer attribute defined in [RFC8011].

3969 7.7.2 resource-name (name([MAX](#)))

Deleted: 127

3970 This REQUIRED Resource attribute contains the name of the Resource and is semantically
3971 equivalent to the ResourceName element defined in [PWG5108.03] and semantically
3972 analogous to the “printer-name” Printer attribute defined in [RFC8011].

3973 7.7.3 resource-owner-col (collection [| unknown](#))

3974 This REQUIRED Resource attribute identifies the Resource Owner. [Table 10 lists the](#)
3975 [“resource-owner-col” member attributes, which are the same as the “system-owner-col”](#)
3976 [System Description attribute \(section 7.2.38\).](#)

Commented [MS13]: Shouldn't this be a Resource Status attribute?

3977 7.8 Resource Status Attributes

3978 All of the Resource Status attributes are READ-ONLY and cannot be directly updated by the
3979 Set-Resource-Attributes operation.

3980 7.8.1 date-time-at-canceled (dateTime [| no-value](#))

3981 This REQUIRED Resource attribute contains the date and time of Resource cancelation
3982 request (i.e., when Cancel-Resource operation is accepted) or Resource abortion by the
3983 System, which can be before the Resource transitions to the ‘canceled’ or ‘aborted’ state. [It](#)
3984 [is semantically analogous to the DateTimeAtExpiration element defined in \[PWG5108.03\]](#)
3985 [and semantically analogous to the Job “date-time-at-completed” attribute defined in](#)
3986 [\[RFC8011\]. \[If the Resource has not been canceled or aborted, the ‘no-value’ out-of-band\]\(#\)](#)
3987 [value is returned.](#)

Deleted: [<#>owner-uri \(uri\)](#)
<#> This REQUIRED member attribute contains a Resource Owner URI, e.g., “mailto:bob@example.com,” and is semantically analogous to the Service object’s OwnerURI defined in [PWG5108.01]. If specified in a Set-Resource-Attributes operation, then the “owner-vcard” member attribute MUST also be specified (to preserve consistency).
Deleted: [<#>owner-vcard \(1setOf text\(1023\)\)](#)
<#> This REQUIRED member attribute contains a Resource Owner vCard [RFC6350] and is semantically analogous to the Service object’s OwnerVCard defined in [PWG5108.01]. If specified in a Set-Resource-Attributes operation, then the “owner-uri” member attribute MUST also be specified (to preserve consistency).

Deleted: , and

Deleted:

3988 7.8.2 date-time-at-creation (dateTime)

3989 This REQUIRED Resource attribute contains the date and time of Resource creation request
3990 (i.e., when Create-Resource operation is accepted) and is semantically equivalent to the
3991 DateTimeAtCreation element defined in [PWG5108.03] and semantically analogous to the
3992 “date-time-at-creation” Job attribute defined in [RFC8011].

3993 7.8.3 date-time-at-installed (dateTime [| no-value](#))

3994 This REQUIRED Resource attribute contains the date and time of Resource installation
3995 request (i.e., when Install-Resource operation is accepted), which can be before the

4018 Resource transitions to the 'installed' state. It is semantically analogous to the "date-time-at-
4019 processing" Job attribute defined in [RFC8011]. If the Resource has not been installed, the
4020 'no-value' out-of-band value is returned.

Deleted: , and

4021 **7.8.4 resource-data-uri (uri | no-value))**

4022 This REQUIRED Resource attribute identifies the URI of the Resource data (if any) and is
4023 semantically equivalent to the ResourceFormat element defined in [PWG5108.03] and
4024 semantically analogous to the "document-format" attribute defined in [RFC8011]. When a
4025 Resource has no associated data, the System MUST return the 'no-value' out-of-band value
4026 defined in [RFC8011] for "resource-data-uri".

4027 **7.8.5 resource-format (mimeType)**

4028 This REQUIRED Resource attribute identifies the format of the Resource data and is
4029 semantically equivalent to the ResourceFormat element defined in [PWG5108.03] and
4030 semantically analogous to the "document-format" attribute defined in [RFC8011].

4031 **7.8.6 resource-id (integer(1:MAX))**

4032 This REQUIRED Resource attribute uniquely identifies the Resource within the System and
4033 is semantically equivalent to the ResourceId element defined in [PWG5108.03] and
4034 semantically analogous to the "job-id" attribute defined in [RFC8011].

4035 **7.8.7 resource-k-octets (integer(0:MAX))**

4036 This REQUIRED Resource attribute contains the size of the data associated with the
4037 Resource (if any) but is not included in the original Resource object defined in [PWG5108.03]
4038 and semantically analogous to the "job-k-octets" attribute defined in [RFC8011].

4039 **7.8.8 resource-state (type1 enum)**

4040 This REQUIRED Resource attribute contains the current state of the Resource and is
4041 semantically analogous to the DateTimeOfExpiration and ResourceHasExpired elements
4042 defined in [PWG5108.03] and semantically analogous to the "job-state" attribute defined in
4043 [RFC8011].

4044 Standard enum values for this attribute are:

4045 'pending' (3): The Resource has been created but is not yet available or installed.

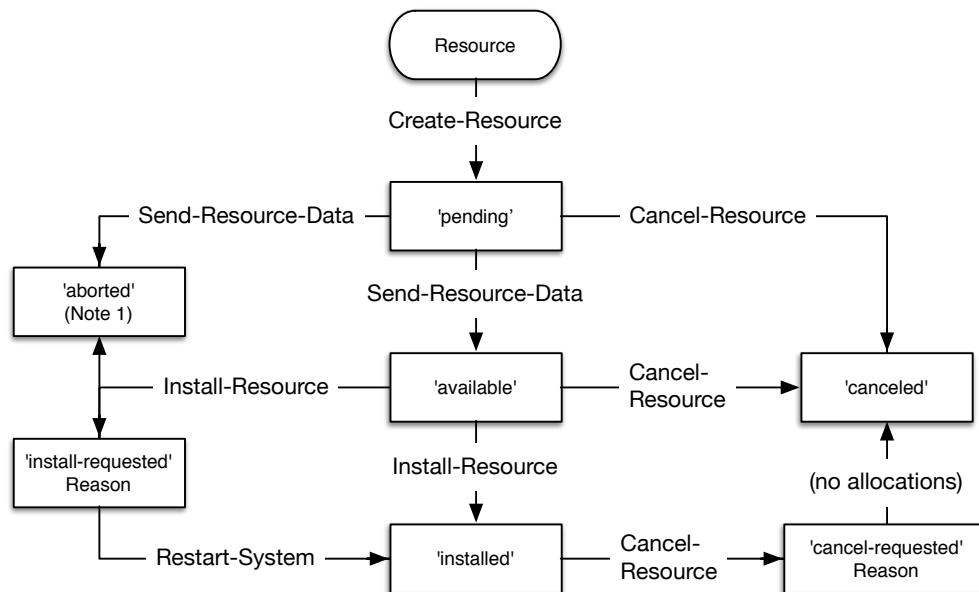
4046 'available' (4): The Resource data has been uploaded and the Resource is
4047 available for installation.

4048 'installed' (5): The Resource has been installed and is ready for use.

4049 'canceled' (6): The Resource has been canceled and can no longer be used.

4051 'aborted' (7): The Resource has been aborted by the System and can no longer be
 4052 used.

4053 Normal Resource state transitions are shown in Figure 2 below. Resource states normally
 4054 progress from top to bottom ('created' to 'available' to 'installed') until the Resource finally
 4055 transitions to a terminal state of 'canceled' (by Administrator) or 'aborted' (by System). See
 4056 note 2 below for one of the exceptions to normal Resource state transitions.



4057
 4058 **Figure 2 – IPP Resource Object Life Cycle**

4059 Notes:

- 4060 1) A Resource object can transition to the 'aborted' state due to an interrupted Send-
 4061 Resource-Data request, corrupted Resource data, an unsupported Resource data
 4062 format, inability to store the Resource data, inability to install the Resource data,
 4063 and/or other System internal fault conditions. The "resource-state-reasons" attribute
 4064 will contain the reason for the Resource being aborted by the System.
- 4065 2) When a new Resource version is installed that replaces a previous Resource
 4066 version (e.g., firmware), the old Resource "resource-state" MUST transition back to
 4067 'available' and the old Resource "resource-use-count" MUST be set to zero.

4068 7.8.9 resource-state-message (text(MAX))

4069 This REQUIRED Resource attribute contains a state message for the Resource but is not
4070 included in the original Resource object defined in [PWG5108.03] and semantically
4071 analogous to the “job-state-message” attribute defined in [RFC8011].

4072 7.8.10 resource-state-reasons (1setOf type2 keyword)

4073 This REQUIRED Resource attribute contains a list of state reasons for the Resource but is
4074 not included in the original Resource object defined in [PWG5108.03] and is semantically
4075 analogous to the “job-state-reasons” attribute defined in [RFC8011]. Any applicable “job-
4076 state-reasons” keyword value can be used in “resource-state-reasons”.

4077 Standard values for this attribute are:

4078 ‘cancel-requested’: A Cancel-Resource operation has been received and accepted
4079 and the Resource will become permanently unavailable when the cancellation is
4080 completed (e.g., after the current Job using the Resource is completed).

4081 ‘install-requested’: An Install-Resource operation has been received and accepted
4082 and the Resource will become available for use when the installation is completed
4083 (e.g., potentially after the next System or Subunit reboot in the case of an
4084 executable Resource).

4085 ‘resource-incoming’: A Send-Resource-Data operation has been received and
4086 accepted, Resource data upload is in progress, and “resource-state” will transition
4087 to ‘available’ after the upload is completed.

4088 7.8.11 resource-string-version (text(127))

4089 This REQUIRED Resource attribute contains the string version of the Resource, which
4090 SHOULD conform to section 4.2.4 “String Version” of IETF PA-TNC [RFC5792] which
4091 defines the internal string fields Product Version Number, Internal Build Number, and
4092 Configuration Version Number. This attribute is semantically analogous to the
4093 FirmwareStringVersion attribute defined in [PWG5110.4].

4094 7.8.12 resource-type (type2 keyword)

4095 This REQUIRED Resource attribute identifies the type of the Resource and is semantically
4096 equivalent to the ResourceType element defined in [PWG5108.03].

4097 IPP System Service implementations SHOULD support System-scope executable
4098 resources (e.g., for firmware update). System Service implementations MAY support Printer-
4099 scope and/or Job-scope executable resources in an implementation-defined manner.

4100 Standard values for this attribute (with their resource category prefix) include:

4101 ‘executable-firmware’: Executable firmware.

Commented [MS14]: DISCUSS: We have a limit of 127 octets, but only a SHOULD for conforming to RFC 5792. The 5792 string version consists of three variable-length strings up to 255 octets each.

Seems like it would be good to remove the explicit limit (MAX = 1023 octets) or at least increase it (255 + 255 + 255 = 765).

4102 'executable-software': Executable [\(Printer-resident application\)](#) software.

4103 'static-font': Static font.

4104 'static-form': Static form.

4105 'static-icc-profile': Static ICC profile.

4106 'static-image': Static image [such as a Printer icon](#).

4107 'static-logo': Static logo [such as an organizational logo used on letterhead](#).

4108 ['static-other': Static resource of some other kind.](#)

4109 ['static-strings': Static localization \(".strings"\) file.](#)

4110 'template-document': Template for creating Document object [PWG5100.5].

4111 'template-job': Template for creating Job object [PWG5108.07].

4112 'template-printer': Template for creating Printer object [RFC8011].

4113 7.8.13 resource-use-count (integer(0:MAX))

4114 This REQUIRED Resource attribute contains the use count (i.e., allocation count) for the
4115 Resource but is not included in the original Resource object defined in [PWG5108.03].

4116 Note: If the System internal use count exceeds MAX, then the System MUST return
4117 "resource-use-count" with a value of MAX.

4118 7.8.14 resource-uuid (uri(45))

4119 This REQUIRED Resource attribute identifies the UUID as a URI [RFC4122] for the
4120 Resource but is not included in the original Resource object defined in [PWG5108.03] and
4121 is semantically analogous to the "system-uuid" attribute defined in section 7.3.

4122 7.8.15 resource-version (octetString(16))

4123 This REQUIRED Resource attribute contains the numeric version of the Resource, which
4124 SHOULD conform to section 4.2.3 "Numeric Version" of IETF PA-TNC [RFC5792] which
4125 defines the internal integer fields Major Version Number, Minor Version Number, Build
4126 Number, Service Pack Major, and Service Pack Minor. This attribute is semantically
4127 analogous to the FirmwareVersion attribute defined in [PWG5110.4].

4128 7.8.16 time-at-canceled (integer(MIN:MAX) | no-value)

4129 This REQUIRED Resource attribute contains the time of Resource cancelation request (i.e.,
4130 when Cancel-Resource operation is accepted) or Resource abortion by the System, which

Commented [MS15]: DISCUSS: We have a limit of 16 octets, but only a SHOULD for conforming to RFC 5792. Should the limit be removed or increased (slightly)?

4131 can be before the Resource transitions to the 'canceled' or 'aborted' state. It is not included
 4132 in the original Resource object defined in [PWG5108.03] and is semantically analogous to
 4133 the "time-at-completed" Job attribute defined in [RFC8011]. If the Resource has not been
 4134 canceled or aborted, the 'no-value' out-of-band value is returned.

Deleted: , but

4135 7.8.17 time-at-creation (integer(MIN:MAX))

4136 This REQUIRED Resource attribute contains the time of Resource creation request (i.e.,
 4137 when Create-Resource operation is accepted) but is not included in the original Resource
 4138 object defined in [PWG5108.03] and is semantically analogous to the "time-at-creation" Job
 4139 attribute defined in [RFC8011].

4140 7.8.18 time-at-installed (integer(MIN:MAX)) no-value

4141 This REQUIRED Resource attribute contains the time of Resource installation request (i.e.,
 4142 when Install-Resource operation is accepted), which can be before the Resource transitions
 4143 to the 'installed' state. It is not included in the original Resource object defined in
 4144 [PWG5108.03] and is semantically analogous to the "time-at-processing" Job attribute
 4145 defined in [RFC8011]. If the Resource has not been installed, the 'no-value' out-of-band
 4146 value is returned.

Deleted: , but

Deleted: date-

4147 7.9 Subscription Status Attributes

4148 All Subscription Status attributes are READ-ONLY.

4149 7.9.1 notify-system-uri (uri)

4150 This attribute provides the "system-uri" associated with the Subscription. Systems MUST
 4151 support this attribute for System and Resource Subscriptions.

Deleted: <#>Job Status Attributes

<#>All of the Job Status attributes are READ-ONLY and cannot be directly updated by the Set-Job-Attributes operation.

<#>job-owner-col (collection)

<#>This REQUIRED Job attribute identifies the Job Owner.

<#>owner-uri (uri)

<#>This REQUIRED member attribute contains a Job Owner URI, e.g., "mailto:bob@example.com," and is semantically analogous to the Service object's OwnerURI defined in [PWG5108.01].

<#>owner-vcard (1setOf text(1023))

<#>This REQUIRED member attribute contains a Job Owner vCard [RFC6350] and is semantically analogous to the Service object's OwnerVCard defined in [PWG5108.01].

4152 7.10 Event Notifications Attributes

4153 7.10.1 notify-system-up-time (integer(0:MAX))

4154 This attribute provides the "system-up-time" value when the event occurred. Systems MUST
 4155 support this attribute for System and Resource Subscription event notifications.

4156 7.10.2 notify-system-uri (uri)

4157 This attribute provides the "system-uri" for the subscribed event. Systems MUST support
 4158 this attribute for System and Resource Subscription event notifications.

4159

8. Additional Semantics for Existing Operations

8.1 Cancel-Subscription, Get-Notifications, Get-Subscription-Attributes, Get-Subscriptions, Renew-Subscription: system-uri (uri)

This specification adds the "system-uri" (section 7.1.20) operation attribute to specify the target System object of the operation.

8.2 Create-Job, Print-Job, Print-URI: job-resource-ids (1setOf integer(1:MAX))

This specification adds the "job-resources-ids (1setOf integer(1:MAX))" (section 7.1.1) operation attribute to specify a list of Printer resources that are to be allocated to the created Job.

If any of the resource IDs are not allocated to the Printer, the Printer returns the "job-resource-ids" attribute with the corresponding resource IDs in the Unsupported Attributes group of the response. The returned "status-code" value will be 'successful-ok-ignored-or-substituted-attributes' or 'client-error-attributes-or-values-not-supported' depending on the requested attribute fidelity.

The successfully allocated resource IDs are copied to the corresponding "job-resource-ids" Job Status attribute (section 7.4.2).

8.3 Get-Printer-Attributes: system-uri (uri) or printer-uri (uri)

This specification adds the "system-uri" (section 7.1.20) operation attribute to specify the target System object of the operation.

When this request is sent to the System object, the System responds as if the request was sent to the default Printer for the System (section 7.2.29). If no default Printer is configured, the System responds with the 'client-error-not-found' status code.

9. Additional Values for Existing Attributes

9.1 notify-events (1setOf type2 keyword)

This specification defines the following new "notify-events" values:

'printer-created': REQUIRED - a Printer was created.

'printer-deleted': REQUIRED - a Printer was deleted.

'resource-canceled': REQUIRED - a Resource was canceled.

- 4210 'resource-config-changed': REQUIRED - when the configuration of the Resource is
4211 changed, i.e., when any Resource Description attribute is changed.
- 4212 'resource-created': REQUIRED - a Resource was created.
- 4213 'resource-installed': REQUIRED - a Resource was installed.
- 4214 'resource-state-changed': REQUIRED - the Resource changed state from any state
4215 to any other state. Specifically, the value of the Resource's "resource-state" or
4216 "resource-state-reasons" attributes change.
- 4217 'system-config-changed': REQUIRED - when the configuration of the System is
4218 changed, i.e., when any System Description attribute is changed.
- 4219 'system-restarted': OPTIONAL - when the System is booted/started up.
- 4220 'system-shutdown': OPTIONAL - when the System is being shut down.
- 4221 'system-state-changed': REQUIRED - the System changed state from any state to
4222 any other state. Specifically, the value of the System's "system-state" or "system-
4223 state-reasons" attributes changed.
- 4224 'system-stopped': REQUIRED - when the "system-state" is 'stopped'.

4225 **9.2 printer-state-reasons (1setOf type2 keyword)**

- 4226 This specification defines the following new "printer-state-reasons" values:
- 4227 'deleted'; The Printer has been deleted.
- 4228 'resuming'; The Printer is processing a Resume-Printer request.

4229 **9.3 requested-attributes (1setOf type2 keyword)**

- 4230 This specification defines the following new "requested-attributes" values:
- 4231 'resource-description': The subset of Resource Description attributes.
- 4232 'resource-status': The subset of Resource Status attributes.
- 4233 'resource-template': The subset of Resource Template attributes.
- 4234 'system-description': The subset of System Description attributes.
- 4235 'system-status': The subset of System Status attributes.
- 4236

4237 10. Conformance Requirements

4238 Provide numbered lists of conformance requirements for the document.

4239 10.1 Conformance Requirements for Clients

4240 In order for a Client to claim conformance to this specification, a Client MUST support:

- 4241 1. The required IPP operations defined in section 6,
- 4242 2. The required IPP attributes defined in section 7,
- 4243 3. The internationalization considerations in section 11, and
- 4244 4. The security considerations in section 12.

4245 10.2 Conformance Requirements for Infrastructure Systems

4246 In order for an Infrastructure System to claim conformance to this specification, an
4247 Infrastructure System MUST support:

- 4248 1. The required IPP operations defined in section 6,
- 4249 2. The required IPP attributes defined in section 7,
- 4250 3. The additional IPP operation semantics defined in section 8,
- 4251 4. The additional IPP attribute values defined in section 9,
- 4252 5. The internationalization considerations in section 11, and
- 4253 6. The security considerations in section 12.

4254 10.3 Conformance Requirements for Systems

4255 In order for a System to claim conformance to this specification, a System MUST support:

- 4256 1. The required IPP operations defined in section 6,
- 4257 2. The required IPP attributes defined in section 7,
- 4258 3. The additional IPP operation semantics defined in section 8,
- 4259 4. The additional IPP attribute values defined in section 9,
- 4260 5. The internationalization considerations in section 11, and
- 4261 6. The security considerations in section 12.

4262 11. Internationalization Considerations

4263 For interoperability and basic support for multiple languages, conforming implementations
4264 MUST support the Universal Character Set (UCS) Transformation Format -- 8 bit (UTF-8)
4265 [RFC3629] encoding of Unicode [UNICODE] [ISO10646] and the Unicode Format for
4266 Network Interchange [RFC5198].

4267 Implementations of this specification SHOULD conform to the following standards on
4268 processing of human-readable Unicode text strings, see:

4269 • Unicode Bidirectional Algorithm [UAX9] – left-to-right, right-to-left, and vertical

4270 • Unicode Line Breaking Algorithm [UAX14] – character classes and wrapping

4271 • Unicode Normalization Forms [UAX15] – especially NFC for [RFC 5198]

4272 • Unicode Text Segmentation [UAX29] – grapheme clusters, words, sentences

4273 • Unicode Identifier and Pattern Syntax [UAX31] – identifier use and normalization

4274 • Unicode Collation Algorithm [UTS10] – sorting

4275 • Unicode Locale Data Markup Language [UTS35] – locale databases

4276 Implementations of this specification are advised to also review the following informational
4277 documents on processing of human-readable Unicode text strings:

4278 • Unicode Character Encoding Model [UTR17] – multi-layer character model

4279 • Unicode in XML and other Markup Languages [UTR20] – XML usage

4280 • Unicode Character Property Model [UTR23] – character properties

4281 • Unicode Conformance Model [UTR33] – Unicode conformance basis

4282 **12. Security Considerations**

4283 The IPP extensions defined in this document require the same security considerations as
4284 defined in the IPP/1.1: Model and Semantics [RFC8011] and PWG System Object and
4285 System Control Service Semantics [PWG5108.06], plus the additional security
4286 considerations below.

4287 **12.1 Human-readable Strings**

4288 Implementations of this specification SHOULD conform to the following standard on
4289 processing of human-readable Unicode text strings, see:

4290 • Unicode Security Mechanisms [UTS39] – detecting and avoiding security attacks

4291 Implementations of this specification are advised to also review the following informational
4292 document on processing of human-readable Unicode text strings:

4293 • Unicode Security FAQ [UNISECFAQ] – common Unicode security issues

4294 12.2 Confidentiality and Integrity

4295 Clients and Systems MUST provide confidentiality and integrity of data in transit using either
4296 an interface providing physical security such as USB or using TLS encryption [RFC5246]
4297 over otherwise unsecured local or network connections,

4298 12.3 Access Control

4299 Because of the potential for abuse and misuse, Systems SHOULD provide access control
4300 mechanisms including lists of allowed Clients, authentication, and authorization for site
4301 defined policies since, except for Get-Printer-Attributes for legacy Clients, an IPP System
4302 Service consists of administrative operations for authenticated and authorized users.

4303 12.4 Physical Safety

4304 Systems MUST NOT allow Clients to disable physical safety features of the hardware, such
4305 as protective gates, covers, or interlocks.

4306 12.5 Digital Signature Validation

4307 When accepting new resource data using the Send-Resource-Data operation, the System
4308 SHOULD validate any Resource signature supplied or embedded in the Resource data, for
4309 example as described in US NIST Digital Signature Standard [FIPS186-4], ENISA
4310 Algorithms, Key Size and Parameters Report [ENISAALG], ETSI Electronic Signatures and
4311 Infrastructures (ESI) Signature validation procedures and policies [TS102853], and IETF
4312 XML-Signature Syntax and Processing [RFC3275].

4313 In the event that the "resource-signature (1setOf octetString)" operation attribute (section
4314 7.1.15) is specified for Resource data with an embedded signature, both signatures MUST
4315 be validated. Resource signatures MAY be re-validated at other times by the System,
4316 however such validation is outside the scope of this specification.

4317 12.6 Encrypted Resources

4318 Resource data can be encrypted as part of the underlying resource format. Systems
4319 SHOULD NOT decrypt such resources until they are used in order to provide the best
4320 protection at rest for those resources. Key distribution and management for such
4321 resources is outside the scope of this specification.

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13. IANA Considerations

13.1 Object Registrations

The objects defined in this document will be published by IANA according to the procedures in the IPP Model and Semantics [RFC8011] section 7.1 in the following file:

<http://www.iana.org/assignments/ipp-registrations>

The registry entries will contain the following information:

Object Name	Reference
Resource	[PWG5100.SYS]
System	[PWG5100.SYS]

13.2 Attribute Registrations

The attributes defined in this document will be published by IANA according to the procedures in IPP Model and Semantics [RFC8011] section 7.2 in the following file:

<http://www.iana.org/assignments/ipp-registrations>

The registry entries will contain the following information:

Operation attributes:	Reference
job-resource-ids (1setOf integer(1:MAX))	[PWG5100.SYS]
printer-id (integer(1:65535))	[PWG5100.SYS]
printer-ids (1setOf integer(1:65535))	[PWG5100.SYS]
printer-geo-location (uri)	[PWG5100.SYS]
printer-location (text(127))	[PWG5100.SYS]
printer-service-type (1setOf type2 keyword)	[PWG5100.SYS]
printer-xri-requested (1setOf collection)	[PWG5100.SYS]
requesting-user-vcard (1setOf text(MAX))	[PWG5100.SYS]
resource-format (mimeType)	[PWG5100.SYS]
resource-format-accepted (1setOf mimeType)	[PWG5100.SYS]
resource-formats (1setOf mimeType)	[PWG5100.SYS]
resource-id (integer(1:MAX))	[PWG5100.SYS]
resource-ids (1setOf integer(1:MAX))	[PWG5100.SYS]
resource-k-octets (integer(0:MAX))	[PWG5100.SYS]
resource-signature (1setOf octetString)	[PWG5100.SYS]
resource-states (1setOf type1 enum)	[PWG5100.SYS]
resource-type (type2 keyword)	[PWG5100.SYS]
resource-types (1setOf type2 keyword)	[PWG5100.SYS]
restart-get-interval (integer(0:MAX))	[PWG5100.SYS]
system-uri (uri)	[PWG5100.SYS]
which-printers (type2 keyword)	[PWG5100.SYS]
System Description attributes:	Reference

```

4364 charset-configured (charset) [PWG5100.SYS]
4365 charset-supported (1setOf charset) [PWG5100.SYS]
4366 document-format-supported (1setOf mimeType) [PWG5100.SYS]
4367 ippget-event-life (integer(15:MAX)) [PWG5100.SYS]
4368 ipp-features-supported (1setOf type2 keyword) [PWG5100.SYS]
4369 ipp-versions-supported (1setOf type2 keyword) [PWG5100.SYS]
4370 multiple-document-printers-supported (boolean) [PWG5100.SYS]
4371 natural-language-configured (naturalLanguage) [PWG5100.SYS]
4372 generated-natural-language-supported (1setOf naturalLanguage) [PWG5100.SYS]
4373 notify-attributes-supported (1setOf keyword) [PWG5100.SYS]
4374 notify-events-default (1setOf type2 keyword) [PWG5100.SYS]
4375 notify-events-supported (1setOf type2 keyword) [PWG5100.SYS]
4376 notify-lease-duration-default (integer(0:67108863)) [PWG5100.SYS]
4377 notify-lease-duration-supported (1setOf (integer(0:67108863) |
4378   rangeOfInteger(0:67108863))) [PWG5100.SYS]
4379 notify-max-events-supported (integer(2:MAX)) [PWG5100.SYS]
4380 notify-pull-method-supported (1setOf type2 keyword) [PWG5100.SYS]
4381 notify-schemes-supported (1setOf uriScheme) [PWG5100.SYS]
4382 operations-supported (1setOf type2 enum) [PWG5100.SYS]
4383 power-calendar-policy-col (1setOf collection) [PWG5100.SYS]
4384   calendar-id (integer(1:MAX)) [PWG5100.SYS]
4385   day-of-month (integer(1:31)) [PWG5100.SYS]
4386   day-of-week (integer(1:7)) [PWG5100.SYS]
4387   hour (integer(0:23)) [PWG5100.SYS]
4388   minute (integer(0:59)) [PWG5100.SYS]
4389   month (integer(1:12)) [PWG5100.SYS]
4390   request-power-state (type1 keyword) [PWG5100.SYS]
4391   run-once (boolean) [PWG5100.SYS]
4392 power-event-policy-col (1setOf collection) [PWG5100.SYS]
4393   event-id (integer(1:MAX)) [PWG5100.SYS]
4394   event-name (name(127)) [PWG5100.SYS]
4395   request-power-state (type1 keyword) [PWG5100.SYS]
4396 power-timeout-policy-col (1setOf collection) [PWG5100.SYS]
4397   start-power-state (type1 keyword) [PWG5100.SYS]
4398   timeout-id (integer(1:MAX)) [PWG5100.SYS]
4399   timeout-predicate (type1 keyword) [PWG5100.SYS]
4400   timeout-seconds (integer(0:MAX)) [PWG5100.SYS]
4401 printer-creation-attributes-supported (1setOf keyword) [PWG5100.SYS]
4402 resource-format-supported (1setOf mimeType) [PWG5100.SYS]
4403 resource-type-supported (1setOf type2 keyword) [PWG5100.SYS]
4404 resource-settable-attributes-supported (1setOf keyword) [PWG5100.SYS]
4405 system-current-time (dateTime) [PWG5100.SYS]
4406 system-default-printer-id (integer(1:65535) | no-value) [PWG5100.SYS]
4407 system-device-id (text(MAX)) [PWG5100.SYS]
4408 system-geo-location (uri | unknown) [PWG5100.SYS]
4409 system-info (text(127)) [PWG5100.SYS]
4410 system-location (text(127)) [PWG5100.SYS]
4411 system-mandatory-printer-attributes (1setOf keyword) [PWG5100.SYS]
4412 system-make-and-model (text(127)) [PWG5100.SYS]
4413 system-message-from-operator (text(127)) [PWG5100.SYS]
4414 system-name (name(127)) [PWG5100.SYS]
4415 system-owner-col (collection | unknown) [PWG5100.SYS]
4416   < member attributes are the same as "printer-owner-col" > [PWG5100.SYS]
4417 system-settable-attributes-supported (1setOf keyword) [PWG5100.SYS]
4418 system-strings-languages-supported (1setOf naturalLanguage) [PWG5100.SYS]
4419 system-strings-uri (uri | no-value) [PWG5100.SYS]

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4420 system-xri-supported (1setOf collection) [PWG5100.SYS]
4421 < member attributes are the same as "printer-xri-supported" > [PWG5100.SYS]
4422
4423 System Status attributes: Reference
4424 -----
4425 power-log-col (1setOf collection) [PWG5100.SYS]
4426   log-id (integer(1:MAX)) [PWG5100.SYS]
4427   power-state (type1 keyword) [PWG5100.SYS]
4428   power-state-date-time (dateTime) [PWG5100.SYS]
4429   power-state-message (text(255)) [PWG5100.SYS]
4430 power-state-capabilities-col (1setOf collection) [PWG5100.SYS]
4431   can-accept-jobs (boolean) [PWG5100.SYS]
4432   can-process-jobs (boolean) [PWG5100.SYS]
4433   power-active-watts (integer(0:MAX)) [PWG5100.SYS]
4434   power-inactive-watts (integer(0:MAX)) [PWG5100.SYS]
4435   power-state (type1 keyword) [PWG5100.SYS]
4436 power-state-counters-col (1setOf collection) [PWG5100.SYS]
4437   hibernate-transitions (integer(0:MAX)) [PWG5100.SYS]
4438   on-transitions (integer(0:MAX)) [PWG5100.SYS]
4439   standby-transitions (integer(0:MAX)) [PWG5100.SYS]
4440   suspend-transitions (integer(0:MAX)) [PWG5100.SYS]
4441 power-state-monitor-col (collection) [PWG5100.SYS]
4442   current-month-kwh (integer(0:MAX)) [PWG5100.SYS]
4443   current-watts (integer(0:MAX)) [PWG5100.SYS]
4444   lifetime-kwh (integer(0:MAX)) [PWG5100.SYS]
4445   meters-are-actual (boolean) [PWG5100.SYS]
4446   power-state (type1 keyword) [PWG5100.SYS]
4447   power-state-message (text(255)) [PWG5100.SYS]
4448   power-usage-is-rms-watts (boolean) [PWG5100.SYS]
4449 power-state-transitions-col (1setOf collection) [PWG5100.SYS]
4450   end-power-state (type1 keyword) [PWG5100.SYS]
4451   start-power-state (type1 keyword) [PWG5100.SYS]
4452   state-transition-seconds (integer(0:MAX)) [PWG5100.SYS]
4453 system-config-change-date-time (dateTime) [PWG5100.SYS]
4454 system-config-change-time (integer(0:MAX)) [PWG5100.SYS]
4455 system-config-changes (integer(0:MAX)) [PWG5100.SYS]
4456 system-configured-printers (1setOf collection) [PWG5100.SYS]
4457   printer-id (integer(0:65535)) [PWG5100.SYS]
4458   printer-info (text(127)) [PWG5100.SYS]
4459   printer-is-accepting-jobs (boolean) [PWG5100.SYS]
4460   printer-name (name(127)) [PWG5100.SYS]
4461   printer-service-type (type2 keyword) [PWG5100.SYS]
4462   printer-state (type1 enum) [PWG5100.SYS]
4463   printer-state-reasons (1setOf type2 keyword) [PWG5100.SYS]
4464   printer-xri-supported (collection) [PWG5100.SYS]
4465   < member attributes are the same as "printer-xri-supported" > [PWG5100.SYS]
4466 system-configured-resources (1setOf collection) [PWG5100.SYS]
4467   resource-format (mimeMediaType) [PWG5100.SYS]
4468   resource-id (integer(1:MAX)) [PWG5100.SYS]
4469   resource-info (text(127)) [PWG5100.SYS]
4470   resource-name (name(127)) [PWG5100.SYS]
4471   resource-state (type1 enum) [PWG5100.SYS]
4472   resource-type (type2 keyword) [PWG5100.SYS]
4473 system-impressions-completed \(integer\(0:MAX\)\) [PWG5100.SYS]
4474 system-impressions-completed-col \(collection\) [PWG5100.SYS]
4475 < member attributes are the same as "job-impressions-col" > [PWG5100.SYS]

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4476 system-media-sheets-completed (integer(0:MAX)) [PWG5100.SYS]
4477 system-media-sheets-completed-col (collection) [PWG5100.SYS]
4478 < member attributes are the same as "job-media-sheets-col" > [PWG5100.SYS]
4479 system-pages-completed (integer(0:MAX)) [PWG5100.SYS]
4480 system-pages-completed-col (collection) [PWG5100.SYS]
4481 < member attributes are the same as "job-pages-col" > [PWG5100.SYS]
4482 system-serial-number (text(255)) [PWG5100.SYS]
4483 system-state (type1 enum) [PWG5100.SYS]
4484 system-state-change-date-time (dateTime) [PWG5100.SYS]
4485 system-state-change-time (integer(0:MAX)) [PWG5100.SYS]
4486 system-state-message (text(MAX)) [PWG5100.SYS]
4487 system-state-reasons (1setOf type2 keyword) [PWG5100.SYS]
4488 system-up-time (integer(1:MAX)) [PWG5100.SYS]
4489 system-uuid (uri(45)) [PWG5100.SYS]
4490 xri-authentication-supported (1setOf type2 keyword) [PWG5100.SYS]
4491 xri-security-supported (1setOf type2 keyword) [PWG5100.SYS]
4492 xri-uri-scheme-supported (1setOf uriScheme) [PWG5100.SYS]
4493
4494 Job Status attributes: Reference
4495 -----
4496 job-owner-col (collection | unknown) [PWG5100.SYS]
4497 < member attributes are the same as "printer-owner-col" > [PWG5100.SYS]
4498 job-resource-ids (1setOf integer(1:MAX)) [PWG5100.SYS]
4499
4500 Printer Description attributes: Reference
4501 -----
4502 printer-owner-col (collection | unknown) [PWG5100.SYS]
4503   owner-name (name(MAX)) [PWG5100.SYS]
4504   owner-uri (uri) [PWG5100.SYS]
4505   owner-vcard (1setOf text(MAX)) [PWG5100.SYS]
4506
4507 Printer Status attributes: Reference
4508 -----
4509 printer-config-changes (integer(0:MAX)) [PWG5100.SYS]
4510 printer-id (integer(1:65535)) [PWG5100.SYS]
4511 printer-impressions-completed (integer(0:MAX)) [PWG5100.SYS]
4512 printer-impressions-completed-col (collection) [PWG5100.SYS]
4513 < member attributes are the same as "job-impressions-col" > [PWG5100.SYS]
4514 printer-media-sheets-completed (integer(0:MAX)) [PWG5100.SYS]
4515 printer-media-sheets-completed-col (collection) [PWG5100.SYS]
4516 < member attributes are the same as "job-media-sheets-col" > [PWG5100.SYS]
4517 printer-pages-completed (integer(0:MAX)) [PWG5100.SYS]
4518 printer-pages-completed-col (collection) [PWG5100.SYS]
4519 < member attributes are the same as "job-pages-col" > [PWG5100.SYS]
4520 printer-service-type (type2 keyword) [PWG5100.SYS]
4521
4522 Resource Description attributes: Reference
4523 -----
4524 resource-info (text(MAX)) [PWG5100.SYS]
4525 resource-name (name(MAX)) [PWG5100.SYS]
4526 resource-owner-col (collection | unknown) [PWG5100.SYS]
4527 < member attributes are the same as "printer-owner-col" > [PWG5100.SYS]
4528
4529 Resource Status attributes: Reference
4530 -----
4531 date-time-at-canceled (dateTime | no-value) [PWG5100.SYS]

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4534 date-time-at-creation (dateTime) [PWG5100.SYS]
4535 date-time-at-installed (dateTime | no-value) [PWG5100.SYS]
4536 resource-data-uri (uri | no-value) [PWG5100.SYS]
4537 resource-format (mimeType) [PWG5100.SYS]
4538 resource-id (integer(1:MAX)) [PWG5100.SYS]
4539 resource-k-octets (integer(0:MAX)) [PWG5100.SYS]
4540 resource-state (type1 enum) [PWG5100.SYS]
4541 resource-state-message (text(MAX)) [PWG5100.SYS]
4542 resource-state-reasons (1setOf type2 keyword) [PWG5100.SYS]
4543 resource-string-version (text(127)) [PWG5100.SYS]
4544 resource-type (type2 keyword) [PWG5100.SYS]
4545 resource-use-count (integer(0:MAX)) [PWG5100.SYS]
4546 resource-uuid (uri(45)) [PWG5100.SYS]
4547 resource-version (octetString(16)) [PWG5100.SYS]
4548 time-at-canceled (integer(MIN:MAX) | no-value) [PWG5100.SYS]
4549 time-at-creation (integer(MIN:MAX)) [PWG5100.SYS]
4550 time-at-installed (integer(MIN:MAX) | no-value) [PWG5100.SYS]

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4551 13.3 Type2 keyword Attribute Value Registrations

4552 The keyword attribute values defined in this document will be published by IANA according
 4553 to the procedures in the IPP Model and Semantics [RFC8011] section 7.3 in the following
 4554 file:

4555 <http://www.iana.org/assignments/ipp-registrations>

4556 The registry entries will contain the following information:

4557 Attributes (attribute syntax)	Reference
4558 Keyword Attribute Value	
4559 -----	-----
4560 end-power-state (type1 keyword)	[PWG5100.SYS]
4561 < any "power-state" value >	[PWG5100.SYS]
4562	
4563 notify-events (1setOf type2 keyword)	[RFC3995]
4564 printer-created	[PWG5100.SYS]
4565 printer-deleted	[PWG5100.SYS]
4566 resource-canceled	[PWG5100.SYS]
4567 resource-config-changed	[PWG5100.SYS]
4568 resource-created	[PWG5100.SYS]
4569 resource-installed	[PWG5100.SYS]
4570 resource-state-changed	[PWG5100.SYS]
4571 system-config-changed	[PWG5100.SYS]
4572 system-restarted	[PWG5100.SYS]
4573 system-shutdown	[PWG5100.SYS]
4574 system-state-changed	[PWG5100.SYS]
4575 system-stopped	[PWG5100.SYS]
4576	
4577 power-state (type1 keyword)	[PWG5100.SYS]
4578 hibernate	[PWG5100.SYS]
4579 hibernate-vendor1	[PWG5100.SYS]
4580 hibernate-vendor2	[PWG5100.SYS]
4581 hibernate-vendor3	[PWG5100.SYS]
4582 hibernate-vendor4	[PWG5100.SYS]

Deleted: 1
 Job Status attributes: -Reference 1

Moved up [3]: job-owner-col
 (collection) → [PWG5100.SYS] 1

4591	hibernate-vendor5	[PWG5100.SYS]
4592	off-hard	[PWG5100.SYS]
4593	off-hard-graceful	[PWG5100.SYS]
4594	off-soft	[PWG5100.SYS]
4595	off-soft-graceful	[PWG5100.SYS]
4596	off-soft-vendor1	[PWG5100.SYS]
4597	off-soft-vendor2	[PWG5100.SYS]
4598	off-soft-vendor3	[PWG5100.SYS]
4599	off-soft-vendor4	[PWG5100.SYS]
4600	off-soft-vendor5	[PWG5100.SYS]
4601	on	[PWG5100.SYS]
4602	on-vendor1	[PWG5100.SYS]
4603	on-vendor2	[PWG5100.SYS]
4604	on-vendor3	[PWG5100.SYS]
4605	on-vendor4	[PWG5100.SYS]
4606	on-vendor5	[PWG5100.SYS]
4607	reset-hard	[PWG5100.SYS]
4608	reset-hard-graceful	[PWG5100.SYS]
4609	reset-init	[PWG5100.SYS]
4610	reset-mbr	[PWG5100.SYS]
4611	reset-mbr-graceful	[PWG5100.SYS]
4612	reset-nmi	[PWG5100.SYS]
4613	reset-soft	[PWG5100.SYS]
4614	reset-soft-graceful	[PWG5100.SYS]
4615	standby	[PWG5100.SYS]
4616	standby-vendor1	[PWG5100.SYS]
4617	standby-vendor2	[PWG5100.SYS]
4618	standby-vendor3	[PWG5100.SYS]
4619	standby-vendor4	[PWG5100.SYS]
4620	standby-vendor5	[PWG5100.SYS]
4621	suspend	[PWG5100.SYS]
4622	suspend-vendor1	[PWG5100.SYS]
4623	suspend-vendor2	[PWG5100.SYS]
4624	suspend-vendor3	[PWG5100.SYS]
4625	suspend-vendor4	[PWG5100.SYS]
4626	suspend-vendor5	[PWG5100.SYS]
4627		
4628	printer-service-type (type2 keyword)	[PWG5100.SYS]
4629	copy	[PWG5100.SYS]
4630	faxin	[PWG5100.SYS]
4631	faxout	[PWG5100.SYS]
4632	print	[PWG5100.SYS]
4633	print3d	[PWG5100.SYS]
4634	scan	[PWG5100.SYS]
4635	transform	[PWG5100.SYS]
4636		
4637	printer-state-reasons (1setOf type2 keyword)	[RFC8011]
4638	deleted	[PWG5100.SYS]
4639	resuming	[PWG5100.SYS]
4640		
4641	request-power-state (type1 keyword)	[PWG5100.SYS]
4642	< any "power-state" value >	[PWG5100.SYS]
4643		
4644	requested-attributes (1setOf type2 keyword)	[RFC8011]
4645	resource-description	[PWG5100.SYS]
4646	resource-status	[PWG5100.SYS]

```

4647     resource-template [PWG5100.SYS]
4648     system-description [PWG5100.SYS]
4649     system-status [PWG5100.SYS]
4650
4651     resource-state-reasons (1setOf type2 keyword) [PWG5100.SYS]
4652     < any "job-state-reasons" value > [PWG5100.SYS]
4653     cancel-requested [PWG5100.SYS]
4654     install-requested [PWG5100.SYS]
4655     resource-incoming [PWG5100.SYS]
4656
4657     resource-type (type2 keyword) [PWG5100.SYS]
4658     executable-firmware [PWG5100.SYS]
4659     executable-software [PWG5100.SYS]
4660     static-font [PWG5100.SYS]
4661     static-form [PWG5100.SYS]
4662     static-icc-profile [PWG5100.SYS]
4663     static-image [PWG5100.SYS]
4664     static-logo [PWG5100.SYS]
4665     static-other [PWG5100.SYS]
4666     static-strings [PWG5100.SYS]
4667     template-document [PWG5100.SYS]
4668     template-job [PWG5100.SYS]
4669     template-printer [PWG5100.SYS]
4670
4671     start-power-state (type1 keyword) [PWG5100.SYS]
4672     < any "power-state" value > [PWG5100.SYS]
4673
4674     system-state-reasons (1setOf type2 keyword) [PWG5100.SYS]
4675     < any "printer-state-reasons" value > [PWG5100.SYS]
4676
4677     timeout-predicate (type1 keyword) [PWG5100.SYS]
4678     activity [PWG5100.SYS]
4679     inactivity [PWG5100.SYS]
4680     none [PWG5100.SYS]
4681
4682     which-printers (type2 keyword) [PWG5100.SYS]
4683     all [PWG5100.SYS]
4684     idle [PWG5100.SYS]
4685     not-accepting [PWG5100.SYS]
4686     processing [PWG5100.SYS]
4687     shutdown [PWG5100.SYS]
4688     stopped [PWG5100.SYS]
4689     testing [PWG5100.SYS]

```

4690 13.4 Type2 enum Attribute Value Registrations

4691 The enumerations defined in this document will be published by IANA according to the
 4692 procedures in the IPP Model and Semantics [RFC8011] section 7.4 in the following file:

4693 <http://www.iana.org/assignments/ipp-registrations>

4694 The registry entries will contain the following information:

4695 Attributes (attribute syntax)

4696	Enum Value	Enum Symbolic Name	Reference
4697	-----	-----	-----
4698	operations-supported (1setOf type2 enum)		[RFC8011]
4699	0x001E	Get-Resource-Attributes	[PWG5100.SYS]
4700	0x0020	Get-Resources	[PWG5100.SYS]
4701	0x004B	Allocate-Printer-Resources	[PWG5100.SYS]
4702	0x004C	Create-Printer	[PWG5100.SYS]
4703	0x004D	Deallocate-Printer-Resources	[PWG5100.SYS]
4704	0x004E	Delete-Printer	[PWG5100.SYS]
4705	0x004F	Get-Printers	[PWG5100.SYS]
4706	0x0050	Shutdown-One-Printer	[PWG5100.SYS]
4707	0x0051	Startup-One-Printer	[PWG5100.SYS]
4708	0x0052	Cancel-Resource	[PWG5100.SYS]
4709	0x0053	Create-Resource	[PWG5100.SYS]
4710	0x0054	Install-Resource	[PWG5100.SYS]
4711	0x0055	Send-Resource-Data	[PWG5100.SYS]
4712	0x0056	Set-Resource-Attributes	[PWG5100.SYS]
4713	0x0057	Create-Resource-Subscriptions	[PWG5100.SYS]
4714	0x0058	Create-System-Subscriptions	[PWG5100.SYS]
4715	0x0059	Disable-All-Printers	[PWG5100.SYS]
4716	0x005A	Enable-All-Printers	[PWG5100.SYS]
4717	0x005B	Get-System-Attributes	[PWG5100.SYS]
4718	0x005C	Get-System-Supported-Values	[PWG5100.SYS]
4719	0x005D	Pause-All-Printers	[PWG5100.SYS]
4720	0x005E	Pause-All-Printers-After-Current-Job	[PWG5100.SYS]
4721	0x005F	Register-Output-Device	[PWG5100.SYS]
4722	0x0060	Restart-System	[PWG5100.SYS]
4723	0x0061	Resume-All-Printers	[PWG5100.SYS]
4724	0x0062	Set-System-Attributes	[PWG5100.SYS]
4725	0x0063	Shutdown-All-Printers	[PWG5100.SYS]
4726	0x0064	Startup-All-Printers	[PWG5100.SYS]
4727	0x0065	Get-Printer-Resources	[PWG5100.SYS]
4728			
4729	resource-state (type1 enum)		[PWG5100.SYS]
4730	3	pending	[PWG5100.SYS]
4731	4	available	[PWG5100.SYS]
4732	5	installed	[PWG5100.SYS]
4733	6	canceled	[PWG5100.SYS]
4734	7	aborted	[PWG5100.SYS]
4735			
4736	system-state (type1 enum)		[PWG5100.SYS]
4737	3	idle	[PWG5100.SYS]
4738	4	processing	[PWG5100.SYS]
4739	5	stopped	[PWG5100.SYS]

4740 13.5 Attribute Group Registrations

4741 The attribute groups defined in this document will be published by IANA according to the
 4742 procedures in the IPP Model and Semantics [RFC8011] section 7.5 in the following file:

4743 <http://www.iana.org/assignments/ipp-registrations>

4744 The registry entries will contain the following information:

4745	Attribute Group Value	Symbolic Name	Reference
4746	-----	-----	-----
4747	0x08	resource-attributes-tag	[PWG5100.SYS]
4748	0x0A	system-attributes-tag	[PWG5100.SYS]

4749 13.6 Operation Registrations

4750 The operations defined in this document will be published by IANA according to the
 4751 procedures in the IPP Model and Semantics [RFC8011] section 7.8 in the following file:

4752 <http://www.iana.org/assignments/ipp-registrations>

4753 The registry entries will contain the following information:

4754	Operation Name	Reference
4755	-----	-----
4756	Allocate-Printer-Resources	[PWG5100.SYS]
4757	Cancel-Resource	[PWG5100.SYS]
4758	Cancel-Subscription (extension)	[PWG5100.SYS]
4759	Create-Job (extension)	
4760	Create-Printer	[PWG5100.SYS]
4761	Create-Resource	[PWG5100.SYS]
4762	Create-Resource-Subscriptions	[PWG5100.SYS]
4763	Create-System-Subscriptions	[PWG5100.SYS]
4764	Deallocate-Printer-Resources	[PWG5100.SYS]
4765	Delete-Printer	[PWG5100.SYS]
4766	Disable-All-Printers	[PWG5100.SYS]
4767	Enable-All-Printers	[PWG5100.SYS]
4768	Get-Notifications (extension)	[PWG5100.SYS]
4769	Get-Printer-Attributes (extension)	[PWG5100.SYS]
4770	Get-Printer-Resources	[PWG5100.SYS]
4771	Get-Printers	[PWG5100.SYS]
4772	Get-Resource-Attributes	[PWG5100.SYS]
4773	Get-Resources	[PWG5100.SYS]
4774	Get-Subscription-Attributes (extension)	[PWG5100.SYS]
4775	Get-Subscriptions (extension)	[PWG5100.SYS]
4776	Get-System-Attributes	[PWG5100.SYS]
4777	Get-System-Supported-Values	[PWG5100.SYS]
4778	Install-Resource	[PWG5100.SYS]
4779	Pause-All-Printers	[PWG5100.SYS]
4780	Pause-All-Printers-After-Current-Job	[PWG5100.SYS]
4781	Print-Job (extension)	[PWG5100.SYS]
4782	Print-URI (extension)	[PWG5100.SYS]
4783	Register-Output-Device	[PWG5100.SYS]
4784	Restart-System	[PWG5100.SYS]
4785	Renew-Subscription (extension)	[PWG5100.SYS]
4786	Resume-All-Printers	[PWG5100.SYS]
4787	Send-Resource-Data	[PWG5100.SYS]
4788	Set-Resource-Attributes	[PWG5100.SYS]
4789	Set-System-Attributes	[PWG5100.SYS]
4790	Shutdown-All-Printers	[PWG5100.SYS]
4791	Shutdown-One-Printer	[PWG5100.SYS]
4792	Startup-All-Printers	[PWG5100.SYS]
4793	Startup-One-Printer	[PWG5100.SYS]

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4991

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16. Appendix A – Rationale for Design Choices

This section describes the rationale for important design choices made in the development of this IPP System Service specification.

16.1 Resource Object

16.1.1 Move Resource Service operations into System Service

The PWG Network Resource Service [PWG5108.03] was unique because it wasn't a Job service and was implicitly a capability of the overall System. Therefore, selected Resource operations have been incorporated into the System Service.

16.1.2 Remove some Resource operations

The PWG Network Resource Service [PWG5108.03] defined a DeleteResource operation that was incompatible with System log files and audit trail mechanisms. Instead a new Cancel-Resource operation has been added to the System Service that permanently removes the Resource from further use but preserves the Resource metadata in a Resource History phase for correlation with System log files.

The PWG Network Resource Service [PWG5108.03] defined a RetrieveResource operation for reading the contents of the Resource data that was inherently insecure. This operation has been removed from the System Service.

The PWG Network Resource Service [PWG5108.03] defined a ReplaceResource operation for replacing the contents of the Resource data that was inherently insecure. This operation has been removed from the System Service.

The PWG Network Resource Service [PWG5108.03] defined a RenewResource operation for renewing the lease on a Resource. This operation has been removed from the System Service.

The PWG Network Resource Service [PWG5108.03] defined a set of Administrative service-level operations (DisableResourceService, EnableResourceService, RestartResourceService, ShutdownResourceService, and StartupResourceService). These operations have been removed from the System Service.

16.1.3 Decompose some Resource operations

The PWG Network Resource Service [PWG5108.03] defined a single operation StoreResource that both created the Resource metadata object and uploaded the Resource data, by analogy to the Print-Job operation defined in [RFC8011]. Consistent with current PWG design philosophy, this StoreResource operation has been decomposed into Create-Resource (create Resource object), Send-Resource-Data (upload Resource data), and Install-Resource (install executable, static, or template Resource for use). Installation of an executable Resource (e.g., firmware) can involve a System or Subunit reboot to complete.

5049 16.1.4 Replace Resource lease with Resource state

5050 The PWG Network Resource Service [PWG5108.03] used the lease concept from the
5051 Subscription object defined in [RFC3995]. There was a strong consensus to move away
5052 from leases and instead add a new “resource-state” Resource Status attribute for clarity and
5053 flexibility.

5054 16.2 Printer Object**5055 16.2.1 Restrict “printer-id” range**

5056 For compatibility with IETF Printer MIB v2 [RFC3805] and existing discovery protocols the
5057 maximum value of “printer-id” and members of “printer-ids” is restricted to 65535 (16-bit
5058 unsigned maximum value). Although some IPP implementations might support more than
5059 65535 print queues, this 16-bit restriction was deemed important for best compatibility with
5060 SNMP, Bluetooth, and other interfaces. Implementations needing more than 65535 print
5061 queues can use “printer-uuid” and/or partitioning of “printer-id” number spaces.

17. Change History

[17.1 May 4, 2018](#)

- [Added missing xri-xxx-supported System Status attributes](#)
- [Added missing work totals \(formerly system-totals\) for both System and Printer Status \(xxx-impressions-completed\[-col\], xxx-media-sheets-completed\[-col\], and xxx-pages-completed\[-col\]\)](#)
- [Added "multiple-document-printers-supported" and "printer-service-type-supported" System Description attributes](#)
- [Eliminated the extra Job Status Attributes section \(7.9\)](#)
- [resource-name and resource-info are now "name\(MAX\)" and "text\(MAX\)" respectively](#)
- [resource-owner-col is now collection | unknown](#)
- [DISCUSS for resource-string-version and resource-version size limits](#)
- [DISCUSS making all type1 keyword attributes type1 enum since they are ordered, non-extensible lists?](#)
- [owner-user-name should have been owner-name](#)
- [Updated the IANA considerations](#)

[17.2 May 2, 2018](#)

- [Create-Printer, "printer-creation-attributes-supported", "system-mandatory-printer-attributes": Clarified interactions.](#)
- [Added "printer-xri-requested" operation attribute](#)
- [Added "document-format-supported" System Description attribute](#)

[17.3 April 25, 2018](#)

- [Abstract: Simplified.](#)
- [Fixed a bunch of broken references, other typos.](#)
- [Added editor's notes based on prototyping experience.](#)
- ["system-configured-printers" and "system-configured-resources": allow no-value.](#)
- [Added missing "ippget-event-life" and "notify-xxx" System Description attributes.](#)
- [Added missing "notify-system-uri" and "notify-system-up-time" Subscription Status attributes.](#)
- [Some "date-time-at-xxx" and "time-at-xxx" Resource Status attributes need to include 'no-value' syntax.](#)
- [Added 'static-strings' and 'static-other' "resource-type" values, renamed 'static-iccprofile' to 'static-icc-profile'.](#)
- [Added discussion for "xxx-owner-col" attributes, "collection | unknown".](#)

5096 17.4 14 February 2018

- 5097 • Fixed operation name in section 6.3.4.x.
- 5098 • Section 6.2.3: Added list of requested-attributes values.
- 5099 • Section 6.2.5: Moved the specifics of signature validation to section 12.5, added
- 5100 reference.
- 5101 • Section 6.3.4.2: Added system state attributes to the response.
- 5102 • Section 6.3.7: Added list of requested-attributes values.
- 5103 • Section 6.3.8: Added list of requested-attributes values.
- 5104 • Section 6.3.9: Added list of requested-attributes values.
- 5105 • Section 6.3.13: Added missing close quote and fixed Figure 1 (was fuzzy).
- 5106 • New Section 9.3: Additional values for "requested-attributes"
- 5107 • Section 12: Filled out the security considerations for resources.
- 5108 • Section 13.3: Added requested-attributes values.

5109 17.5 12 January 2018

- 5110 • Section 6.3.x: Added Delete-Printer operation
- 5111 • Section 6.3.12: Added note about next steps, updated Figure 1, added reference to
- 5112 software rejuvenation paper
- 5113 • Sections 8.1 and 8.3: Reword "system-uri" attribute as specifying the target System
- 5114 object.
- 5115 • Section 14.2: Added reference to software rejuvenation paper

5116 17.6 17 November 2017

- 5117 • Updated document styles and boilerplate text from current WD template.
- 5118 • Moved Create-Printer, Create-Resource, Create-System-Subscriptions, and Get-
- 5119 Resources operations to section 6.4 (System Operations) since the target is a System
- 5120 object.
- 5121 • Moved Create-Resource-Subscriptions operation to section 6.2 (Resource Operations)
- 5122 since the target is a Resource object.
- 5123 • Deleted section 6.3 (Subscription Operations) since there were no more operations in
- 5124 this section.
- 5125 • Added Restart-System flow chart (figure)
- 5126 • Added missing "job-resource-ids" operation and Job Status attribute definitions.
- 5127 • Rewrote section 8 (Additional Semantics) with the brief summary format used in other
- 5128 recent IPP specifications.
- 5129 • Added "notify-events" and "printer-state-reasons" keywords.

5130 17.7 13 November 2017

- 5131 - Prototype draft – changes per IPP WG review on 9 November 2017
- 5132 - global – accepted all changes from previous draft

5133 - global – added comments to all Create-Xxx operations to possibly move to section 6.4
5134 System Operations
5135 - revised section 2.4 Abbreviations to add “DPA” with link
5136 - revised section 5.4 System Operations to capitalize Systems, add DPA reference
5137 [ISO10175-3], and correct typos
5138 - revised section 6 IPP Operations to delete “of the originating Operator or Administrator”
5139 - revised section 6.1.6 Get-Printer-Resources to insert missing “the” in “return “resource-id”
5140 for each”
5141 - revised section 6.1.6.1 Get-Printer-Resources Request to change “system-uri” to “printer-
5142 uri”
5143 - revised section 6.2.3 Get-Resources to insert missing “the” in “return “resource-id” for each”
5144 - revised section 6.4 System Operations to insert missing leading quote before printer-
5145 message-from-operator”
5146 - revised section 8.1 Cancel-Subscription, Get-Notifications, and Renew-Subscription and
5147 section 8.3 Create-Job, Get-Job-Attributes to add comments about minimal extension format
5148 for existing operations
5149 - revised section 8.2 Get-Printer-Attributes to change ‘successful-ok’ to ‘client-error-not-
5150 found and add comment about minimal extension format for existing operations
5151

Page 26: [1] Deleted	Michael Sweet	5/3/18 9:34:00 AM
RECOMMENDED	system-totals	SystemTotals[6] [PWG5108.06]

Page 112: [2] Deleted	Michael Sweet	5/2/18 1:51:00 PM
	charset-configured	[RFC8011]

Page 112: [3] Deleted	Michael Sweet	5/2/18 1:53:00 PM
	pdl-override-supported	[RFC8011]