The Printer Working Group

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Working Draft

IPP System Service v1.0 (SYSTEM)

Status: Interim

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

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

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

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About the IEEE-ISTO PWG

The Printer Working Group (or PWG) is a Program of the IEEE Industry Standards and Technology Organization (ISTO) with member organizations including printer manufacturers, print server developers, operating system providers, network operating systems providers, network connectivity vendors, and print management application developers. The group is chartered to make printers and the applications and operating systems supporting them work together better. All references to the PWG in this document implicitly mean “The Printer Working Group, a Program of the IEEE ISTO.” In order to meet this objective, the PWG will document the results of their work as open standards that define print related protocols, interfaces, procedures and conventions. Printer manufacturers and vendors of printer related software will benefit from the interoperability provided by voluntary conformance to these standards.

In general, a PWG standard is a specification that is stable, well understood, and is technically competent, has multiple, independent and interoperable implementations with substantial operational experience, and enjoys significant public support.

For additional information regarding the Printer Working Group visit:

http://www.pwg.org

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About the Internet Printing Protocol Work Group

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

For additional information regarding IPP visit:

http://www.pwg.org/ipp/

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

Table of Contents

List of Tables

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 [PWG 5108.06] and the PWG Resource Service that is defined in [PWG5108.03]. This document defines IPP objects, operations, and attributes to support management of all configured Services, Subunits, and Resources on an Imaging System and monitoring of the current status of the Imaging System, Services, Subunits, and Resources. This document also defines IPP operations and attributes to support registration of an IPP System, through its IPP Proxy, with one or more Cloud Imaging Systems. This document is technically aligned with the abstract PWG Cloud Imaging Requirements and Model [PWG5109.1] and concrete PWG IPP Shared Infrastructure Extensions [PWG5100.18].

1.1 Rationale for two IPP Protocol Endpoints

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

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

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.

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

2.3 Printing Terminology

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

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

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

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

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

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

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

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

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

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

384 *Logical Device*: a print server, software service, or gateway that processes jobs and either
385 forwards or stores the processed job or uses one or more Physical Devices to render
386 output.

387 *Output Device*: a single Logical or Physical Device.

388 *Physical Device*: a hardware implementation of a endpoint device, e.g., a marking engine,
389 a fax modem, etc.

390 *Print Job:* An object created and managed by a Print Service that contains description,
391 processing, and status information. The Print Job also contains zero or more Document
392 objects.

393 *Print Service:* An Imaging Service that accepts incoming IPP operation requests for
394 creation of Print Jobs and management of Print Jobs and the service itself.

395 *Printer:* Synonym for Imaging Service – an object that accepts incoming IPP operation
396 requests for creation of Imaging Jobs and management of Imaging Jobs.

397 *Scan Job:* An object created and managed by a Scan Service that contains description,
398 processing, and status information. The Scan Job also contains zero or more Document
399 objects.

400 *Scan Service:* An Imaging Service that accepts incoming IPP operation requests for
401 creation of Scan Jobs and management of Scan Jobs and the service itself.

402 *Spooling Service:* An Imaging Service that stores all of a Job's document data so that it
403 can be reprocessed as needed.

404 *Streaming Service:* An Imaging Service that stores some of a Job's document data as it is
405 processed, output, and/or delivered.

406 *Subunit:* A hardware component (e.g., input tray or marker) or software component (e.g.,
407 input channel or interpreter) of an Imaging System.

408 *System Service:* A software entity that supports management of all hardware and software
409 components of an Imaging System and the System object defined in this specification.

410 *Transform Job:* An object created and managed by a Transform Service that contains
411 description, processing, and status information. The Transform Job also contains zero or
412 more Document objects.

413 *Transform Service:* An Imaging Service that accepts incoming IPP operation requests for
414 creation of Transform Jobs and management of Transform Jobs and the service itself.

415

2.4 Abbreviations

IANA: Internet Assigned Numbers Authority, http://www.iana.org/

IETF: Internet Engineering Task Force, http://www.ietf.org/

ISO: International Organization for Standardization, http://www.iso.org/

PWG: Printer Working Group, http://www.pwg.org/

3. Requirements for the IPP System Service

3.1 Rationale 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].

Therefore, this IPP System Service specification should define:

1) An IPP binding of the PWG System object;

2) An IPP binding of the PWG System Control Service to support management and monitoring of Imaging Systems and their configured Imaging Services; and

3) An IPP binding of the PWG Resource object and the PWG Resource Service.

3.2 Use Cases

3.2.1 Imaging System Service Enumeration

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

3.2.2 Imaging System Monitoring

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

3.2.3 Imaging System Management

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

3.2.4 Resource Management

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

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 [RFC2911], 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.

4. IPP Object Model

This specification extends the original IPP Model defined in section 2 of IETF IPP/1.1 Model and Semantics [RFC2911] 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].

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).

4.2 Subunit Object

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

4.3 Printer Object

This specification extends the original IPP Printer object defined in IETF IPP/1.1 Model and Semantics [RFC2911] 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.

4.4 Job Object

This specification extends the original IPP Job object defined in IETF IPP/1.1 Model and Semantics [RFC2911] 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.

4.5 Document Object

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

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

4.6 Resource Object

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

4.7 Subscription Object

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

5. IPP System and Resource Objects and Operations

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 maps a summary of PWG SM SystemConfiguration group into the IPP "system-configured-subunits" attribute defined in section 5.4 System Status.

5.1 System Attribute Group

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

5.2 System Description Attributes

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

Table 1 – IPP System Description Attributes

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

Notes:

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

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].

4) CONDITIONALLY REQUIRED for a System that supports the Set-System-Attributes operation – also “owner-uri” and “owner-vcard” MUST be updated simultaneously if specified in a Set-System-Attributes operation (to preserve consistency).

5) REQUIRED for a System to support the Get-Printer-Attributes operation which uses the implementation-defined or administratively-configured “default” Printer object as a target.

5.3 System Status Attributes

The READ-ONLY attributes in the IPP System Status group are listed in Table 2. 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-System-Attributes operation.

Table 2 – IPP System Status Attributes

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

Notes:

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

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].

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].

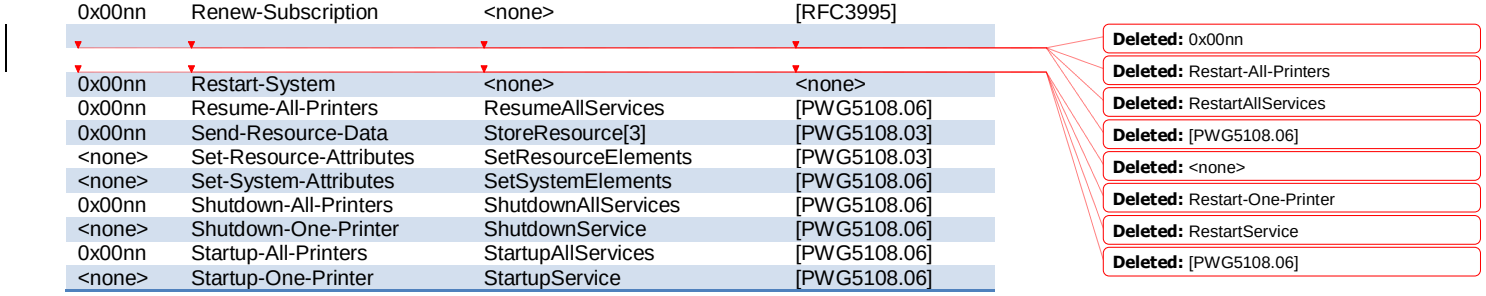
7) The System object “system-uuid” attribute identifies the System Service. The Printer object “printer-uuid” identifies a specific Imaging Service (e.g., Print, Scan, FaxOut, etc.).

5.4 System Operations

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

Table 3 – IPP System Service Operations

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



Notes:

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

2) [Enable/Disable]-Printer and [Pause/Resume]-Printer are intentionally left out of this specification – they should be directed to the specific Imaging Service that is enumerated in the "configured-printers" attribute defined in section 5.x above.

3) Create-Resource and Send-Resource-Data are intentionally decomposed from the original ambigously scoped StoreResource operation specified in PWG Resource Service [PWG5108.03]. Create-Resource is semantically equivalent to Create (for a Resource object) defined in ISO Document Printing Application (DPA) Part 3: Management Abstract Service Definition and Procedures [ISO10175-3] where a newly created Resource object has the special initial state of 'unknown' (which is NOT defined or used in this specification).

4) Install-Resource is to activate (for use) firmware, software, fonts, etc. after Create-Resource and Send-Resource-Data.

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

6) Register-Output-Device is semantically equivalent to Register-System defined in PWG Cloud Imaging Model [PWG5109.1] with the difference that the System itself is not registered, but rather the associated Output Devices are registered.

5.5 Resource Attribute Group

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

5.6 Resource Description Attributes

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

Table 4 – IPP Resource Description Attributes

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

Notes:

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

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.

Table 5 – IPP Resource Status Attributes

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

Notes:

1) REQUIRED for a Resource by analogy to PWG Network Resource Service Semantic Model and Service Interface [PWG5108.03].

2) REQUIRED for a Resource by analogy to a Job in IETF IPP/1.1 Model and Semantics [RFC2911].

3) REQUIRED for a Resource by analogy to a Job in PWG IPP: Job and Printer Extensions – Set 3 (JPS3) [PWG5100.13].

4) REQUIRED for a Resource by analogy to a Job in IETF IPP/1.1 Model and Semantics [RFC2911]. 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 a “resource-id” values and resulting ambiguity in log files.

5) REQUIRED for a Resource that is Job-scoped.

6) REQUIRED for a Resource that is Printer-scoped.

7) REQUIRED for a Resource to allow for verification of the validity and source of Resource data after a Send-Resource-Data operation. See section 7.6 of this specification for details of the “resource-authenticator” attribute.

8) REQUIRED for a Resource by analogy to a “job-k-octets” in a Job in IETF IPP/1.1 Model and Semantics [RFC2911].

5.8 Printer Description Attributes

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

Table 6 – IPP Printer Description Attributes

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

6. IPP Operations

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

6.1 Cancel-Resource

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

6.2 Create-Printer

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

- Initial state is stopped, "shutdown" reason

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

- Requires Startup-Printer call to bring the service up, followedby Enable-Printer to set printer-is-accepting-jobs to true and Resume-Printer to set “printer-state” to ‘idle’ and remove ‘pause’ from “printer-state-reasons”.

- How to provide resources?

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

- PUT them after creating the service

- How to associate with Subunits?

- Could use list of Subunit types and IDs

- Semantic Model does not go into great detail

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

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

- Extensions for Printers:

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

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

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- Create-Job with resource-attributes-tag group, a la subscriptions

- Response includes resource IDs

- Upload resource with Send-Resource-Data operation or reference existing resource-id to do a fast copy whose life is limited to the job

- No Cancel-Resource for jobs - just cancel the job to do it

- Send-Resource-Data before Send-Document/URI

- job-resource-ids (1setOf integer(1:MAX)) Job Status attribute that lists the resource IDs associated with a Job.

- Job resources persist with the Job/Document data

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

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

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

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

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738 **6.2.1 Create-Printer Request**

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

741 Group 1: Operation Attributes

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

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

746 “system-uri” (uri):

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

749 “printer-uri” (uri):

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

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

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

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

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

758 Group 2: Printer Description Attributes

759 <any Printer Description attribute>

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

762 **6.2.2 Create-Printer Response**

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

764 Group 1: Operation Attributes

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

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

The System MUST return both of these attributes.

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

The System MAY return one or both of these attributes.

Group 2: Unsupported Attributes

See [RFC2911] for details on returning Unsupported Attributes.

Groups 3: Printer Attributes

See [RFC2911] for details on returning Printer Attributes.

“printer-uri” (uri):

The System MUST return this attribute.

“printer-uuid” (uri(45)):

The System MUST return this attribute.

“printer-uri-supported” (1setOf uri) and
“uri-authentication-supported” (1setOf type2 keyword)” and
“uri-security-supported (1setOf type2 keyword)”:

The System MUST return all three of these attributes.

“printer-state” (type1 enum) and
“printer-state-reasons” (1setOf type2 keyword):

The System MUST return both of these attributes.

6.3 Create-Resource

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

- Good, add type and category attributes to Resource Description attributes
- Resources are managed by the System - IDs are unique across all services of a system
- Persistence is decided by System
- System-wide resources typically persisted for life of system
- Printer/service resources persist for life of printer/service

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- Job resource persist for life of job
- Residence (after restart) depends on use/implementation
- Job resources retained for as long as document data
- Installation/use of resources through separate operation ("Install-Resource")
- Firmware, software, fonts, etc.
- No expiration/lease like in PWG Network Resource Service
- Too much like DRM, still manual maintenance
- Just cancel resource at the right time
- Avoids resource race conditions

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

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

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

6.3.1 Create-Resource Request

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

Group 1: Operation Attributes

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

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

"system-uri" (uri):

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

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

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

"resource-category" (type2 keyword) and
"resource-format" (mimeMediaType) and
"resource-type" (type2 keyword):

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

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

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

"resource-printer-uri" (uri):

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

Group 2: Resource Description Attributes

<any Resource Description attribute>

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

6.3.2 Create-Resource Response

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

Group 1: Operation Attributes

"attributes-charset" (charset) [RFC2911] and
"attributes-natural-language" (naturalLanguage) [RFC2911]:

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

The System MUST return both of these attributes.

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

The System MAY return one or both of these attributes.

Group 2: Unsupported Attributes

See [RFC2911] for details on returning Unsupported Attributes.

Groups 3: Resource Attributes

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

“resource-id” (integer(1:MAX)):

The System MUST return this attribute.

“resource-uuid” (uri(45)):

The System MUST return this attribute.

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

The System MUST return both of these attributes.

6.4 Create-Resource-Subscriptions

6.5 Create-System-Subscriptions

6.6 Delete-Printer

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

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

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

6.6.1 Delete-Printer Request

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

Group 1: Operation Attributes

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

6.6.2 Delete-Printer Response

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

Group 1: Operation Attributes

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

6.7 Disable-All-Printers

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

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

6.7.1 Disable-All-Printers Request

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

Group 1: Operation Attributes

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

6.7.2 Disable-All-Printers Response

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

Group 1: Operation Attributes

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

6.8 Enable-All-Printers

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

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

6.8.1 Enable-All-Printers Request

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

Group 1: Operation Attributes

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

6.8.2 Enable-All-Printers Response

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

Group 1: Operation Attributes

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

6.9 Get-Printers

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

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

6.9.1 Get-Printers Request

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

Group 1: Operation Attributes

"attributes-charset" (charset) and
"attributes-natural-language" (naturalLanguage);

Deleted: [RFC2911]

Deleted: [RFC2911]

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

“system-uri” (uri);

Deleted: [PWG5108.06]

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

"requesting-user-name" (name(MAX)) and
"requesting-user-uri" (uri);

Deleted: [RFC2911]

Deleted: [PWG5100.13]

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

“first-index” (integer(1:MAX));

Deleted: [PWG5100.13]

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

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

Deleted: [RFC2911]

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

“printer-geo-location” (uri);

Deleted: [PWG5100.13]

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

"printer-location" (text(127));

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

"printer-service-type" (1setOf (type2 keyword));

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

"requested-attributes" (1setOf type2 keyword);

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

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

"which-printers" (type2 keyword);

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

6.9.2 Get-Printers Response

The System MUST return a Get-Printers operation response to the Client up to the number specified by the "limit" operation attribute that match the filter criteria as specified by the attribute values supplied by the Client in the request. If no Printers match the specified filter criteria, then the System MUST return a "status-code" of 'successful-ok'.

Group 1: Operation Attributes

"attributes-charset" (charset) and
"attributes-natural-language" (naturalLanguage);

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

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

The System MAY return one or both of these attributes.

Group 2: Unsupported Attributes

See [RFC2911] for details on returning Unsupported Attributes.

Groups 3 to N: Printer Attributes

Deleted: [RFC2911]
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Deleted: the most important characteristics of a Printer
Deleted: [RFC2911]
Deleted: "status-code" (type2 enum):¶ The System MUST return this attribute.¶
Deleted: [RFC2911]
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See [RFC2911] for details on returning Printer Attributes.

6.10 Get-Printer-Attributes

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

6.10.1 Get-Printer-Attributes

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

Group 1: Operation Attributes

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

6.10.2 Get-Printer-Attributes Response

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

Group 1: Operation Attributes

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

Group 2: Unsupported Attributes

See [RFC2911] for details on returning Unsupported Attributes.

Groups 3 to N: Printer Attributes

See [RFC2911] for details on returning Printer Attributes.

6.11 Get-Resources

[rename of ListResources]

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

Note: This Administrator operation requires Client authentication.

6.12 Get-Resource-Attributes

[rename of GetResourceElements]

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

6.13 Get-System-Attributes

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

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

6.14 Install-Resource

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

6.15 Pause-All-Printers

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

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

6.15.1 Pause-All-Printers Request

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

Group 1: Operation Attributes

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

6.15.2 Pause-All-Printers Response

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

Group 1: Operation Attributes

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

6.16 Pause-All-Printers-After-Current-Job

6.17 Register-Output-Device

[for IPP Infra/Cloud Model]

- Drop system attributes in request? Continue discussion later (from PWG F2F 4/29/15)
- Put static resource attributes in the printer groups of the response

6.18 Restart-System

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

6.19 Resume-All-Printers

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

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

Deleted: <#>Restart-All-Printers¶
This REQUIRED operation allows a Client to restart all configured Printer objects (i.e., Job processing services) on the target System object. This operation is semantically equivalent to the RestartAllServices operation defined in [PWG5108.06]. This operation is also semantically equivalent to a Shutdown-All-Printers operation followed by either a Startup-All-Printers operation (preferred) or a sequence of Restart-One-Printer operations (preferred) or Restart-Printer operations [RFC3998] for all configured Printer objects. The System will be paused with the "system-state" set to 'stopped'. Each configured Printer will be restarted with the "printer-state" set to 'stopped' (i.e., no Jobs can be processed and intervention is required), "printer-is-accepting-jobs" set to 'false' (i.e., no incoming Jobs accepted), and the 'paused' value added to "printer-state-reasons" (i.e., no Job processing output allowed). The Client can then send one or more Set-Printer-Attributes operations to modify the configuration of each Printer, followed by Resume-Printer (i.e., remove 'paused' from "printer-state-reasons") and Enable-Printer (i.e., change "printer-is-accepting-jobs" to 'true').¶
<#>Restart-All-Printers Request¶
The Client submits a Restart-All-Printers operation request to a System object. The following groups of attributes are part of a Restart-All-Printers request.¶
Group 1: Operation Attributes¶
The System MUST support the same operation attributes in a Restart-All-Printers operation request as those defined for the Startup-All-Printers operation.¶
<#>Restart-All-Printers Response¶
The System MUST return a Restart-All-Printers operation response to the Client. If no Printers are configured on the System, then the System MUST return a "status-code" of 'successful-ok'.¶
Group 1: Operation Attributes¶
The System MUST support the same operation attributes in a Restart-All-Printers operation response as those defined for the Startup-All-Printers operation.¶
<#>Restart-One-Printer¶
This REQUIRED operation allows a Client to restart one configured Printer object (i.e., Job processing service) on the target System object. This operation is semantically equivalent to the RestartService operation defined in [PWG5108.06]. This operation is also semantically equivalent to a Restart-Printer operation [RFC3998] to the configured Printer object (except for the resulting "printer-state" of 'stopped' rather than 'idle'). This operation MAY cause the System to pause with the "system-state" set to 'stopped' (if all other Printers already had a "printer-state" of 'stopped'). ¶
The specified Printer will be restarted with the "printer-state" set to 'stopped' (i.e., no Jobs can be processed and intervention is required), "printer-is-accepting-jobs" set to 'false' (i.e., no incoming Jobs accepted), and the 'paused' value added to "printer-state-reasons" (i.e., no Job processing output allowed). The Client can then send one or more Set-Printer-Attributes ...

6.19.1 Resume-All-Printers Request

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

Group 1: Operation Attributes

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

6.19.2 Resume-All-Printers Response

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

Group 1: Operation Attributes

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

6.20 Send-Resource-Data

[rename of *part* of original StoreResource]

- Agreement on not supporting replacement of resource data

6.21 Set-Resource-Attributes

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

6.22 Set-System-Attributes

6.23 Shutdown-All-Printers

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

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

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

6.23.1 Shutdown-All-Printers Request

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

Group 1: Operation Attributes

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

6.23.2 Shutdown-All-Printers Response

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

Group 1: Operation Attributes

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

6.24 Shutdown-One-Printer

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

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

6.24.1 Shutdown-One-Printer Request

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

Group 1: Operation Attributes

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

6.24.2 Shutdown-One-Printer Response

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

Group 1: Operation Attributes

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

6.25 Startup-All-Printers

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

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

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

6.25.1 Startup-All-Printers Request

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

Group 1: Operation Attributes

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

Deleted: [RFC2911]

Deleted: [RFC2911]

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

“system-uri” (uri):

Deleted: [PWG5108.06]

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

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

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

6.25.2 Startup-All-Printers Response

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

Group 1: Operation Attributes

"attributes-charset" (charset) and
"attributes-natural-language" (naturalLanguage);

The System MUST return both of these attributes.

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

The System MAY return one or both of these attributes.

6.26 Startup-One-Printer

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

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

6.26.1 Startup-One-Printer Request

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

Group 1: Operation Attributes

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

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

“system-uri” (uri):

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

“printer-uri” (uri):

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

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

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

6.26.2 Startup-One-Printer Response

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

Group 1: Operation Attributes

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

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

The System MUST return both of these attributes.

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

The System MAY return one or both of these attributes.

7. IPP Attributes

7.1 System, Printer, and Resource Operation Attributes

7.1.1 printer-geo-location (uri)

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

Deleted: for the operation
Deleted: the
Deleted: operation

7.1.2 printer-location (text(127))

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

Deleted: for the operation
Deleted: the
Deleted: operation

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

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

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

7.1.4 resource-category (type2 keyword)

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

Deleted: objects for the operation
Deleted: the
Deleted: operation

7.1.5 resource-format (1setOf (mimeMediaType))

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

Deleted: objects for the operation
Deleted: the
Deleted: operation

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

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

Deleted: for the operation
Deleted: the
Deleted: operation

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

This operation attribute specifies the Job scope for a Resource as used in Create-Resource or a filter for the applicable Job scope Resources as used in Get-Resources defined in section 6. This attribute is semantically analogous to the "job-id" attribute as described in [RFC2911]. See "resource-job-id" in section 7.7 Resource Status Attributes.

Deleted: objects for the operation
Deleted: the
Deleted: operation

7.1.8 resource-k-octets (integer(0:MAX))

This operation attribute specifies the size of the data for a Resource as used in Create-Resource/Send-Resource-Data defined in section 6. This attribute is semantically analogous to the "job-k-octets" attribute as described in [RFC2911]. See "resource-k-octets" in section 7.7 Resource Status Attributes.

Deleted: the target
Deleted: object for the operation
Deleted: the
Deleted: operation
Deleted: format

7.1.9 resource-printer-uri (uri)

This operation attribute specifies the Printer scope for a Resource as used in Create-Resource or a filter for the applicable Printer scope Resources as used in Get-Resources defined in section 6. This attribute is semantically analogous to the "job-printer-uri" attribute as described in [RFC2911]. See "resource-printer-uri" in section 7.7 Resource Status Attributes.

Deleted: objects for the operation
Deleted: the
Deleted: operation

7.1.10 resource-state (type1 enum)

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

Deleted: objects for the operation
Deleted: the
Deleted: operation

7.1.11 resource-type (type2 keyword)

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

Deleted: objects for the operation
Deleted: the
Deleted: operation

7.1.12 system-uri (uri)

This operation attribute specifies the target System object as used in Get-Printers and all other operations defined in section 6. This attribute is semantically analogous to the "printer-uri" attribute as described in [RFC2911] and is semantically equivalent to the "SystemURI" attribute as described in [PWG5108.06].

Deleted: for the operation
Deleted: the
Deleted: operation

7.1.13 which-printers (type2 keyword):

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

Deleted: for the operation

Deleted: the

Deleted: operation

Deleted: are

'accepting': All Printers with "printer-state" of 'idle' or 'processing' and "printer-is-accepting-jobs" of 'true'.

'all': All Printers configured on this System object, regardless of their state.

'idle': All Printers with "printer-state" of 'idle'.

'not-accepting: All Printers with "printer-is-accepting-jobs" of 'false'.

'processing': All Printers with "printer-state" of 'processing'.

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

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

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

7.2 System Description Attributes

7.2.1 charset-configured (charset)

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

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

7.2.2 charset-supported (1setOf charset)

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

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

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

Deleted: <#>device-id (text(1023))¶

7.2.3 ipp-versions-supported (1setOf type2 keyword)

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

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

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

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

7.2.4 natural-language-configured (naturalLanguage)

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

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

7.2.5 natural-language-supported (1setOf naturalLanguage)

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

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

7.2.6 operations-supported (1setOf type2 enum)

This REQUIRED System attribute specifies the set of supported operations for this System object.

Standard enum and "operation-id" values are defined in the IANA IPP Registry [IANAIPP].

This attribute is semantically analogous to the “operations-supported" Printer attribute defined in [RFC2911].

7.2.7 power-calendar (1setOf collection)

This OPTIONAL System attribute specifies the list of configured calendar-based power state change policies for the System.

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

7.2.8 power-event (1setOf collection)

This OPTIONAL System attribute specifies the list of configured event-based power state change policies for the System.

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

7.2.9 power-timeout (1setOf collection)

This RECOMMENDED System attribute specifies the list of configured timeout-based power state change policies for the System.

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

7.2.10 system-default-printer-uri (uri)

This REQUIRED System attribute specifies the default Printer URI configured by the operator, administrator, or manufacturer and is used by the User operation Get-Printer-Attributes defined in this specification.

7.2.11 system-device-id (text(1023))

This REQUIRED System attribute specifies the IEEE 1284 Device ID of the overall System as defined in [IEEE1284] and further refined in [PWG5107.2].

This attribute is semantically analogous to the "printer-device-id" Printer attribute defined in [PWG5107.2].

Deleted: ¶

Formatted: IEEEStds Paragraph

Deleted: ¶
<#>owner-uri (uri)¶
<#>owner-vcard (1setOf text(1023))¶

Deleted: ¶

Deleted: ¶

7.2.12 system-geo-location (uri)

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

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

7.2.13 system-info (text(127))

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

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

7.2.14 system-location (text(127))

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

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

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

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

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

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

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

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

7.2.17 system-name (name(127))

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

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

7.2.18 system-owner-uri (uri)

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

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

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

7.2.20 system-xri-supported (1setOf collection)

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

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

Deleted: New

7.3 System Status Attributes

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

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

7.3.1 power-counters (1setOf collection)

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

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

7.3.2 power-general (collection)

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

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

7.3.3 power-log (1setOf collection)

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

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

7.3.4 power-meters (1setOf collection)

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

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

7.3.5 power-monitor (collection)

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

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

7.3.6 power-support (1setOf collection)

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

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

7.3.7 power-transition (1setOf collection)

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

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

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

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

7.3.9 system-configured-printers (1setOf collection)

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

7.3.10 system-configured-resources (1setOf collection)

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

7.3.11 system-configured-subunits (1setOf collection)

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

7.3.12 system-current-time (dateTime)

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

7.3.13 system-health (1set of collection)

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

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

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

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

7.3.15 system-state (type1 enum)

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

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

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

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

Deleted: ¶

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

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

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

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

7.3.18 system-totals (1setOf collection)

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

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

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

7.3.20 system-uuid (uri(45))

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

7.4 Printer Description Attributes

7.5 Printer Status Attributes

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

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7.5.1 printer-service-type (type2 keyword)

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

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

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

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

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

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

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

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

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

'vendor': A vendor-specific service

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

7.6 Resource Description Attributes

7.6.1 resource-info (text(127))

7.6.2 resource-name (name(127))

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

[follow HCD-TNC]

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7.6.4 resource-version (octetString(16))

[follow HCD-TNC – but no infixed periods allowed as separators]

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7.7 Resource Status Attributes

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

7.7.1 date-time-at-canceled (dateTime)

7.7.2 date-time-at-creation (dateTime)

7.7.3 resource-authenticator (1setOf collection)

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

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

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7.7.4 resource-category (type2 keyword)

- Static resources already supported in INFRA
- Executable resources: focus on firmware and applications,

but not code that runs as part of a job (ew!)

- Template resources: define what an IPP Job Ticket resource

looks like, need to have a way to differentiate between Print

and FaxOut and Scan job tickets

- IPP Job Ticket has a few select operation attributes

(destination-uri, etc.) + Job Template attributes

- Looks like a Create-Job request?
- No document template attributes - those can be

inferred from Job Template as needed.

7.7.5 resource-data-uri (uri)

7.7.6 resource-format (mimeMediaType)

7.7.7 resource-id (integer(1:MAX))

7.7.8 resource-job-id (integer(1:MAX))

7.7.9 resource-k-octets (integer(0:MAX))

7.7.10 resource-originating-user-name (name(MAX))

7.7.11 resource-originating-user-uri (uri)

7.7.12 resource-printer-uri (uri)

7.7.13 resource-state (type1 enum)

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

'3' 'pending': The Resource has been created but not yet activated.

'4' 'active': The Resource has been activated and is available for use.

'5' 'canceled': The Resource has been canceled and can no longer be used.

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

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

7.7.16 resource-type (type2 keyword)

7.7.17 resource-uuid (uri(45))

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

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

8. Additional Semantics for Existing Operations

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

Deleted: Create-Subscription,

Deleted: s

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

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

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

9. Additional Values for Existing Attributes

9.1 notify-events (1setOf type2 keyword)

10. Conformance Requirements

Provide numbered lists of conformance requirements for the document.

10.1 Conformance Requirements for Clients

10.2 Conformance Requirements for Infrastructure Systems

10.3 Conformance Requirements for Systems

11. Internationalization Considerations

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

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

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

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

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

- Unicode Conformance Model [UTR33] – Unicode conformance basis

12. Security Considerations

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

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

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

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

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

13. IANA and PWG Considerations

TBD

14. References

14.1 Normative References

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The authors would also like to thank the following individuals for their contributions to this standard:

Peter Zehler (Xerox)

16. Change History

16.1 17 January 2016

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

16.2 6 December 2015

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

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

16.3 2 November 2015

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

16.4 18 October 2015

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

16.5 20 September 2015

- Interim draft - changes per PWG F2F review on 31 August 2015
- global - accepted all changes up to and through section 6.9 (from previous review)
- revised Abstract and section 1 Introduction to add explicit references to Cloud & Infra
- deleted section 5.2 System Operation Attributes and section 5.7 Resource Operation Attributes
- added section 5.8 Printer Description Attributes and table for “printer-owner-[uri|vcard]”
- revised section 6.9.1 Get-Printers Request to make “attributes-charset” and “attributes-natural-language” REQUIRED for Client (per RFC 2911)
- revised section 6.9.1 Get-Printers Request to add note to “requested-attributes” about the primary Printer attributes in the IETF LDAP Printer Schema (RFC 7612)
- revised section 7,2 System Description Attributes to add new attribute definitions
- revised section 14.1 Normative References to add references for new attribute definitions

16.6 31 August 2015

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

- revised section 5.5 System Operations Table 3 to add missing references and change "Cancel-Subscriptions" and "Renew-Subscriptions" to singular per RFC 3995
- revised section 5.5 System Operations Table 3 to update note for Create-Resource and add note for Create-Printer referring to the semantically equivalent Create operation in ISO 10175-3
- revised section 5.5 System Operations Table 3 to add note that Register-Output-Device is semantically equivalent to Register-System in PWG 5109.1 (with differences explained)
- revised section 5.9 Resource Status Attributes Table 5 to add note for "resource-id" analogous to "job-id" in RFC 2911.
- revised section 5.9 Resource Status Attributes Table 5 to add note for "resource-k-octets" analogous to "job-k-octets" in RFC 2911.
- revised section 5.9 Resource Status Attributes Table 5 to add notes for "resource-job-id" and "resource-printer-uri" which are requried for Job and Printer scoped Resource objects, respectively
- revised section 5.9 Resource Status Attributes Table 5 to add "resource-authenticator" for verification of Resource data after a Send-Resource-Data operation
- deleted redundant sections 6.x Cancel-Subscription, Get-Notifications, Get-Printer-Attributes, and Renew-Subscription and moved to sections 8.x for existing operations with new semantics
- revised section 6.x Get-Printers to change "selected" to "matching" and make sure that each attribute has a colon (:) at the end and put the reference(s) at the end of each attribute name
- revised section 6.x Get-Printers to use "the Client [MUST|SHOULD|MAY] supply and the System MUST support" for clarity – "OPTIONALLY" is NOT a defined conformance keyword
- revised section 6.x Get-Printers and section 7.1.x "printer-geo-location" to remove 'unknown' value (never appropriate in this specification)
- revised section 6.x Get-Printers and section 7.1.x "printer-service-types" to change singular to plural (i.e., multiple printers can be chosen by the filter)
- revised sections 6.x Get-Resources and Get-Resource-Attributes to note that they are modeled on Get-Jobs and Get-Job-Attributes with default returns of "resource-id" and "resource-state"
- revised section 6.x Get-System-Attributes to note that it is modeled on Get-Printer-Attributes with default return of all System attributes
- revised section 7.1 title to be "System and Resource Operation Attributes" (since some apply to operations on both objects)
- revised section 7.1.x to change "selects" to "filters" and "selected" to "matching" for clarity
- added sections 7.1.x for "resource-category", "resource-id", "resource-job-id", "resource-printer-uri", "resource-state", and "resource-type" operation attributes
- revised section 14.1 Normative References to update IPP/2.0 title and reference (work-in-progress) and add IPP INFRA (PWG 5100.18-2015) and Cloud Imaging Model (PWG 5109.1-2015)

16.7 10 August 2015

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

16.8 28 April 2015

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

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

16.9 15 March 2015

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

and IPP Proxy from IPP Shared Infrastructure Extensions, per IPP WG review on 3 February 2015
- revised section 2.3 Printing Terminology to delete Resource Service and revise the definitions of Spooling Service and Streaming Service, per IPP WG review on 4 November 2014
- revised section 2.3 Printing Terminology to add definitions of Logical Device, Output Device, and Physical Device from IPP Shared Infrastructure Extensions, per IPP WG review on 3 February 2015
- renamed section 2.4 from “Acronyms and Organizations” to simply “Abbreviations”, for consistency with RFC 7472, per RFC Editor on 5 March 2015
- revised section 3.1 Rationale for the IPP System Service to add the Resource Service functionality (objects, operations, and attributes), per IPP WG review on 4 November 2014
- added new use case in section 3.2.4 Resource Management, per IPP WG review on 4 November 2014
- revised section 3.4 Out-of-Scope, to delete creation/deletion of Imaging Services, per IPP WG review on 3 February 2015
- revised section 3.5 Design Requirements, to add Resource object, per IPP WG review on 4 November 2014
- added section 4.6 Resource Service, to add Resource object, per IPP WG review on 4 November 2014
- revised section 5.1 Attribute Groups to define the system-attributes-tag and resource-attributes-tag, per IPP WG review on 19 January 2015
- revised section 5.2 Operation Attributes to define system-uri and resource-uri, per IPP WG review on 19 January 2015
- revised title of section 5.3 to System Description Attributes, per IPP WG review on 19 January 2015
- revised section 5.3 System Description Attributes in Table 1 to raise owner-uri from OPTIONAL to RECOMMENDED, per IPP WG review on 19 January 2015
- revised section 5.3 System Description Attributes to delete redundant original Figure 3 and Figure 4, per IPP WG review on 19 January 2015
- revised title of section 5.4 to System Status Attributes, per IPP WG review on 19 January 2015
- revised section 5.4 to System Status Attributes in Table 2 to delete redundant device-uuid, per IPP WG review on 19 January 2015
- revised section 5.4 to System Status Attributes to delete redundant original Figure 4, Figure 5, Figure 6, and Figure 7, per IPP WG review on 19 January 2015
- revised section 5.5 System Operations to delete issue about Subscription operations, per IPP WG review on 3 February 2015
- revised section 5.5 System Operations in Table 3 to add Create/Delete-Printer and Resource operations, per IPP WG review on 3 February 2015

16.10 2 November 2014

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

review
- globally changed “Imaging Device” to “Imaging System” where appropriate (most instances), per IPP WG review
- globally changed “[RFC2616]” to “[RFC7230]”, per IPP WG review
- globally changed “[PWG5100.SCAN]” to “PWG5100.17]” and corrected reference in section 10.1, per PWG approval of IPP Scan Service
- added section 1.1 Rationale for two IPP Protocol Endpoints to explain the reason for separate URI for System and Printer objects, per IPP WG review
- revised section 2.2 to change title from “Printing Terminology” to “Protocol Roles”, per IPP WG review
- revised section 2.2 to delete “IPP Printer” (and thus Logical Device and Physical Device definitions and details) as not applicable to System Control Service and to add “IPP System”, per IPP WG review
- revised section 2.3 to change title from “Other Terminology” to “Printing Terminology”, per IPP WG review
- moved first sentence of section 2.2 (sources of terms) to section 2.3, per IPP WG review
- revised section 2.3 to add new terms, including “Document”, “FaxOut Job/Service”, “ith”, “Job”, “Print Job/Service”, “Scan Job/Service”, “Spooling Service”, “Streaming Service”, “Subunit”, “Transform Job/Service”, per IPP WG review
- revised section 2.3 to improve “Imaging System” definition, per IPP WG review
- revised section 3.1 Rationale to clarify various paragraphs and add numbered lists, per IPP WG review
- revised section 3.2 Use Cases to clarify various paragraphs, per IPP WG review
- revised section 3.3 to change “TBD” to “There are no exceptions to the use cases defined in section 3.2”, per IPP WG review
- revised section 3.4 Out of Scope to clarify first sentence, per IPP WG review
- revised section 3.4 Out of Scope to clarify several statements, per IPP WG review
- revised section 3.4 Design Requirements to clarify first sentence, per IPP WG review
- added section 4.5 Document Object, per IPP WG review
- revised section 5.3 System Description to change “READ-ONLY” to “READ-WRITE” (because Set-System-Attributes was restored in this draft), per IPP WG review and Cloud Imaging WG recommendations
- revised section 5.4 System Status to clarify the “READ-ONLY” cannot be modified by a Set-System-Attributes operation, per IPP WG review and Cloud Imaging WG recommendations
- revised section 5.4 System Status to clarify the meaning of “system-uuid” (SCS), “printer-uuid” (Imaging Service), and “device-uuid” (physical hardware, i.e., network device), per IPP WG review
- revised section 5.4 System Status Table 2 to change “configured-services” to “configured-printers”, per IPP WG review
- revised section 5.5 System Operations Table 3 to add back Restart-One-Printer, Startup-One-Printer, Shutdown-One-Printer, and Set-System-Elements, per IPP WG review and Cloud Imaging WG recommendations
- revised section 6 New IPP Operations to add back Restart-One-Printer, Startup-One-Printer, Shutdown-One-Printer, and Set-System-Elements, per IPP WG review and Cloud Imaging WG recommendations

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

16.11 24 August 2014

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

16.12 11 August 2014

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

