



The Printer Working Group

September 18, 2014
Candidate Standard 5100.17-2014

IPP Scan Service (SCAN)

Status: PWG Approved

Abstract: This document defines an IPP extension that implements a protocol binding of the PWG Semantic Model Scan service over IPP.

This document is a PWG Candidate Standard. For a definition of a "PWG Candidate Standard", see: <ftp://ftp.pwg.org/pub/pwg/general/pwg-process30.pdf>

This document is available electronically at:

<http://ftp.pwg.org/pub/pwg/candidates/cs-ippscan10-20140918-5100.17.docx>
<http://ftp.pwg.org/pub/pwg/candidates/cs-ippscan10-20140918-5100.17.pdf>

Copyright © 2011-2014 The Printer Working Group. All rights reserved.

This document may be copied and furnished to others, and derivative works that comment on, or otherwise explain it or assist in its implementation may be prepared, copied, published and distributed, in whole or in part, without restriction of any kind, provided that the above copyright notice, this paragraph and the title of the document as referenced below are included on all such copies and derivative works. However, this document itself may not be modified in any way, such as by removing the copyright notice or references to the IEEE-ISTO and the Printer Working Group, a program of the IEEE-ISTO.

Title: *IPP Scan Service (SCAN)*

The IEEE-ISTO and the Printer Working Group DISCLAIM ANY AND ALL WARRANTIES, WHETHER EXPRESS OR IMPLIED INCLUDING (WITHOUT LIMITATION) ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

The Printer Working Group, a program of the IEEE-ISTO, reserves the right to make changes to the document without further notice. The document may be updated, replaced or made obsolete by other documents at any time.

The IEEE-ISTO takes no position regarding the validity or scope of any intellectual property or other rights that might be claimed to pertain to the implementation or use of the technology described in this document or the extent to which any license under such rights might or might not be available; neither does it represent that it has made any effort to identify any such rights.

The IEEE-ISTO invites any interested party to bring to its attention any copyrights, patents, or patent applications, or other proprietary rights which may cover technology that may be required to implement the contents of this document. The IEEE-ISTO and its programs shall not be responsible for identifying patents for which a license may be required by a document and/or IEEE-ISTO Industry Group Standard or for conducting inquiries into the legal validity or scope of those patents that are brought to its attention. Inquiries may be submitted to the IEEE-ISTO by e-mail at: ieee-isto@ieee.org.

The Printer Working Group acknowledges that the IEEE-ISTO (acting itself or through its designees) is, and shall at all times, be the sole entity that may authorize the use of certification marks, trademarks, or other special designations to indicate compliance with these materials.

Use of this document is wholly voluntary. The existence of this document does not imply that there are no other ways to produce, test, measure, purchase, market, or provide other goods and services related to its scope.

About the IEEE-ISTO

The IEEE-ISTO is a not-for-profit corporation offering industry groups an innovative and flexible operational forum and support services. The IEEE-ISTO provides a forum not only to develop standards, but also to facilitate activities that support the implementation and acceptance of standards in the marketplace. The organization is affiliated with the IEEE (<http://www.ieee.org/>) and the IEEE Standards Association (<http://standards.ieee.org/>).

For additional information regarding the IEEE-ISTO and its industry programs visit:

<http://www.ieee-isto.org>

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>

Contact information:

The Printer Working Group
c/o The IEEE Industry Standards and Technology Organization
445 Hoes Lane
Piscataway, NJ 08854
USA

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 now 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

1. Introduction	8
2. Terminology	8
2.1 Conformance Terminology	8
2.2 Protocol Role Terminology	8
2.3 Scanning Terminology.....	8
2.4 Acronyms and Organizations	10
3. Requirements.....	11
3.1 Rationale for the IPP Scan Service	11
3.2 Use Cases.....	11
3.2.1 Mobile User.....	11
3.2.2 Home/Family User	11
3.2.3 Business User.....	12
3.3 Exceptions to the Use Cases	12
3.3.1 Scan Delivery Failure.....	12
3.3.2 Scan Acquisition Failure	12
3.4 Out of Scope	13
3.5 Design Requirements.....	13
4. IPP Scan Service Definition	14
4.1 Scan Job Processing.....	14
4.1.1 Documents within a Scan Job	14
4.1.2 Output Spooling Services	15
4.1.3 Output Streaming Services.....	15
4.1.4 Scan Job Terminating State	15
4.1.5 Image Acquisition Failure	16
4.1.6 Scan Job History.....	16
4.1.7 IPP Scan Service URIs.....	16
4.1.8 Destination URIs.....	16
4.2 IPP Operations	17
4.3 IPP Printer Description Attributes.....	19
4.4 IPP Printer Status Attributes.....	20
4.5 IPP Operation Attributes.....	21
4.6 IPP Job Template Attributes.....	22
4.6.1 Other Job Template Attributes.....	22
4.7 IPP Job Description Attributes.....	22
4.8 IPP Job Status Attributes	23
5. Document Formats	25
6. New Operation	25
6.1 Get-Next-Document-Data Operation.....	25
6.1.1 Get-Next-Document-Data Request.....	25
6.1.2 Get-Next-Document-Data Response.....	26
7. Additional Semantics for Existing Operations	28
7.1 Create-Job Operation.....	28
7.1.1 Create-Job Request.....	28
7.1.2 Create-Job Response.....	30
8. New Attributes.....	31

8.1 Operation Attribute	31
8.1.1 compression-accepted (1setOf type2 keyword)	31
8.1.2 destination-accesses (1setOf collection no-value)	31
8.1.3 document-format-accepted (1setOf mimeType)	33
8.1.4 document-data-get-interval (integer(0:MAX))	33
8.1.5 document-data-wait (boolean)	33
8.1.6 input-attributes (collection)	34
8.1.7 output-attributes (collection)	34
8.1.8 output-attributes-actual (collection)	35
8.2 Job Template Attributes	35
8.2.1 destination-uris (1setOf collection)	35
8.3 IPP Printer Description Attributes	35
8.3.1 destination-accesses-supported (1setOf type2 keyword)	35
8.3.2 destination-uri-schemes-supported (1setOf uriScheme)	35
8.3.3 destination-uri-ready (1setOf collection)	36
8.3.4 job-destination-spooling-supported (type2 keyword)	37
8.3.5 output-attributes-default (collection)	38
8.3.6 output-attributes-supported (1setOf type2 keyword)	38
8.4 Document Description Attributes	38
8.4.1 input-attributes-actual (collection)	38
8.4.2 output-attributes-actual (collection)	38
9. Additional Values and Semantics for Existing Attributes	39
9.1 input-color-mode (type2 keyword)	39
9.2 ipp-features-supported (1setOf type2 keyword)	39
9.3 job-state-reasons (1setOf type2 keyword)	39
10. Bonjour Support	41
10.1 Required Service Type	41
10.2 Required TXT Record Values	41
10.2.1 ADF	41
10.2.2 rs	42
10.2.3 Scan2	42
10.2.4 TMA	43
11. Conformance Requirements	43
11.1 Conformance Requirements for this Specification	43
11.1.1 Scan Service Conformance Requirements for this Specification	43
11.1.2 Scan Client Conformance Requirements for this Specification	43
11.1.3 Conditional Conformance Requirements for Spooling IPP Scan Service	44
11.1.4 Conditional Conformance Requirements for Streaming IPP Scan Client	44
12. Internationalization Considerations	44
13. Security Considerations	45
14. IANA and PWG Considerations	45
14.1 Attribute Registrations	45
14.2 Attribute Value Registrations	46
14.3 Type2 enum Attribute Value Registrations	47
14.4 Operation Registrations	47
14.5 Semantic Model Registrations	47

15. References.....48
 15.1 Normative References.....48
 15.2 Informative References50
 16. Authors' Addresses.....51

List of Tables

Table 1 - Operations for Scan (note 1) 17
 Table 2 - Required IPP Printer Description Attributes..... 19
 Table 3 - Required IPP Printer Status Attributes20
 Table 4 - Required Operation Attributes21
 Table 5 - Required Job Template Attributes22
 Table 6 - Required Job Description Attributes22
 Table 7 - Required Job Status Attributes23
 Table 8 - IPP Scan "input-color-mode" Keyword Values40
 Table 9 - IPP Scan "job-state-reasons" Keyword Values40
 Table 10 - Required Text Record Values.....42

List of Figures

Figure 1 - Scan Job Creation Flow Chart.....24

1. Introduction

This document defines an IPP Binding of the PWG Network Scan Service Semantic Model and Service Interface Version 1.0 [PWG5108.02].

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:

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

Scan Service: Listener for incoming IPP session requests and receiver of incoming IPP operation requests (HyperText Transfer Protocol -- HTTP/1.1 [RFC7230] Server) that represents one or more Imaging Devices.

2.3 Scanning Terminology

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

This document refines the definition of the following terms in order to specify unambiguous conformance requirements:

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

Imaging System: A logical or physical system that supports printing, scanning, and other imaging services.

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

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

Job Description: Attributes supplied by the end user to provide additional information for the Scan Job and the documents generated during the Scan Job Processing [RFC2911].

Job Status: Attributes maintained by the service describing the Job object's identification, state, size, etc. These attributes are not directly modified by the Scan Client but can be affected indirectly through Client-initiate operations [RFC3380].

Job Template: Attributes supplied by the end user specifying job processing instructions which are intended to override any Scan Service object defaults [RFC2911].

Job Ticket: The combination of Job Description and Job Template attributes.

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

Multifunction Device (MFD): A hardware entity that supports one or more Imaging Services, including the System. Generally abbreviated MFD, this also includes Imaging Devices commonly called Multifunction Peripherals or Multifunction Printers (MFPs) and All-In-Ones [PWG5108.1].

Output Image: A digital electronic representation of the information captured by the image acquisition hardware and optionally processed by the associated Scan Service. An Output Image can simply be the image acquired from the specified scan region. The scan region can encompass the entire media sheet or a portion thereof. Or an Output Image can contain images acquired from multiple scan regions and combined into a final Output Image through job processing attributes such as “number-up”.

Physical Device: a hardware implementation of a endpoint device, e.g., a scanner subunit, a fax modem, etc.

Pull Scan: A Scan Job where the resulting scan document data is retrieved from the Scan Service by an authorized Scan Client.

Push Scan: A Scan Job where the resulting scan document data is delivered to the specified destination by the Scan Service.

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

Spooling Device: An Imaging System that can store all of a Job's Document data for delayed processing/delivery or subsequent reprocessing/redelivery.

Streaming Device: An Imaging System that can only store a portion of a Job's Document data and that processes/delivers the data as it is recieved or acquired.

2.4 Acronyms and Organizations

/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

3.1 Rationale for the IPP Scan Service

This specification is based on common requirements defined in the Multifunction Device Service Model Requirements [MFDREQ]. In order to support common functionality for Scan using Multifunction Devices, there is a clear need to develop a semantic model and a set of abstract operations and elements for Scan related services. In order to implement an abstract model of the operations and elements for Scan related services, there is need to map them onto implementable applications and communication protocols that support interactions between Scan Clients and Scan Services. In order to reuse existing protocol encoding components deployed across the industry, there is a clear need to define a binding of the abstract model onto the IPP protocol stack.

The Internet Printing Protocol Version 2.0 Second Edition [PWG5100.12] defines a collection of existing IPP specifications that form the basis for IPP/2.0.

The MFD Model and Common Semantics [PWG5108.1] defines a common semantic model and service interface for multi-function devices based on IPP.

The Scan Service Semantic Model and Service Interface v1.0 [PWG5108.05] defines the semantics and interfaces specific to scanning.

The PWG Raster Format [PWG5102.4] defines a simple page-based raster format.

Therefore, this Scan Service specification should support scanning using IPP based on the semantics and interfaces defined by the Scan Service Semantic Model and Service Interface v1.0.

3.2 Use Cases

3.2.1 Mobile User

Andrew has a WiFi-capable tablet computing device. While traveling he was given access to a hard copy document containing some information he'd like to keep. Andrew uses his tablet to locate a nearby MFD and specifies the scanning intent he'd like to use when scanning the document. Andrew loads the multipage document into an MFD's automatic document feeder and the document is scanned and stored locally on his tablet.

3.2.2 Home/Family User

Melissa borrowed a collection of old family photographs she would like to own. She would like to submit scans of the photographs to a photo web site to eventually have new copies created and delivered to her. Melissa uses her mobile device to create a scan job for her personal scanner that will deliver the scans to the photo web site. She then places each

photo on the platen and initiates the scan resulting in the scan being delivered to the photo web site.

3.2.3 Business User

Julia has access to several shared network scanners managed by her company's IT department. She uses them to scan documents, proposals, invoices, and other work-related documents and deliver them to the appropriate destination for storage and/or further processing. She has some documents that need to be scanned to deliver them to the legal department's document repository and she needs them delivered to her administrative assistant for further processing. She uses her mobile device to select a network scanner. Since there are several scanners right next to each other she then uses her mobile device to instruct the device to flash an indicator light to insure she is using the correct scanner. She uses her mobile device to construct a scan job that will scan the documents and deliver copies to the desired location. She can subsequently check the scan job status to determine whether the scanned documents have been delivered successfully.

3.3 Exceptions to the Use Cases

3.3.1 Scan Delivery Failure

Molly has scanned some invoices and requested they be delivered to the appropriate destination for storage and/or further processing. The specified destination is currently down for maintenance. The Scan Service automatically retries delivery as specified. Since the delivery was unsuccessful, the Scan Job completes indicating the transmission error. Molly can subsequently check the scan job status to determine whether the scanned documents have been delivered to each destination successfully.

3.3.2 Scan Acquisition Failure

Anne has placed a stack of her student's tests in a scanner's automatic document feeder. She requested they be delivered to the appropriate destination for further processing. While scanning the Automatic Document Feeder gets jammed. The Scan Service has delivered a portion of the scanned tests to the destination. Since all the documents could not be scanned, the Scan Job is aborted and indicates the jam and subsequent timeout reasons for the aborted job. When Anne comes back and sees that the scanner is jammed she can check the scan job status to determine the state of the current job and whether the subset of delivered scans can be used or must be rescanned.

3.4 Out of Scope

The rationale in section 3.1 and the use cases in section 3.2 identify several out of scope items:

1. The design of the Scan Client's user interface
2. The methods of performing the physical scans
3. The Scan Service performing document format conversions. The document formats emitted are limited to those supported by the Scan Service. (i.e., The Scan Destination handles conversion of documents if a document format other than those supported by the Scan Service is required)
4. Scan to archive formats (i.e., a single document object referencing a container of multiple files)

3.5 Design Requirements

The rationale in section 3.1 and the use cases in section 3.2 identify several design requirements:

1. Follow the PWG Semantic Model for the Network Scan Service.
2. Follow the naming conventions defined in IPP/1.1: Model and Semantics [RFC2911], including keyword value case (lower) and hyphenation requirements
3. Re-use existing IPP operations, attributes, and values when possible.
4. Define IPP attributes, values, and operations necessary for Push Scan.
5. Define IPP attributes, values, and operations necessary for Pull Scan.
6. Define a minimum set of required document formats for interoperability.
7. Define security requirements necessary to support privacy, integrity, and auditing policies
8. Define sections to register all attributes, values, and operations with IANA and PWG Semantic Model
9. Support one or more destinations for Push Scan.
10. Support monitoring of the status of transmission to each destination.
11. Support streaming of basic page-based raster data.
12. Support identification of the Imaging System.

4. IPP Scan Service Definition

4.1 Scan Job Processing

From the Client's perspective, Scan Jobs are largely processed the same way as a Print Job, and IPP Scan reuses operations, attributes, and status codes from the Internet Printing Protocol/1.1: Model and Semantics [RFC2911] wherever possible. Spooling Scan Services handle retransmission of whole Jobs automatically while Streaming Scan Services put the burden of retransmission on the Scan Client.

One primary difference with Scan is that instead of picking up the output of the Job at the device as with printing, the output of the Job must be delivered to a destination. In a Pull Scan the Scan Service retains the scan Document(s) data until the data is requested by a Scan Client. In a Push Scan the Scan Service transmits the scan Document(s) data to the specified destination(s).

Another difference is that Scan Jobs generally expose different capabilities and use different resources than Print Jobs, e.g., scan media path (i.e., platen, automatic document feeder) and scanner subunits. Imaging Devices MUST support Scan on endpoint(s)/path(s) separate from the Print service(s) in order to expose the capabilities and status corresponding to the service being accessed by the Scan Client.

When supported by the Scan Service, Scan Jobs can also be directed to multiple destinations. This requires some additional state information to manage the transmission of the Job to each destination. Scan Jobs that have multiple destinations have the "destination-statuses" Job Status attribute (section 0) to track the status of the delivery to each requested destination.

Just as with printing, attribute fidelity specified with the "ipp-attribute-fidelity" [RFC2911] and "job-mandatory-attributes" [PWG5100.7] operation attributes applies only when a Scan Job is created - Scan Services indicate that fidelity was not honored during transmission by reporting the 'job-completed-with-warnings' keyword in the "job-state-reasons" Scan Job attribute.

4.1.1 Documents within a Scan Job

From a Client's point of view the number of Documents created in a Job is a function of the Scan Service's capability and the document format of the Output Image. For example a document format such as JPEG only allows a single image per file. If multiple units of physical media (e.g., sheets, film cells, scan regions, etc.) are being scanned and the Scan Service supports multi-document Jobs, then each JPEG file generated will be associated with a Document within the Scan Job. If the Scan Service does not support multi-document Jobs, then only a single unit of physical media will be scanned resulting in a single Document Job. If that same physical media is scanned using a multi-page document format such as PDF, then all the Output Images, regardless of multi-document support, will be contained in a single file associated with a single Document within the Scan Job.

4.1.2 Output Spooling Services

Some Scan Services have the capability to temporarily spool scan output Documents. Spooling services with a value of 'spool' for the "job-destination-spooling-supported" attribute (see 8.3.4) MUST automatically retry scan delivery upon failure and support multiple destination URIs. Such Imaging Services typically support the PDF ("application/pdf") [ISO32000] and/or OpenXPS ("application/openxps") [ECMA-388] document formats, however they MAY NOT support spooling for all formats. Scan Clients MUST include and Scan Services MUST support the "document-format" operation attribute in Get-Printer-Attributes requests in order to determine the spooling capabilities of the Scan Service for a given format.

4.1.3 Output Streaming Services

Scan Services that can only stream scan Jobs to a single destination URI MUST support redelivery of the current page. When an error occurs that requires redelivery of larger portions of the Job by the Client, Scan Services MUST move the Job to the 'aborted' state, add the appropriate keyword to the "job-state-reasons" Job Status attribute for the Scan Job, and return the 'server-error-device-error' status code to the Scan Client.

Some document formats, e.g., PWG Raster Format ("image/pwg-raster") [PWG5102.4], are considered to be streamable formats. Scan Clients MUST include and Scan Services MUST support the "document-format" operation attribute in "Get-Printer-Attributes" requests in order to determine the streaming capabilities of the Scan Service for a given format.

4.1.4 Scan Job Terminating State

The terminating state of an IPP Scan Job reflects the final disposition of the Scan Job. Scan Jobs in the 'canceled' state were canceled by a User using the "Cancel-Job", "Cancel-Jobs", or "Cancel-My-Jobs" operations, regardless of whether any or all of the Scan Job has been processed or partially transferred to its destination URI(s). The "destination-statuses" Job Status attribute (section 0) provides detailed information regarding the progress of the Job prior to cancellation with the value of the "destination-state" member attribute set to 'completed' for Scan Jobs that were completely sent to the destination or 'canceled' otherwise.

Scan Jobs in the 'aborted' state were aborted by the Scan Service itself, typically due to a fatal processing error or a failed transfer to any of a Scan Job's destination URIs. The "destination-statuses" Job Status attributes provides detailed information regarding the progress of the Scan Job prior to being aborted by the service with the value of the "destination-state" member attribute set to 'completed' for Scan Jobs that were completely sent to the destination or 'aborted' otherwise. The "job-state-reasons" Job Status attribute will contain the keyword 'destination-uri-failed' if the Scan Job was aborted due to a transfer error to one or more destination URIs.

Scan Jobs in the 'completed' state were successfully processed and transferred to at least one of the Scan Job's destination URIs. The "destination-statuses" Job Status attribute

provides detailed information regarding the terminating state of each destination URI. Scan Services MUST report the 'job-completed-with-errors' keyword in the "job-state-reasons" attribute if the Scan Job was not successfully transferred to all destination URIs.

4.1.5 Image Acquisition Failure

When a Scan Job is processed it is possible that no image can be obtained (e.g., nothing on platen) or during processing there can be an interruption in the stream of images (e.g., jam in Automatic Document Feeder). After an implementation defined period of time has elapsed and the issue has not been resolved, the Scan Job moves to the 'aborted' state with an appropriate set of "job-state-reasons" (e.g., 'media-jam', 'aborted-by-system'). Since there is no guarantee that the images delivered by the aborted Job can be used, the entire Job should be resubmitted.

4.1.6 Scan Job History

IPP Scan Job history MUST be retained for a minimum of 300 seconds.

4.1.7 IPP Scan Service URIs

Each instance of a Scan Service is identified by a URI. The path component of an IPP Scan URI MUST be "/ipp/scan" for the only (or default) instance of the service on an Imaging System and "/ipp/scan/*instance-name*" for each additional, non-default instance on the Imaging System.

4.1.8 Destination URIs

IPP Scan supports delivery of Scan Jobs to one or more destination URIs. The following URI schemes are identified by this specification:

'ftp', 'ftps': Scan Jobs are sent to the destination address using the File Transfer Protocol [RFC1738].

'http', 'https': Scan Jobs are sent to the destination address using the HyperText Transfer Protocol [RFC1738], [RFC2818], [RFC7230].

'dav': Scan Jobs are sent to the destination address using HTTP Extensions for Distributed Authoring (WebDAV) [RFC2518], [RFC4918].

'ipp', 'ipps': Scan Jobs are submitted to the destination URI using the Internet Printing Protocol [RFC2911], typically for printing.

'mailto': Scan Jobs are converted to a supported document format and sent to the destination email address using Multimedia Internet Mail Exchange [RFC2045] attachments.

'smb': Scan Jobs are sent to the specified Server Message Block/Common Internet File System destination.

4.2 IPP Operations

Table 1 lists the operations for a Scan Service conforming to this Scan Service specification. The “Create-Job” and “Get-Next-Document-Data” operations are REQUIRED, but support for multiple document Jobs is OPTIONAL.

Table 1 - Operations for Scan (note 1)

Code	IPP Operation Name	SM Operation Name	Reference
0x0004	Validate-Job	ValidateScanJobTicket	RFC 2911
0x0005	Create-Job	CreateScanJob	RFC 2911
0x0008	Cancel-Job	CancelScanJob	RFC 2911
0x0009	Get-Job-Attributes	GetScanJobElements	RFC 2911
0x000A	Get-Jobs	GetActiveScanJobs, GetScanJobHistory	RFC 2911
0x000B	Get-Printer-Attributes	GetScanServiceElements	RFC 2911
0x000C	Hold-Job	HoldScanJob	RFC 2911
0x000D	Release-Job	ReleaseScanJob	RFC 2911
0x0010	Pause-Printer (O)	PauseScanService	RFC 2911
0x0011	Resume-Printer (O)	ResumeScanService	RFC 2911
0x0013	Set-Printer-Attributes (O)	SetScanServiceElements	RFC 3380
0x0014	Set-Job-Attributes (O)	SetScanJobElements	RFC 3380
0x0015	Get-Printer-Supported-Values (O)	-	RFC 3380
0x0016	Create-Printer-Subscriptions (O)	-	RFC 3995
0x0017	Create-Job-Subscriptions (O)	-	RFC 3995
0x0018	Get-Subscription-Attributes (O)	-	RFC 3995
0x0019	Get-Subscriptions (O)	-	RFC 3995
0x001A	Renew-Subscription (O)	-	RFC 3995
0x001B	Cancel-Subscription (O)	-	RFC 3995
0x001C	Get-Notifications (O)	-	RFC 3996
0x0022	Enable-Printer (O)	EnableScanService	RFC 3998
0x0023	Disable-Printer (O)	DisableScanService	RFC 3998
0x0024	Pause-Printer-After-Current-Job (O)	PauseScanService AfterCurrentJob	RFC 3998
0x0025	Hold-New-Jobs (O)	HoldNewScanJobs	RFC 3998
0x0026	Release-Held-New-Jobs (O)	ReleaseHeldScanJobs	RFC 3998
0x0027	Deactivate-Printer (O)	-	RFC 3998
0x0028	Activate-Printer (O)	-	RFC 3998
0x0029	Restart-Printer (O)	RestartScanService	RFC 3998
0x002A	Shutdown-Printer (O)	ShutdownScanService	RFC 3998
0x002B	Startup-Printer (O)	StartupService (note 2)	RFC 3998

0x002D	Cancel-Current-Job (O)	CancelCurrentScanJob	RFC 3998
0x002E	Suspend-Current-Job (O)	SuspendCurrentScanJob	RFC 3998
0x002F	Resume-Job (O)	ResumeScanJob	RFC 3998
0x0030	Promote-Job (O)	PromoteScanJob	RFC 3998
0x0031	Schedule-Job-After (O)	PromoteScanJob	RFC 3998
0x0034	Get-Document-Attributes (O)	GetScanDocumentElements	PWG 5100.5
0x0035	Get-Documents (O)	GetScanDocuments	PWG 5100.5
0x0036	Delete-Document (O)	-	PWG 5100.5
0x0037	Set-Document-Attributes (O)	SetScanDocumentElements	PWG 5100.5
0x0038	Cancel-Jobs (O)	CancelScanJobs	PWG 5100.11
0x0039	Cancel-My-Jobs	CancelMyScanJobs	PWG 5100.11
0x003A	Resubmit-Job (O)	ResubmitScanJob	PWG 5100.11
0x003B	Close-Job	CloseScanJob	PWG 5100.11
0x003C	Identify-Printer	IdentifyScanService	PWG 5100.13
0x003D	Validate-Document (O)	ValidateScanDocumentTicket	PWG 5100.13
0x004A	Get-Next-Document-Data	GetNextDocumentData	PWG 5100.17

"(O)" = OPTIONAL

Note 1: The legacy “IPP Print-Job” (0x0002), “Print-URI” (0x0003), “Restart-Job” (0x000E), “Purge-Jobs” (0x0012). and “Reprocess-Job” (0x002C) operations MUST NOT be supported by a conforming IPP Scan implementation.

Note 2: “StartupService” is an operation on the Semantic Model System Control Service.

4.3 IPP Printer Description Attributes

Table 2 lists the REQUIRED IPP Printer Description attributes for a Scan Service.

Table 2 - Required IPP Printer Description Attributes

Attribute	Reference
charset-configured	RFC 2911
charset-supported	RFC 2911
color-supported (note 1)	RFC 2911
compression-supported	RFC 2911
copies-default (note 2)	RFC 2911
copies-supported (note 2)	RFC 2911
destination-accesses-supported (note 4)	PWG 5100.17
destination-uri-schemes-supported	PWG 5100.15
document-format-default	RFC 2911
document-format-supported	RFC 2911
generated-natural-language-supported	RFC 2911
input-attributes-default	PWG 5100.15
input-attributes-supported	PWG 5100.15
input-color-mode-supported	PWG 5100.15
input-media-supported	PWG 5100.15
input-orientation-requested-supported	PWG 5100.15
input-quality-supported	PWG 5100.15
input-resolution-supported	PWG 5100.15
input-sides-supported	PWG 5100.15
input-source-supported	PWG 5100.15
ipp-features-supported	PWG 5100.13
ipp-versions-supported	RFC 2911
job-ids-supported	PWG 5100.11
multiple-destination-uris-supported	PWG 5100.15
multiple-document-handling-supported (note 3)	RFC 2911
multiple-document-jobs-supported	RFC 2911
multiple-operation-time-out (note 3)	RFC 2911
multiple-operation-time-out-action (note 3)	PWG 5100.13
natural-language-configured	RFC 2911
number-of-retries-default	PWG 5100.15
number-of-retries-supported (note 4)	PWG 5100.15
operations-supported	RFC 2911
output-attributes-default	PWG 5100.17
output-attributes-supported	PWG 5100.17
overrides-supported	PWG 5100.6
printer-device-id	PWG 5107.2
printer-geo-location	PWG 5100.13
printer-get-attributes-supported (note 5)	PWG 5100.13
printer-icons	PWG 5100.13
printer-info	RFC 2911

printer-location	RFC 2911
printer-make-and-model	RFC 2911
printer-more-info	RFC 2911
printer-name	RFC 2911
printer-organization	PWG 5100.13
printer-organizational-unit	PWG 5100.13
retry-interval-default (note 4)	PWG 5100.15
retry-interval-supported (note 4)	PWG 5100.15
retry-time-out-default (note 4)	PWG 5100.15
retry-time-out-supported (note 4)	PWG 5100.15
which-jobs-supported	PWG 5100.11

Note 1: Defines color support of the Scan Service, not of the recipient.

Note 2: MUST have a value of 1.

Note 3: CONDITIONALLY REQUIRED for Scan Services that support the multi-document jobs.

Note 4: CONDITIONALLY REQUIRED for Push Scan

Note 5: MUST include “destination-uri” in order to filter capabilities by URI scheme.

4.4 IPP Printer Status Attributes

Table 2 lists the REQUIRED IPP Printer Status attributes for a Scan Service.

Table 3 - Required IPP Printer Status Attributes

Attribute	Reference
printer-alert	PWG 5100.9
printer-alert-description	PWG 5100.9
printer-config-change-date-time	PWG 5100.13
printer-config-change-time	PWG 5100.13
printer-current-time	RFC 2911
printer-is-accepting-jobs	RFC 2911
printer-state	RFC 2911
printer-state-change-date-time	RFC 3995
printer-state-change-time	RFC 3995
printer-state-message	RFC 2911
printer-state-reasons	RFC 2911
printer-up-time	RFC 2911
printer-uri-supported	RFC 2911
printer-uuid	PWG 5100.13
queued-job-count	RFC 2911
xri-authentication-supported	RFC 3380
xri-security-supported	RFC 3380
xri-uri-scheme-supported	RFC 3380

4.5 IPP Operation Attributes

Table 4 lists the REQUIRED operation attributes for a Scan Service.

Table 4 - Required Operation Attributes

Attribute	Reference
compression	RFC 2911
compression-accepted	PWG 5100.17
document-data-get-interval	PWG 5100.17
document-data-wait	PWG 5100.17
document-format	RFC 2911
document-format-accepted	PWG 5100.17
document-name	RFC 2911, PWG 5100.5
first-index	PWG 5100.13
input-attributes (note 1)	PWG 5100.15
ipp-attribute-fidelity	RFC 2911
job-ids	PWG 5100.11
job-name	RFC 2911
last-document	RFC 2911
limit	RFC 2911
output-attributes	PWG 5100.17
requesting-user-name	RFC 2911
requesting-user-uri	PWG 5100.13
which-jobs	RFC 2911, PWG 5100.11

Note 1: Only those members explicitly listed in this specification are required.

4.6 IPP Job Template Attributes

Table 5 lists the REQUIRED Job Template attributes for a Scan Service.

Table 5 - Required Job Template Attributes

Attribute	Reference
copies (note 1)	RFC 2911
destination-uris (note 2)	PWG 5100.15
multiple-document-handling (note 3)	RFC 2911
number-of-retries (note 2)	PWG 5100.15
page-ranges (note 3)	RFC 2911
retry-interval (note 2)	PWG 5100.15
retry-time-out (note 2)	PWG 5100.15

Note 1: Must have a value of 1.

Note 2: CONDITIONALLY REQUIRED for Push Scan

Note 3: CONDITIONALLY REQUIRED for Scan Services that support multi-document jobs

4.6.1 Other Job Template Attributes

Scan Services MAY support additional Job Template attributes such as “media” “number-up”, and “overrides. These attributes are applied by the Scan Service when generating the content to be delivered to the destination (e.g. specifying a media size that is different from the acquired image size would result in an image scaled to the specified media size. Note that the normal use case is that image size scanned would be the same as the output image size.).

4.7 IPP Job Description Attributes

Table 6 lists the REQUIRED Job Description attributes for a Scan Service.

Table 6 - Required Job Description Attributes

Attribute	Source
job-name	RFC 2911

4.8 IPP Job Status Attributes

Table 7 lists the REQUIRED Job Status attributes for a Scan Service.

Table 7 - Required Job Status Attributes

Attribute	Source
date-time-at-completed	RFC 2911
date-time-at-creation	RFC 2911
date-time-at-processing	RFC 2911
destination-statuses	PWG 5100.15
document-name-supplied	PWG 5100.7
input-attributes-actual	PWG 5100.15
job-id	RFC 2911
job-impressions (note 1)	RFC 2911
job-impressions-completed (note 1)	RFC 2911
job-originating-user-name	RFC 2911
job-originating-user-uri	PWG 5100.13
job-printer-up-time	RFC 2911
job-printer-uri	RFC 2911
job-state	RFC 2911
job-state-message	RFC 2911
job-state-reasons	RFC 2911
job-uri	RFC 2911
job-uuid	PWG 5100.13
time-at-completed	RFC 2911
time-at-creation	RFC 2911
time-at-processing	RFC 2911

Note 1: Impressions is equivalent to Output Images in the output file(s) delivered to the destination

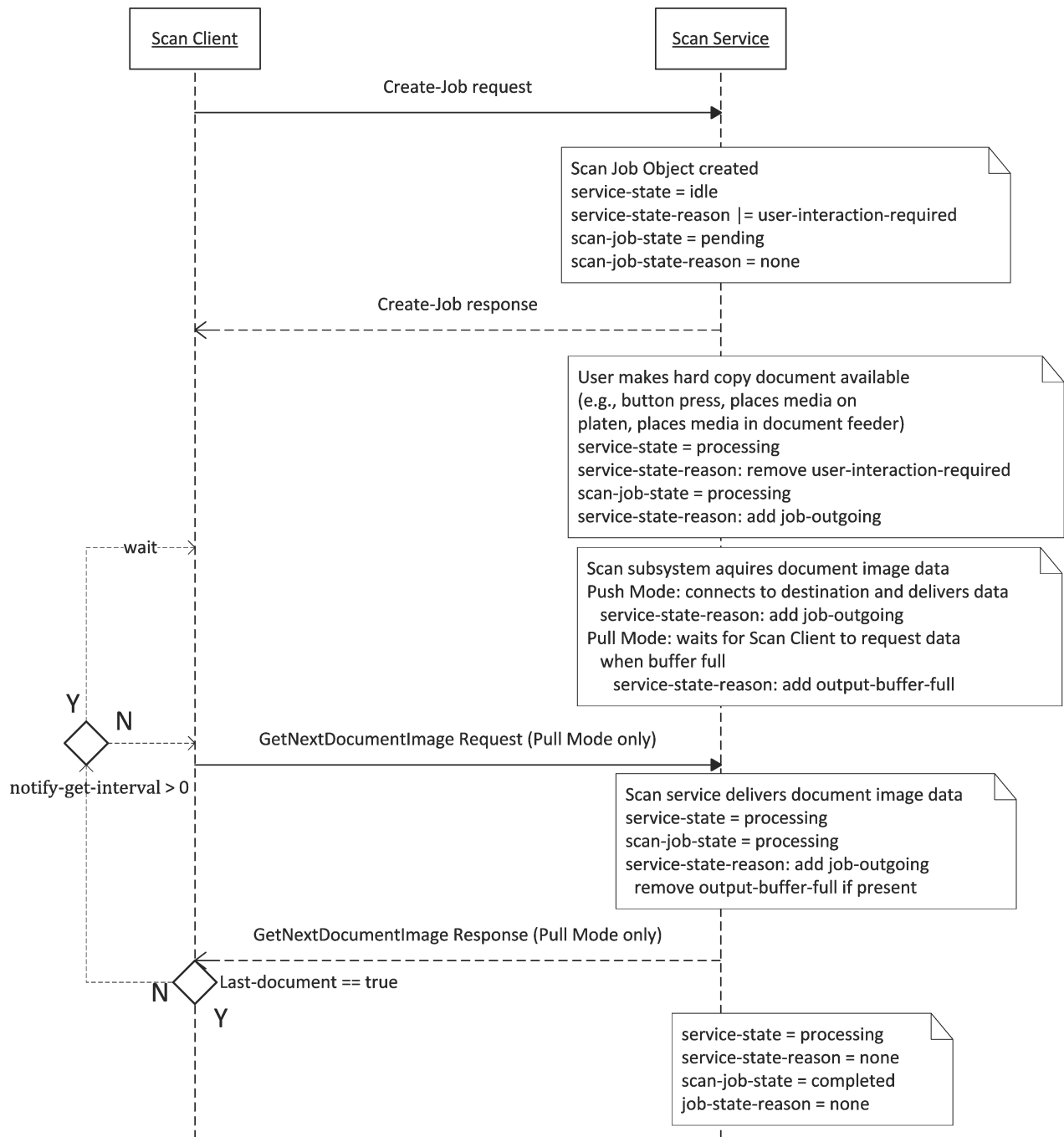


Figure 1 - Scan Job Creation Flow Chart

5. Document Formats

Scan Services **MUST** support generating Documents conforming to Document management — Portable document format — Part 1: PDF 1.7 [ISO32000] ("application/pdf").

Scan Services **SHOULD** support generating Documents conforming to the JPEG JFIF format [ITU-T81], [W3CJFIF] ("image/jpeg").

Scan Services **MAY** support generating other document formats.

6. New Operation

6.1 Get-Next-Document-Data Operation

The **REQUIRED** Get-Next-Document-Data operation allows a Scan Client to retrieve the scan data from an existing Job object. This operation enables pull scanning. The Scan Client specifies the target Scan Job. The Scan Job **MUST** be in the 'processing' or 'completed' state. As the scan data becomes available the Scan Job content is delivered in the response. The response's operation attribute "document-format" indicates the file type of the data. The Document Description attribute "document-number" indicates which Document within the Job is being returned. If the document number changes, the previous Document is complete. If the operation attribute "last-document" is 'true' the transfer of all Documents within the Job is complete. To support streaming the Scan Client **MUST** support the "chunked" Transfer-Encoding in the response.

Access Rights: The authenticated user (see [RFC2911] section 8.3) performing this operation must either be the Job Owner (as determined in the Create-Job operation) or an Operator or Administrator of the Scan Service (see [RFC2911] Sections 1 and 8.5). Otherwise, the Scan Service **MUST** reject the operation and return: 'client-error-forbidden', 'client-error-not-authenticated', or 'client-error-not-authorized' as appropriate.

6.1.1 Get-Next-Document-Data Request

The following attributes are part of the Get-Next-Document-Data Request:

Group 1: Operation Attributes

Natural Language and Character Set:

The "attributes-charset (charset)" and "attributes-natural-language (naturalLanguage)" attributes as described in [RFC2911] section 3.1.4.1.

Target:

The "printer-uri (uri)" plus "job-id (integer(1:MAX))" which define the target for this operation as described in [RFC2911] section 3.1.5. The Scan Client **MUST NOT**

supply and the Scan Service MUST NOT support the “job-uri (uri) ” operation attribute for this operation.

Requesting User Name:

The “requesting-user-name (name(MAX)) ” and “requesting-user-uri” (uri) attributes SHOULD be supplied by the Scan Client as described in [RFC2911] section 8.3 and [PWG5100.13] section 6.1.

“document-data-wait (boolean)”:

The “document-data-wait” value indicates whether the Scan Client wants to block waiting for the response. The Scan Client MAY supply this attribute. The Scan Service MUST support both values of this attribute as described for “notify-wait” in [RFC3996] section 5.2 and 5.1.3. See section 6.1.2 for “Get-Next-Document-Data” specific semantics.

6.1.2 Get-Next-Document-Data Response

The Scan Service has the following options for responding to a Get-Next-Document-Data Request:

1. The Scan Service can reject the request and return the 'server-error-busy' status code if the Scan Service is too busy to accept this operation at this time. In this case, the Scan Service MUST return the "document-data-get-interval" operation attribute to indicate when the Client SHOULD try again.
2. If the Scan Client did not request image wait mode("document-data-wait" = 'false' or omitted), the Scan Service MUST immediately return any available Document data and MUST return the "document-data-get-interval" operation attribute with the number of seconds from now, at which the Scan Client SHOULD repeat the Get-Next-Document-Data Request to get additional Document data.
3. If the Scan Client requested image wait mode("document-data-wait" = 'true'), the Scan Service MUST immediately return any available Document data and MUST continue to return Document data as it becomes available until all Document data for the Job has been transferred.

However, the Scan Service MAY decide to terminate Wait Mode at any time, including in the first response. In this case, the Scan Service MUST return the "document-data-get-interval" operation attribute. This attribute indicates that the Scan Service wishes to leave Wait Mode and the number of seconds in the future that the Scan Client SHOULD try the Get-Next-Document-Data operation again. The Scan Client MUST accept this response and MAY disconnect. If the Scan Client does not disconnect, the Scan Service MAY do so.

From the Scan Client's view, the response appears as an initial burst of data, which includes the Get-Next-Document-Data Response and associated available Document

data. After the initial burst of data, if the Scan Client has selected the Wait Mode option to wait for additional Document data, the Scan Client receives subsequent Document data. Proxy servers may delay some Document data or cause timeouts to occur. The Client MUST be prepared to perform the Get-Next-Document-Data operation again when timeouts occur.

The following attributes are part of the Get-Next-Document-Data Response:

Group 1: Operation Attributes

Status Message:

In addition to the REQUIRED status code returned in every response, the response OPTIONALLY includes a “status-message” (text(255)) and/or a “detailed-status-message” (text(MAX)) operation attribute as described in [RFC2911] sections 13 and 3.1.6.

Natural Language and Character Set:

The “attributes-charset (charset)” and “attributes-natural-language” (naturalLanguage) attributes as described in [RFC2911] section 3.1.4.2.

Compression:

The “compression (mimeMediaType)” attribute MUST be supplied by the Scan Service. This attribute indicates the compression algorithm of the Document data retrieved in this operation.

Document Format:

The “document-format (mimeMediaType)” attribute MUST be supplied by the Scan Service. This attribute indicates the format of the Document data retrieved in this operation.

“document-data-get-interval (integer(0:MAX))”:

The value is the number of seconds that the Scan Client SHOULD wait before trying the “Get-Next-Document-Data” operation again. The Scan Service MUST return this operation attribute if (1) it is too busy to return Document data, or (2) the Scan Client did not request Wait Mode. The Scan Client MUST accept this attribute and SHOULD reissue the “Get-Next-Document-Data” operation (with or without “document-data-wait” = 'true') at the indicated number of seconds in the future in order to get more Scan Document data. This value is intended to help the Scan Client be a good network citizen.

Last-Document:

The “last-document (Boolean)” operation attribute set to 'true' indicates that this is the last Document available for the Scan Job. The “last-document” attribute is used in a slightly different manner than in [RFC2911] section 3.3.1.1. The consistent semantics is that the supplier of the Document data is indicating that the last Document has been reached.

Group 2: Document Description Attributes

“document-number (integer(1:MAX))”

The number of the document in the Scan Job.

Group 3: Document data

The Document data, or a portion thereof, is sent in the response as specified in [RFC2910] section 3.1. Note that the Scan Client MUST be ready to accept a response using the “chunked” Transfer-Encoding.

7. Additional Semantics for Existing Operations

7.1 Create-Job Operation

The “Create-Job” has a slightly different signature than the “Create-Job” in [RFC2911] section 3.2.4.

7.1.1 Create-Job Request

The following attributes are part of the Create-Job Request:

Group 1: Operation Attributes

Natural Language and Character Set:

The “attributes-charset (charset)” and “attributes-natural-language (naturalLanguage)” attributes as described in [RFC2911] section 3.1.4.1.

Target:

The “printer-uri (uri)” defines the target for this operation as described in [RFC2911] section 3.1.5.

Requesting User Name:

The “requesting-user-name (name(MAX))” and “requesting-user-uri (uri)” attributes SHOULD be supplied by the Scan Client as described in [RFC2911] section 8.3 and [PWG5100.13] section 6.1.

Job Name:

The “job-name (name(MAX))” attribute SHOULD be supplied by the Scan Client as described in [RFC2911] section 3.2.1.1.

IPP Attribute Fidelity:

The “ipp-attribute-fidelity (boolean)” attribute MAY be supplied by the Scan Client as described in [RFC2911] section 3.2.1.1. The “job-mandatory-attributes (1setOf type2 keyword)” attribute MAY be supplied by the Scan Client as described in [PWG5100.7] section 3.1.2.

Compression Accepted:

The “compression-accepted (1setOf type2 keyword)” attribute SHOULD be supplied by the Scan Client as described in section 8.1.1. The Scan Service MUST support this attribute. It identifies the acceptable compression algorithms for the Document data to emit in order of preference. The default is 'none' (no compression).

Document Format Accepted:

The “document-format-accepted (1setOf mimeType)” attributes SHOULD be supplied by the Scan Client as described in section 8.1.3.

Input Attributes:

The “input-attributes (collection)” attribute MUST be supplied by the Scan Client as described in section 8.1.6. This attribute is not an operation attribute in the “Create-Job” operation in [RFC2911] section 3.2.4.

Output Attributes:

The “output-attributes (collection)” attribute MAY be supplied by the Scan Client as described in section 8.1.7. This attribute is not an operation attribute in the “Create-Job” operation in [RFC2911] section 3.2.4.

Destination Access Attributes:

The “destination-accesses (1setOf collection)” attribute MAY be supplied by the Scan Client as described in section 8.1.2. This attribute is not an operation attribute in the “Create-Job” operation in [RFC2911] section 3.2.4.

Group 2: Job Template Attributes

The Scan Client OPTIONALLY supplies a set of Job Template attributes as defined in section 8.20. If the Scan Client is not supplying any Job Template attributes in

the request, the Scan Client SHOULD omit Group 2 rather than sending an empty group. However, a Scan Service MUST be able to accept an empty group.

Note that the presence of the “destination-uris” attribute indicates that a Push Scan is being requested. The absence of a “destination-uris” attribute indicates that a Pull Scan is being requested. An empty “destinations-uris” SHOULD NOT be supplied. If it is supplied, the Scan Service treats the request the same as when “destination-uris” is omitted.

7.1.2 Create-Job Response

The Create-Job response is the same as defined in section 3.2.4 of [RFC2911] with one additional operation attribute in Group 1. That attribute is:

Compression:

The “compression (type2 keyword)” attribute MUST be returned by the Scan Service. This attribute indicates the compression algorithm of the Document data delivered to the destination.

8. New Attributes

8.1 Operation Attribute

8.1.1 compression-accepted (1setOf type2 keyword)

The OPTIONAL “compression-accepted” operation attribute SHOULD be supplied by the Scan Client. It identifies the acceptable compression algorithms for the Document data to be emitted by the Scan Service for the Scan Job. It is an ordered list starting with the preferred algorithm. The Scan Service MUST use the first supported value in the list. If not specified, the Scan Service MUST use the value 'none'.

8.1.2 destination-accesses (1setOf collection | no-value)

The OPTIONAL "destination-accesses" operation attribute allows the Scan Client to provide authentication information for each of the "destination-uris" values. If provided, this attribute MUST have the same cardinality (have the same number of values) as the "destinations-uris" Job Template attribute. The i^{th} value of the "destination-accesses" attribute corresponds to the i^{th} value of the "destination-uris" attribute.

Each collection value contains zero or more member attributes which provide the authentication information required for the corresponding destination. A Scan Client MAY also provide the no-value out-of-band value for a given destination to specify that no authentication information is supplied.

Scan Services specify which member attributes are supported using the "destination-accesses-supported" Printer attribute (section 8.3.1). Scan Services specify which member attributes are required for a given destination in the "destination-mandatory-access-attributes" member attribute (section 8.3.3.5) of the "destination-uri-ready" Printer attribute (section 8.3.3).

8.1.2.1 access-oauth-token (1setOf octetString(MAX))

The OPTIONAL "access-oauth-token" member attribute provides a Base64-encoded OAuth Access Token as defined in The OAuth 2.0 Authorization Framework [RFC6749]. When the size of the access token exceeds 1023 octets (the maximum size of an octetString value), the Scan Client separates the token into multiple octetString values and sends the result as an ordered set to the Scan Service. The Scan Service reassembles each octetString to produce the complete access token value to be used with the destination.

Scan Services that support this attribute MUST list 'access-oauth-token' in the "destination-accesses-supported" Printer attribute (section 8.3.1).

8.1.2.2 access-oauth-uri (uri)

The OPTIONAL “access-oauth-uri” member attribute is the authorization server that issued the “access-oauth-token” member attribute. See Authorization Server [RFC6749] section 1.1.

8.1.2.3 access-password (text(MAX))

The OPTIONAL "access-password" member attribute provides a password string, typically for HTTP Basic or Digest authentication [RFC2617]. Scan Clients MUST provide the password using the UTF-8 encoding [STD63] in Unicode Normalization Form C as required for Network Unicode [RFC5198]. Scan Services MUST convert the password, as needed, to whatever encoding is required by the destination URI.

Scan Services that support this attribute MUST list 'access-password' in the "destination-accesses-supported" Printer attribute (section 8.3.1).

8.1.2.4 access-pin (text(MAX))

The OPTIONAL "access-pin" member attribute provides a Personal Identification Number string. Scan Clients MUST restrict the characters to the US ASCII digits '0' (code 48) through '9' (code 57) and Scan Services MUST reject values containing characters other than the digits '0' through '9'.

Scan Services that support this attribute MUST list 'access-pin' in the "destination-accesses-supported" Printer attribute (section 8.3.1).

8.1.2.5 access-user-name (text(MAX))

The OPTIONAL "access-user-name" member attribute provides a user name string, typically for HTTP Basic or Digest authentication [RFC2617]. Scan Clients MUST provide the user name using the UTF-8 encoding [STD63] in Unicode Normalization Form C as required for Network Unicode [RFC5198]. Scan Services MUST convert the user name, as needed, to whatever encoding is required by the destination URI.

Scan Services that support this attribute MUST list 'access-user-name' in the "destination-accesses-supported" Printer attribute (section 8.3.1).

8.1.2.6 access-x509-certificate (1setOf octetString(MAX))

The OPTIONAL "access-x509-certificate" member attribute provides a PEM-encoded X.509 certificate identifying the user or Client that is making the request. When the size of the certificate exceeds 1023 octets (the maximum size of an octetString value), the Scan Client separates the certificate into multiple octetString values and sends the result as an ordered set to the Scan Service. The Scan Service reassembles each octetString to produce the complete X.509 certificate to be used with the destination.

Scan Services that support this attribute MUST list 'access-x509-certificate' in the "destination-accesses-supported" Printer attribute (section 8.3.1) and MUST provide an implementation-defined method for loading the corresponding private key that is used for authenticating the holder of the X.509 certificate.

8.1.3 document-format-accepted (1setOf mimeType)

The OPTIONAL "document-format-accepted" operation attribute SHOULD be supplied by the Scan Client. It identifies the acceptable formats of the document data to be emitted by the Scan Service for the Scan Job. It is an ordered list starting with the preferred format. The Scan Service MUST use the first supported value in the list. The default value that MUST be used, if left unspecified, is the value of the "document-format-default" Printer attribute.

8.1.4 document-data-get-interval (integer(0:MAX))

The OPTIONAL "document-data-get-interval" operation attribute specifies the number of seconds that the Scan Client SHOULD wait before trying the "Get-Next-Document-Data" operation again. The Scan Service MUST return this operation attribute if (1) it is too busy to return Document data, or (2) the Scan Client did not request Wait Mode. The Scan Client MUST accept this attribute and SHOULD reissue the "Get-Next-Document-Data" operation (with or without "document-data-wait" = 'true') at the indicated number of seconds in the future in order to get more Scan Document data. This value is intended to help the Scan Client be a good network citizen.

8.1.5 document-data-wait (boolean)

The REQUIRED "document-data-wait" operation attribute indicates whether the Scan Client wants to wait for additional Document data. The Scan Client MAY supply this attribute. The Scan Service MUST support both values of this attribute. The semantics for this attribute are similar to "notify-wait" described in [RFC3996] section 5.2 and 5.1.3. See section 6.1.2 for "Get-Next-Document-Data" specific semantics.

8.1.6 input-attributes (collection)

The REQUIRED "input-attributes" operation attribute specifies the scanning source and other attributes for processing Scan Documents. The following member attributes are defined in [PWG5100.15] section 7.1.1:

"input-auto-exposure"	"input-auto-scaling"	"input-auto-skew-correction"
"input-brightness"	"input-color-mode"	"input-content-type"
"input-contrast"	"input-film-scan-mode"	"input-images-to-transfer"
"input-orientation-requested"	"input-media"	"input-media-type"
"input-quality"	"input-resolution"	"input-scaling-height"
"input-scaling-width"	"input-scan-regions"	"input-sharpness"
"input-sides"	"input-source"	

The member attributes in the remainder of section 8.1 are defined in [PWG5108.02].

The "input-attributes-supported" [PWG5100.15] Printer attribute defines which of the "input-attributes" member attributes are supported.

8.1.7 output-attributes (collection)

The REQUIRED "output-attributes" operation attribute specifies the attributes for image processing to be applied when generating the output images. The "output-attributes-supported" (section 8.3.6) Printer attribute defines which of the "output-attributes" member attributes are supported.

8.1.7.1 noise-removal (integer(0:100))

The OPTIONAL "noise-removal" member attribute contains a normalized integer value used control the amount of random unwanted data to be removed from the scan data. The higher the requested removal value the more aggressively the noise is removed. The value is normalized as an integer between 0 and 100.

8.1.7.2 output-compression-quality-factor (integer(0:100))

The OPTIONAL "output-compression-quality-factor" member attribute contains a normalized integer value between 0 and 100 used by JPEG compression to determine the amount of acceptable image loss.. A value of 100 produces the largest output with the highest quality while a value of 0 produces the smallest output with the least quality. Job Description Attributes

8.1.8 output-attributes-actual (collection)

The "output-attributes-actual" Job Description attribute provides a receipt of the "output-attributes" (section 8.1.7) operation attribute values that were used in the Create-Job (section 7.1) request that created the Scan Job object. Scan Services SHOULD support this attribute.

8.2 Job Template Attributes

8.2.1 destination-uris (1setOf collection)

The CONDITIONALLY REQUIRED "destination-uris" Job Template attribute specifies the destination of the scan Job Document data. Scan Services that support Push Scanning MUST support this attribute. Scan Clients MUST specify this attribute for a Push Scan and MUST NOT specify this attribute for a Pull Scan..

Note that the URI schemes 'tel', 'fax', 'sip', and 'sips' are reserved for use by the IPP FaxOut Service and MUST NOT be used with the IPP Scan Service. Scan Services MUST reject Create-Job requests using these URI schemes or if the "post-dial-string", "pre-dial-string", or "t33-subaddress" member attributes are supplied.

8.2.1.1 destination-attributes (1setOf collection)

The OPTIONAL "destination-attributes" member attribute allows the Scan Client to specify attributes to be applied to the method implied by the "destination". For example, if the destination URI scheme is "ipp", this attribute would contain operation and Job Template Attributes to be used in the creation of the IPP Print Job. This attribute MUST NOT include "document-password", "job-password", or "job-password-encryption" member attributes and SHOULD NOT include member attributes that carry authentication or security information to be applied during the interaction with the destination.

8.3 IPP Printer Description Attributes

8.3.1 destination-accesses-supported (1setOf type2 keyword)

The "destination-accesses-supported" Printer attribute lists the supported member attributes of the "destination-accesses" operation attribute (section 8.1.2). This attribute MUST be supported if the "destination-accesses" attribute is supported.

8.3.2 destination-uri-schemes-supported (1setOf uriScheme)

The CONDITIONALLY REQUIRED "destination-uri-schemes-supported" Printer attribute lists the supported "destination-uri" URI schemes. Scan Services that support Push Scan MUST support this attribute and MUST support the 'http', 'https', 'ftp', and 'ftps' URI schemes. Scan Services MAY support the 'smb', 'ipp', 'ipps', 'mailto', "dav" and other file transfer URI schemes.

Scan Services MUST NOT support the 'tel', 'fax', 'sip', or 'sips' URI schemes. These URI schemes are reserved for use by the IPP FaxOut Service. A Scan Service does not satisfy the additional requirements beyond delivering a scanned Document to a destination (e.g., durable log).

8.3.3 destination-uri-ready (1setOf collection)

The OPTIONAL "destination-uri-ready" Printer attribute lists the configured destinations. This does not limit the destinations that a user may specify. It is a list of administratively set destinations to assist the user in selecting an appropriate destination. Scan Services that support Push Scan MAY support this attribute.

8.3.3.1 destination-attributes (1setOf collection)

This OPTIONAL "destination-attributes" member attribute allows the Administrator to specify attributes to be applied to the "destination-attributes" Job Template attribute (section 8.2.1.1). This attribute MUST NOT include "document-password", "job-password", or "job-password-encryption" member attributes and SHOULD NOT include member attributes that carry authentication or security information to be applied during the interaction with the destination.

8.3.3.2 destination-attributes-supported (1setOf type2 keyword)

The OPTIONAL "destination-attributes-supported" member attribute is a list of member attributes that can be included in "destination-attributes" (section 8.2.1.1) attribute. If an attribute exists in the "destination-attributes" (section **Error! Reference source not found.**) member attribute and does not exist in this attribute, the user is not allowed to change the administratively set value. This attribute MUST NOT include "document-password", "job-password", or "job-password-encryption" and SHOULD NOT include attributes that carry authentication or security information to be applied during the interaction with the destination.

8.3.3.3 destination-info (text(MAX))

The OPTIONAL "destination-info" member attribute provides a human readable description of the destination.

8.3.3.4 destination-is-directory (boolean)

The OPTIONAL "destination-is-directory" member attribute indicates if the destination is a folder that can contain multiple files. The default value if this attribute is not included is 'false'.

8.3.3.5 destination-mandatory-access-attributes (1setOf type2 keyword)

The "destination-mandatory-access-attributes" member attribute lists the member attributes that MUST be supplied in the "destination-accesses" operation attribute in a Job Creation request when using this destination.

8.3.3.6 destination-name (name(MAX))

The OPTIONAL “destination-name” member attribute provides a human readable user friendly name for the destination.

8.3.3.7 destination-oauth-scope (1setOf octetString(MAX))

The OPTIONAL “destination-oauth-scope” member attribute specifies an unordered list of space separated case sensitive granted scopes for the OAuth token - see Access Token Scope [RFC6749] section 3.3. When the size of the scope list exceeds 1023 octets (the maximum size of an octetString value), the list is separated into multiple octetString values. If “destination-oauth-token” is not present, this attribute MUST not be present.

8.3.3.8 destination-oauth-token (1setOf octetString(MAX))

The OPTIONAL “destination-oauth-token” member attribute contains a Base64-encoded OAuth Access Token as defined in The OAuth 2.0 Authorization Framework [RFC6749] When the size of the access token exceeds 1023 octets (the maximum size of an octetString value), the token is separated into multiple sequential octetString values.

8.3.3.9 destination-oauth-uri (uri)

The OPTIONAL “destination-oauth-uri” member attribute specifies the authorization server that will issue the associated “destination-oauth-token” for the destination - see Authorization Server [RFC6749] section 1.1. If “destination-oauth-token” is not present, this attribute MUST not be present.

8.3.3.10 destination-uri (uri)

The REQUIRED “destination-uri” member attribute specifies the destination.

8.3.4 job-destination-spooling-supported (type2 keyword)

This attribute indicates whether or not Scan Job Document data is spooled before the Document data is delivered to the specified destination(s).

The value of this attribute returned in a “Get-Printer-Attributes” response MAY depend on the “document-format” operation attribute supplied in the “Get-Printer-Attributes” request (see [RFC2911] Section 3.2.5.1 and 6.2).

If the Scan Service does not support this attribute, then the spooling behavior is assumed to be ‘automatic’.

The “Get-Printer-Supported-Values” operation [RFC3380] returns a ‘1setOf type2 keyword’ so that all possible values that the implementation is capable of supporting are indicated.

The keyword values defined by this specification are:

'spool': The Scan Service temporarily spools the scan Document data until successfully delivered to the specified destinations or the Scan Job has reached a terminating state. For temporary transmission failure on a Push Scan the Scan Service is responsible for retrying Document delivery. For temporary transmission failure on a Pull Scan the Scan Service is responsible retaining the Document data.

'stream': The amount of Document data buffered by the Scan Service is implementation specific and Document retransmission may not be possible. For temporary transmission failure on a Push or Pull Scan the Scan Client is responsible for resubmitting the Job after the Job has been aborted.

'automatic': The Scan Service MAY spool and/or stream depending on policy and other factors, such as the document format. For temporary transmission failure the Scan Client is responsible for resubmitting the Job after the Job has been aborted.

8.3.5 output-attributes-default (collection)

The CONDITIONALLY REQUIRED “output-attributes-default” Printer attribute defines the default value for the “output-attributes” operation attribute (section 8.1.7). Scan Services that support the “output-attributes” (section 8.1.7) operation attribute MUST support this attribute.

8.3.6 output-attributes-supported (1setOf type2 keyword)

The CONDITIONALLY REQUIRED "output-attributes-supported" Printer attribute lists the supported member elements of the “output-attributes” operation attribute. Scan Services that support the “output-attributes” (section 8.1.7) operation attribute MUST support this attribute.

8.4 Document Description Attributes

8.4.1 input-attributes-actual (collection)

The RECOMMENDED "input-attributes-actual" Document Description attribute provides a receipt of the "input-attributes" (section 8.1.6) operation attribute values that were used in the Create-Job (section 7.1) request that created the Scan Job object.

8.4.2 output-attributes-actual (collection)

The "output-attributes-actual" Document Description attribute [PWG5100.8] section 3 provides a receipt of the "output-attributes" (section 8.1.7) operation attribute values that were used in the Create-Job (section 7.1) request that created the Scan Job object. Scan Services SHOULD support this attribute.

9. Additional Values and Semantics for Existing Attributes

9.1 input-color-mode (type2 keyword)

The "input-color-mode" member attribute specifies the color processing mode. Each keyword describes a color encoding, color space, bit depth and samples per pixel. Table 8 lists the available values, color encoding, and bit depths.

The "input-color-mode-supported" IPP Printer attribute defines the supported values. Scan Services MUST support and Scan Clients MUST supply this member attribute, either directly or through the "input-attributes-default" Printer attribute value.

9.2 ipp-features-supported (1setOf type2 keyword)

This specification defines the REQUIRED keyword 'scan' for the "ipp-features-supported" Printer attribute. The Scan Service uses this value to report support for this specification.

9.3 job-state-reasons (1setOf type2 keyword)

Table 9 lists the "job-state-reasons" keyword values that are specific to IPP Scan. Other Scan specific keywords are defined in Printer MIB and IPP MFD Alerts [PWG5107.3].

Table 8 - IPP Scan "input-color-mode" Keyword Values

Keyword	Color Type	Color Encoding	Bits per Pixel	Bits per Color
auto (note 1)	Color/Gray or Binary	RGB or W	Varies	Varies
bi-level (note 1)	Binary	W	1	1
color (note 1)	Color	RGB	Varies	Varies
monochrome_4	Gray	W	4	4
monochrome_8	Gray	W	8	8
monochrome_16	Gray	W	16	16
monochrome (note 1)	One color (usually gray)	W	Varies	Varies
color_8	color	RGB	24	8
rgba_8	color	RGB	32	8
rgb_16	color	RGB	48	16
rgba_16	color	RGB	64	16
cmyk_8	color	CMYK	32	8
cmyk_16	color	CMYK	64	16

Note 1: Existing keyword defined in the IPP FaxOut Service [PWG5100.15].

Table 9 - IPP Scan "job-state-reasons" Keyword Values

Keyword	Description
waiting-for-user-action	The scan job is awaiting some user intervention to continue processing the job. Note that this is not an error condition and the state of the job remains in the processing state.

10. Bonjour Support

Just as with IPP Everywhere [PWG5100.14], network scanners conforming to this specification are discovered using Bonjour, which is implemented via DNS-Based Service Discovery [RFC6763] and Multicast DNS [RFC6762]. Scanners that are part of a Multifunction Device are discovered using the same service registration and TXT record as the Print Service. Standalone scanners that are not part of a Multifunction Device are discovered using a separate registration and TXT record for just the Scan Service.

10.1 Required Service Type

Scanners MUST register the "_ipp._tcp._scan" service type (IPP type and scan subtype) to indicate conformance to the Internet Printing Protocol and this specification. Scanners that support TLS MUST also register the "_ipps._tcp._scan" service type (IPPS type and scan subtype). Clients using Bonjour for discovery can browse for the "_scan" subtype to limit the list of IPP services to those with scanning capabilities. While additional filtering can be performed using TXT record key values, such filtering is not recommended for general purpose Scan Clients since all Scan Services may not be discovered.

10.2 Required TXT Record Values

Scanners MUST provide (or use the default values for) the TXT record keys listed in Table 9. In addition, standalone Scan Services MUST provide (or use the default values for) the "air", "note", "pdl", "TLS", and "UUID" keys with values corresponding to the Scan Service and MUST NOT provide the "rp" key.

10.2.1 ADF

This value is set to "S" if the scanner is equipped with a simplex Automatic Document Feeder, "D" if equipped with a duplexing Automatic Document Feeder, and "N" if no Automatic Document Feeder is present. For example:

ADF=N

Table 10 - Required Text Record Values

Key	Description	Default
ADF	'S' if the Scanner has a simplex Automatic Document Feeder, 'D' if it has a duplexing one, 'N' if there is no Automatic Document Feeder.	'N'
rs	Resource portion of Scanner URI without leading slash.	'ipp/scan'
Scan2	A comma-delimited list of destination URI schemes supported by the Scan Service, including 'ftp', 'ftps', 'http', 'https', 'ipp', 'ipps', 'mailto', and 'smb'. MUST contain the same values as reported by the "destination-uri-schemes-supported" attribute or be the empty string if Push Scanning is not supported.	" (i.e., Push Scanning not supported)
TMA	'T' if the Scanner has a Transparency Media Adaptor (an adaptor for scanning media such as slides and negatives) 'F' if it doesn't. 'U' indicates presence is unknown.	'U'

10.2.2 rs

This value indicates the full path to a particular scan queue specified by the IPP-SE URL. The value MUST NOT begin with a slash ("/"). The URL for the default 'ipp/scan' value would be:

```
ipp://<hostname>:<port>/ipp/scan
```

If a scanner supports multiple queues an "rs" value such as 'ipp/scan/queue123' would result in the URL:

```
ipp://<hostname>:<port>/ipp/scan/queue123
```

10.2.3 Scan2

This value of this key indicates if the Scan Service is capable of Push Scan and if so what URI schemes are supported to deliver the scan document data to its destination. The value is comma-delimited list of destination URI schemes supported by the Scan Service, including "ftp", "ftps", "http", "https", "ipp", "ipps", "mailto", and "smb". The value MUST contain the same values as reported by the "destination-uri-schemes-supported" attribute or be the empty string if Push Scanning is not supported. For example:

```
Scan2=ftp,http
```

10.2.4 TMA

This value is set to “T” if the scanner is equipped with a Transparency Media Adaptor (used for scanning slides and negatives), “F” if it is not. For example:

TMA=T

11. Conformance Requirements

This section summarizes the Conformance Requirements detailed in the definitions in this document for Scan Clients and Scan Service

11.1 Conformance Requirements for this Specification

11.1.1 Scan Service Conformance Requirements for this Specification

In order for a Scan Service to claim conformance to this specification a Scan Service MUST support the following:

1. The REQUIRED “printer-uri-supported” values defined in section 4.1.7,
2. The REQUIRED operations defined in sections 4.2 and 6,
3. The REQUIRED IPP Printer Description attributes and values defined in sections 4.3 and 8.3,
4. The REQUIRED operation attributes and values defined in sections 4.2 and 8.1,
5. The REQUIRED Job Template attributes and values defined in sections 4.6 and 8.2,
6. The REQUIRED Job Description attributes and values defined in section 4.7,
7. The REQUIRED Job Status attributes and values defined in section 0,
8. The REQUIRED document formats and behaviors defined in section 5,
9. The REQUIRED values defined in section 9,
10. The internationalization considerations in section 12, and
11. The security considerations in section 13.

11.1.2 Scan Client Conformance Requirements for this Specification

In order for a Scan Client to claim conformance to this specification an Scan Client MUST be able to supply or interpret following:

1. The REQUIRED “printer-uri-supported” values defined in section 4.1.7,
2. The REQUIRED operations defined in sections 4.2 and 6,
3. The REQUIRED IPP Printer Description attributes and values defined in sections 4.3 and 8.3,
4. The REQUIRED operation attributes and values defined in sections 4.2 and 8.1,
5. The REQUIRED Job Template attributes and values defined in sections 4.6 and 8.2,
6. The REQUIRED Job Description attributes and values defined in section 4.7,
7. The REQUIRED Job Status attributes and values defined in section 0,

8. The REQUIRED document formats and behaviors defined in section 5,
9. The REQUIRED values defined in section 9,
10. The internationalization considerations in section 12, and
11. The security considerations in section 13.

11.1.3 Conditional Conformance Requirements for Spooling IPP Scan Service

To claim conformance to this specification, Spooling Services MUST support the following:

1. Automatic retries and redelivery of whole jobs as defined in section 4.1.1
2. The “number-of-retries”, “retry-interval”, and “retry-time-out” Job Template attributes (section 4.6)
3. The “number-of-retries-default”, “retry-interval-default”, and “retry-time-out-default” IPP Printer Description attributes (section 8.3).
4. The “number-of-retries-supported”, “retry-interval-supported”, and “retry-time-out-supported” IPP Printer Description attributes (section 8.3).

11.1.4 Conditional Conformance Requirements for Streaming IPP Scan Client

To claim conformance to this specification, Streaming Clients MUST be responsible for handling Scan Job errors that prevent document delivery. It is implementation defined whether the Scan Job will be resubmitted or the End User informed of the failure.

12. Internationalization Considerations

For interoperability and basic support for multiple languages, conforming implementations MUST support:

1. The Universal Character Set (UCS) Transformation Format -- 8 bit (UTF-8) [STD63] encoding of Unicode [UNICODE] [ISO10646]; and
2. The Unicode Format for Network Interchange [RFC5198] which requires transmission of well-formed UTF-8 strings and recommends transmission of normalized UTF-8 strings in Normalization Form C (NFC) [UAX15].

Unicode NFC is defined as the result of performing Canonical Decomposition (into base characters and combining marks) followed by Canonical Composition (into canonical composed characters wherever Unicode has assigned them).

WARNING – Performing normalization on UTF-8 strings received from Scan Clients and subsequently storing the results (e.g., in IPP Scan Job objects) could cause false negatives in Scan Client searches and failed access (e.g., to Scan Services with percent-encoded UTF-8 URIs now 'hidden').

13. Security Considerations

The IPP extensions defined in this document require the same security considerations as defined in the IPP Model and Semantics [RFC2911] and in [PWG5108.02]. Note that credentials MUST be sent over a physically secure local interface or over an encrypted network connection.

14. IANA and PWG Considerations

14.1 Attribute Registrations

The attributes defined in this document will be published by IANA according to the procedures in IPP Model and Semantics [RFC2911] section 6.2 in the following file:

<http://www.iana.org/assignments/ipp-registrations>

The registry entries will contain the following information:

Operation attributes: -----	Reference -----
compression-accepted (1setOf type2 keyword)	[PWG5100.17]
destination-accesses (1setOf collection no-value)	[PWG5100.17]
access-oauth-token (1setOf octetString(MAX))	[PWG5100.17]
access-oauth-uri (uri)	[PWG5100.17]
access-password (text(MAX))	[PWG5100.17]
access-pin (text(MAX))	[PWG5100.17]
access-user-name (text(MAX))	[PWG5100.17]
access-x509-certificate (1setOf octetString(MAX))	[PWG5100.17]
document-data-get-interval (integer(0:MAX))	[PWG5100.17]
document-data-wait (boolean)	[PWG5100.17]
output-attributes (collection)	[PWG5100.17]
noise-removal (integer(0:100))	[PWG5100.17]
output-compression-quality-factor (integer(0:100))	[PWG5100.17]
 Document Description attributes: -----	 Reference -----
input-attributes-actual (collection)	[PWG5100.17]
output-attributes-actual (collection)	[PWG5100.17]
 Job Description attributes: -----	 Reference -----
output-attributes-actual (collection)	[PWG5100.17]
 Job Template attributes: -----	 Reference -----
destination-uris (1setOf uri)	[PWG5100.15]
destination-attributes (1setOf collection)	[PWG5100.17]
 Printer Description attributes: -----	 Reference -----
destination-accesses-supported (1setOf type2 keyword)	[PWG5100.17]
destination-uri-ready (1setOf collection)	[PWG5100.17]

```

destination-attributes (1setOf collection) [PWG5100.17]
destination-attributes-supported (1setOf type2 keyword) [PWG5100.17]
destination-info (text(MAX)) [PWG5100.17]
destination-is-directory (boolean) [PWG5100.17]
destination-mandatory-access-attributes
(1setOf type2 keyword) [PWG5100.17]
destination-name (name(MAX)) [PWG5100.17]
destination-oauth-scope (1setOf octetString(MAX)) [PWG5100.17]
destination-oauth-token (1setOf octetString(MAX)) [PWG5100.17]
destination-oauth-uri (uri) [PWG5100.17]
destination-uri (uri) [PWG5100.17]
job-destination-spooling-supported (type2 keyword) [PWG5100.17]
output-attributes-default (collection | no-value) [PWG5100.17]
output-attributes-supported (1setOf type2 keyword) [PWG5100.17]

```

14.2 Attribute Value Registrations

The keyword attribute values defined in this document will be published by IANA according to the procedures in the IPP Model and Semantics [RFC2911] section 6.1 in the following file:

<http://www.iana.org/assignments/ipp-registrations>

The registry entries will contain the following information:

Attributes (attribute syntax)	Reference
Keyword Attribute Value	-----
-----	-----
compression-accepted (1setOf type2 keyword)	[PWG5100.17]
< all compression values >	[PWG5100.17]
input-color-mode (type2 keyword)	[PWG5100.15]
monochrome_4	[PWG5100.17]
monochrome_8	[PWG5100.17]
monochrome_16	[PWG5100.17]
color_8	[PWG5100.17]
rgba_8	[PWG5100.17]
rgb_16	[PWG5100.17]
rgba_16	[PWG5100.17]
cmyk_8	[PWG5100.17]
cmyk_16	[PWG5100.17]
ipp-features-supported (1setOf type2 keyword)	[PWG5100.13]
scan	[PWG5100.17]
job-state-reasons (1setOf type2 keyword)	[RFC2911]
waiting-for-user-action	[PWG5100.17]

14.3 Type2 enum Attribute Value Registrations

The enumerations defined in this document will be published by IANA according to the procedures in the IPP Model and Semantics [RFC2911] section 6.2 in the following file:

<http://www.iana.org/assignments/ipp-registrations>

The registry entries will contain the following information:

Attributes (attribute syntax)		
Enum Value	Enum Symbolic Name	Reference
-----	-----	-----
operations-supported	(1setOf type2 enum)	[RFC2911]
0x004A	Get-Next-Document-Data	[PWG5100.17]

14.4 Operation Registrations

The operations defined in this document will be published by IANA according to the procedures in the IPP Model and Semantics [RFC2911] section 6.2 in the following file:

<http://www.iana.org/assignments/ipp-registrations>

The registry entries will contain the following information:

Operation Name	Reference
-----	-----
Get-Next-Document-Data	[PWG5100.17]
Create-Job (extension)	[PWG5100.17]

14.5 Semantic Model Registrations

Except as noted below, the IPP attributes, values, and operations defined in this specification and listed in the preceding sections will be added to the PWG Semantic Model XML schema using the method defined in section 21 of [PWG5108.07].

15. References

15.1 Normative References

- [BONJOUR] "Bonjour Printing Specification", Apple Computer Inc., July 10, 2013
<https://developer.apple.com/bonjour/printing-specification/bonjourprinting-1.2.pdf>
- [ECMA-388] "Open XML Paper Specification", ecma International, June 2009
<http://www.ecma-international.org/publications/standards/Ecma-388.htm>
- [ISO10646] "Information technology -- Universal Coded Character Set (UCS)", ISO/IEC 10646:2011
- [ISO32000] "Document management - Portable document format - Part 1: PDF 1.7", ISO/IEC 32000-2008
- [ITU-T81] CCITT (the International Telegraph and Telephone Consultative Committee), "INFORMATION TECHNOLOGY –DIGITAL COMPRESSION AND CODING OF CONTINUOUS-TONE STILL IMAGES – REQUIREMENTS AND GUIDELINES", T.81, September 1992, <http://www.w3.org/Graphics/JPEG/itu-t81.pdf>
- [PWG5100.3] K. Ocke, T. Hastings, "Internet Printing Protocol (IPP): Production Printing Attributes – Set1", PWG 5100.3-2001, February 2001, <ftp://ftp.pwg.org/pub/pwg/candidates/cs-ippprodprint10-20010212-5100.3.pdf>
- [PWG5100.5] D. Carney, T. Hastings, P. Zehler, "Standard for IPP Document Object", PWG 5100.5-2003, October 2003, <ftp://ftp.pwg.org/pub/pwg/candidates/cs-ippdocobject10-20031031-5100.5.pdf>
- [PWG5100.7] T. Hastings, P. Zehler, "Standard for The Internet Printing Protocol (IPP): Job Extensions", PWG 5100.7-2003, October 2003, <ftp://ftp.pwg.org/pub/pwg/candidates/cs-ippjobext10-20031031-5100.7.pdf>
- [PWG5100.9] I. McDonald, C. Whittle, "Internet Printing Protocol (IPP)/ Printer State Extensions v1.0", PWG 5100.9-2009, July 2009, <ftp://ftp.pwg.org/pub/pwg/candidates/cs-ippstate10-20090731-5100.9.pdf>
- [PWG5100.11] T. Hastings, D. Fullman, "IPP: Job and Printer Operations - Set 2", PWG 5100.11-2010, October 2010,

- <ftp://ftp.pwg.org/pub/pwg/candidates/cs-ippjobprinterext10-20101030-5100.11.pdf>
- [PWG5100.12] R. Bergman, H. Lewis, I. McDonald, M. Sweet, "IPP/2.0 Second Edition", PWG 5100.12-2011, February 2011, <ftp://www.pwg.org/pub/pwg/candidates/cs-ipp20-20110214-5100.12.pdf>
- [PWG5100.13] M. Sweet, I. McDonald, "IPP: Job and Printer Extensions - Set 3 (JPS3)", PWG 5100.13-2012, July 2012, <ftp://ftp.pwg.org/pub/pwg/candidates/cs-ippjobprinterext3v10-20120727-5100.13.pdf>
- [PWG5100.15] M. Sweet, "IPP FaxOut Service", PWG 5100.15-2013, November 2013, <http://ftp.pwg.org/pub/pwg/candidates/cs-ippfaxout10-20131115-5100.15.pdf>
- [PWG5102.4] M. Sweet, "PWG Raster Format", PWG 5102.4-2012, April 2012, <ftp://ftp.pwg.org/pub/pwg/candidates/cs-ipp raster10-20120420-5102.4.pdf>
- [PWG5107.3] I. McDonald, R. Bergman, "Printer MIB and IPP MFD Alerts (MFD Alerts)", PWG 5107.3-2012, June 2012, <ftp://ftp.pwg.org/pub/pwg/candidates/cs-pmpmfdalerts10-20120629-5107.3.pdf>
- [PWG5108.1] W. Wagner, P. Zehler, "MFD Model and Common Semantics", PWG 5108.1-2011, April 2011, <ftp://ftp.pwg.org/pub/pwg/candidates/cs-sm20-mfdmodel10-20110415-5108.1.pdf>
- [PWG5108.02] P. Zehler, N Chen, "Network Scan Service Semantic Model and Service Interface", PWG 5108.02-2011, April 2009, <ftp://ftp.pwg.org/pub/pwg/candidates/cs-sm20-scan10-20090410-5108.02.pdf>
- [PWG5108.07] P. Zehler, "PWG Print Job Ticket and Associated Capabilities Version 1.0", PWG 5108.07-2012, August 2012, <http://ftp.pwg.org/pub/pwg/candidates/cs-sm20-pjt10-20120801-5108.07.pdf>
- [RFC2518] Y. Goland, E. Whitehead, A. Faizi, S. Carter, D. Jensen, "HTTP Extensions for Distributed Authoring -- WEBDAV", RFC 2518, February 1999, <http://www.ietf.org/rfc/rfc2518.txt>
- [RFC2617] J. Franks, P. Hallam-Baker, J. Hostetler, S. Lawrence, P. Leach, A. Luotonen, L. Stewart, " HTTP Authentication: Basic and Digest Access Authentication", RFC 2617, June 1999, <http://www.ietf.org/rfc/rfc2617.txt>

- [RFC2911] T. Hastings, R. Herriot, R. deBry, S. Isaacson, P. Powell, "Internet Printing Protocol/1.1: Model and Semantics", RFC 2911, September 2000, <http://www.ietf.org/rfc/rfc2911.txt>
- [RFC3380] T. Hastings, R. Herriot, C. Kugler, H. Lewis, "Internet Printing Protocol (IPP): Job and Printer Set Operations", RFC 3380, September 2002, <http://www.ietf.org/rfc/rfc3380.txt>
- [RFC3382] R. deBry, R. Herriot, T. Hastings, K. Ocke, P. Zehler, "Internet Printing Protocol (IPP): The 'collection' attribute syntax", RFC 3382, September 2002, <http://www.ietf.org/rfc/rfc3382.txt>
- [RFC3805] R. Bergman, H. Lewis, I. McDonald, "Printer MIB v2", RFC 3805, June 2004, <http://www.ietf.org/rfc/rfc3805.txt>
- [RFC4918] L. Dusseault, "HTTP Extensions for Web Distributed Authoring and Versioning (WebDAV)", RFC 4918, June 2007, <http://www.ietf.org/rfc/rfc4918.txt>
- [RFC5198] J. Klensin, M. Padlipsky, "Unicode Format for Network Interchange", RFC 5198, March 2008, <http://www.ietf.org/rfc/rfc5198.txt>
- [RFC6068] M. Duerst, L. Masinter, J. Zawinski, "The 'mailto' URI Scheme", RFC 6068, October 2010, <http://www.ietf.org/rfc/rfc6068>
- [RFC6749] D. Hardt, "The OAuth 2.0 Authorization Framework", RFC 6749, October 2012, <http://www.ietf.org/rfc/rfc6749>
- [RFC7230] R. Fielding, J. Reschke, "HyperText Transfer Protocol -- HTTP/1.1: Message Syntax and Routing", RFC 7230, June 2014, <http://www.ietf.org/rfc/rfc7230.txt>
- [STD63] F. Yergeau, "UTF-8, a transformation format of ISO 10646", RFC 3629/STD 63, November 2003, <http://www.ietf.org/rfc/rfc3629.txt>
- [W3CJFIF] E. Hamilton, "JPEG File Interchange Format Version 1.02", September 1992, <http://www.w3.org/Graphics/JPEG/jfif3.pdf>

15.2 Informative References

- [IPPS] I. McDonald, M. Sweet, "IPP over HTTPS Transport Binding and 'ipps' URI Scheme", <http://tools.ietf.org/html/draft-mcdonald-ipps-uri-scheme>

16. Authors' Addresses

Peter Zehler
PARC - A Xerox Company
800 Phillips Rd
M/S 128-25E
Webster, NY 14580

Michael Sweet
Apple Inc.
1 Infinite Loop
M/S 111-HOMC
Cupertino CA 95014

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

Smith Kennedy (Hewlett Packard)
Andrew Mitchell (Hewlett Packard)
Ira McDonald (High North)