Proposed *Specification* of Objects/Attributes for the Printer Job Monitoring MIB/MIF

From: **Tom Hastings**

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File: **ftp-out.external.hp.com /snmpmib/jobs-mib/job-ext.doc, .ps, .psr, .txt**

This document proposes the *specification* of job and document MIB/MIB objects/attributes for a new MIB/MIF that may be used in a printer implementing RFC 1759 (Printer MIB) for the pruposes of providing some job and document information to management clients and accounting daemon programs.~~for job monitoring for a new MIB that is a companion to RFC 1759 (Printer MIB).~~ Optional objects are provided for implementing agents that monitor higher-end printers. However, objects that a spooling printer might need are not included. Another MIB/MIF for spooling printers and spoolers should be developed if desired, which would augment this MIB/MIF.

This specification lists all of the ISO DPA job and document attributes and copies the specification for the subset those DPA attributes that I propose for this printer job monitoring MIB/MIF~~extension~~. I've left the names of the ISO DPA attributes that we are not including in the MIB for reference purposes to show what ISO DPA attributes that we are *not* propsing to include in the MIB.

This proposal is for a printer job monitoring MIB. If monitoring job in a spooler is also wanted, it should be done in a separate MIB that augments this MIB. If management of jobs, such as cancelling or promoting jobs is also wanted, it should be a separate MIB that augments this MIB. Then the conformance claims to the printer job monitoring MIB and the job management MIB can be kept distinct, since some products will want to do just printer job monitoring and other products will want to do both.

Terminology

The following terms are used in this specification[1]:

A *job* is a data object instantiated by a *server* in response to one or more successful operations performed by a client on a service device object. The *client* is able to specify job attributes which control when and how the job is to be performed by the server. A job contains one or more *documents*.

A *document* is a data object that is contained in a job object and represents a set of related information that is identified by user's as a unit. The client is able to specify document attributes separately for each document in a job which control how the document is to be processed by the server. Sever implementation of more than one document per job is optional.

A *client* is a network entity that submits jobs to servers using some job submission print protocol. A client may be an end-user workstation or PC, or maybe a spooling system or supervisor control program that is controlling a printer.

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[1] Existing systems use conflicting terms, so these terms are drawn from the ISO 10175 Document Printing Application (DPA) standard. For example, PostScript systems use the term *session* for what we call a job in this paper and the term *job* to mean what we call a document in this paper. PJL systems use the term ...

A *server* is a network entity that accepts jobs from clients. A server may be a *printer*, a printer *supervisor* control program, or a print *spooler*.

A *printer* is a server that puts marks on media.

A *supervisor* is a server that contains a control program that controls a printer. A supervisor is a client to the printer.

A spooler is a server that accepts jobs, spools the data, and decides when and on which printer to print the job. A spooler is a client to a printer or a printer supervisor, depending on implementation.

An *agent* is a network entity that accepts SNMP operations from management stations.

A *management* station is a network entity that submits SNMP operations to agents.

An *attribute* is a name, value-pair that specifies an action, a status, or a condition in a job or a document object and in a DMTF MIF.

An *SNMP object* is a name, value-pair that specifies an action, a status, or a condition in an SNMP MIB.

The following diagram illustrates the relationships between the defined entities.

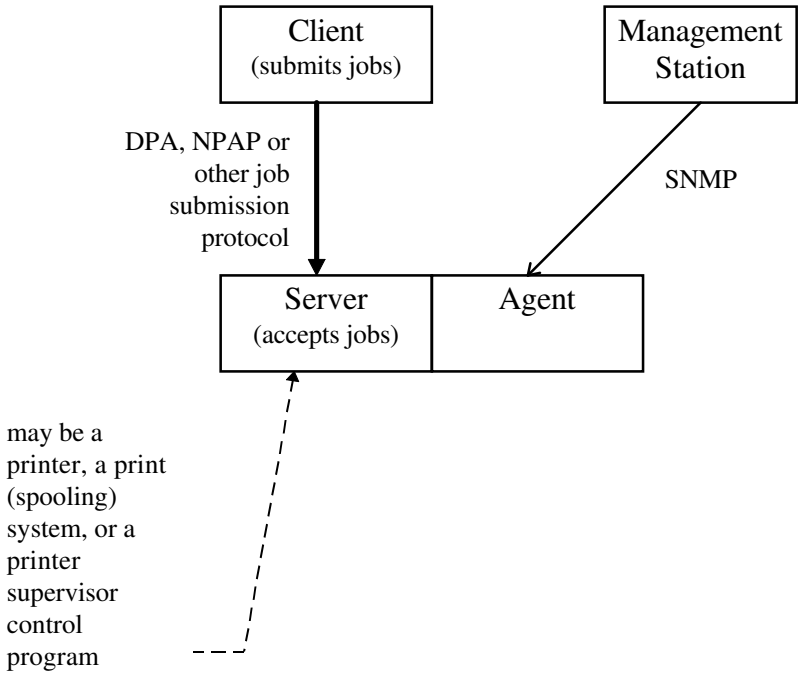
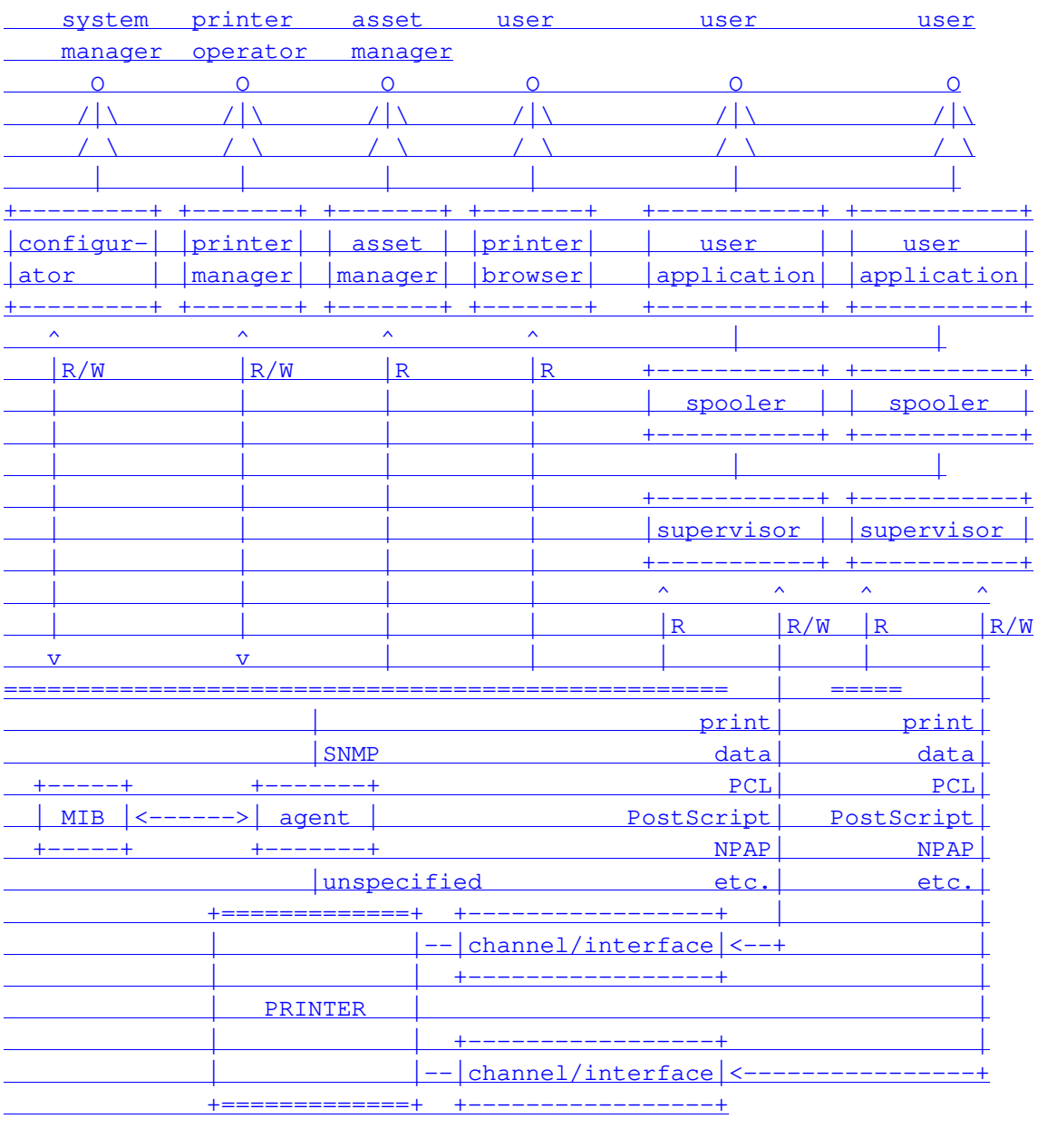


Figure 1 - One Printer's View of the Network (extracted from RFC 1759):



Goals

The goals for the printer job monitoring MIB/MIF~~extensions~~ are:

1. Provide a limited set (25) of *mandatory* job and document attributes for a printer, plus 31~~25~~ or so optional job and document attributes, *not* a complete set of job and document attributes that a high-end printer ~~spooling system~~ might provide. This mandatory and optional subset is intended to be used with printer devices that do not include spooling~~; the optional subset may be used with a printer that does include spooling or with a spooling system~~.

2. Provide for printers that can contain more than one job at a time, but still be usable for low end printers that only contain a single job at a time. In particular, meet the needs of Windows and other PC environments for managing low-end networked devices without unnecessary overhead or complexity, while also providing for higher end systems and devices. Since the job monitoring MIB will also be transformed into a companion DMTF MIF, the job monitoring MIB/MIF should meet the needs for managing devices using the DMTF DMI when the devices are directly connected to PCs.

3. Provide for job information after the printer has finished printing the job. This job information on completed jobs is intended to be used by:

    - management stations that provide job status to system operators that are remote from the printer
    - a management station that is co-located with the printer to privide an enhanced console capability
    - end user job monitoring programs that give end users status on progress and completion of jobs during the complete life cycle of the job, including for a period after the job completes
    - system accounting programs that copy the completed job statistics to an accounting system. Such accounting programs can copy the data for implementation on low-end printers that cannot rely on the print system to reliably write the accounting information when the job completes. It is recognized that depending on accounting programs to copy MIB data during the job-retention period is somewhat unreliable, since the accounting program may not be running (or may have crashed).
    - system usage statistics gaterhing programs that copy the completed job statistics to system usage logs

4. Provide a compatible subset of job and document attributes of the ISO DPA standard, so that coherence is maintained between the two protocols and information seen by end users and system operators. However, the printer job monitoring MIB is intended to be used with printers ~~and print systems~~ that implement other job submitting and management protocols, such as IEEE 1284.1 (NPAP), as well as with ones that do implement ISO DPA. So nothing in the printer job monitoring MIB shall require implementaion of the ISO DPA protocol.

5. Design this printer job monitoring MIB so that an addtional MIB can be specified in the future for monitoring multifunction (scan, FAX, copy) jobs. Design this job monitoring MIB so that the future multifunction job monitoring MIB is able to use entire groups fromaugment ~~(rather than supersede)~~ this MIB. ~~A subsidiary goal is for this job monitoring MIB to be designed so that the future multifuncton MIB can be used with scan systems that do not have a printer. So nothing in the job monitoring MIB requires implementation of the printer MIB (RFC 1759), if the device or system does not have a printer.~~

6. Solve the security policy problem that unauthorized users cannot access job information for jobs that are not theirs. Solving the security problem requires SNMP V2 security. However, this MIB is also intended to be used with SNMP V1 by prividing essor conformance requirements when implementing V1.

7. Do *not* provide for additional job management functions (job control functions), such as ModifyJob, CancelJob, PromoteJob, PauseJob, ResumeJob, InterruptJob. If these job control functions are desired, put them into a second job control MIB that augments this job monitoring MIB. Then the conformance to this printer job monitoring MIB is kept distict from the conformance to such a job control MIB, since some implementations may want to only do the printer job monitoring MIB and others may want to implement both. The

ITEF/DMTF Printer Working Group (PWG) may wish to develop both MIBs in parallel. However, this document refers only to the printer job monitoring MIB.

8. Provide for monitoring of jobs that clients submit (1) directly to printers (end user clients, printer supervisor control programs, or spooling print systems acting as clients) ~~and (2) to spooling print systems. Thus the problem of multiple client-server relationships that can exist in some print scenarios must be provided for. Fortunately, the ISO DPA provides job attributes for submission and monitoring such cascaded job scenarios.~~

9. Provide SNMP MIB access to jobs submitted to the printer ~~or print system~~ by any protocol, including printers ~~and print systems~~ that accept jobs using multiple protocols.

10. Only provide objects that are of interest to system operators and system managers. Implication: Do *not* need to include some objects that ISO DPA has corresponding attributes that are required for ISO DPA level 1 or level 2 conformance. Also include some attributes in the printer job monitoring MIB that are *not* ISO DPA level 1 or level 2 conformance requirements, if they are of particular use and importance to system operators and system administrators for monitoring jobs or for accounting. Note: the tables have been expanded to include a column that indicates the level of conformance requirements in ISO DPA.

Listing of job and document attributes

~~The DPA Datatype column indicates the data type of the ISO DPA attribute, using the following abbrievations:~~

~~A(255)~~	~~ASCII 255 octets maximum~~
~~T(4095)~~	~~Text (of 4095 octets maximum length). Tagged to be one of four standard coded character sets: (1) ASCII, (2) ISO Latin1, (3) T.61, or (4) Unicode - UCS-2.~~
~~Cardinal~~	~~32-bit **Cardinal**~~
~~Cardinal64~~	~~64-bit **Cardinal**~~
~~PosInt~~	~~32-bit **PositiveInteger**~~
~~NameOrOid~~	~~**NameOrOID**~~
~~Oid~~	~~**ObjectIdentifier**~~
~~GenTime~~	~~**GeneralizedTime**~~
~~O(255)~~	~~**OctetString**(of 255 octets maximum length).~~
~~NameOrOid/PosInt~~	~~**NameOrOid** and **PositiveInteger** pairs~~
~~MediumDimensions~~	~~2 **Reals**~~

The MIB/MIF Datatype column shows the corresponding data type for the MIB/MIF object/attribute ~~(object)~~.

A(255)	DisplayString (ASCII) 255 octets maximum
I(255)	**InternationalDisplayString** of 255 octets maximum, localized as specified by the GenCurrentLocalizationIndex. See General MIB (file: gen.doc, .ps, .txt) and the General textual conventions (file: gentc.doc, .ps, .txt).
T(255)	A single Text (maximum of 255 octets) attribute specified as CodeIndexedStringIndex, e.g., in one of the coded character sets that the server supports. See General MIB (file: gen.doc, .ps, .txt) and General MIB textual-conventions (file: gentc.doc, .ps, .txt). The server may store the

attributes in the coded character set supplied by the client when the job was submitted, or the server may convert the coded character set to one of the other coded character sets that the server supports.~~an OCTET STRING. Because ISO DPA permits any of four tagged coded character sets: ASCII, ISO Latin1, T.61, and Unicode to be sent from the client to the server or returned from the server to the client, the corresponding MIB text attributes are specified as an OCTET STRING, so that the client can request which of the four ISO DPA standard representations to be returned (analoguous to the ISO DPA client requesting the **operation-locale** in the **CommonArguments** of each ISO DPA operation).~~

~~NOTE 1 - An agent need not store the text data four times, but may code convert from its internal representation required by the attribute specfied by the GeneralCurrentLocalization object in the jobs General group. Code conversion of the character repertoire of ASCII between the four representations is easy.~~

NOTE 12 -Code conversion from the character repertoire of ISO Latin 1 to Unicode representation is easy (add a leading zero octet). However, code conversion from Unicode to ASCII or Latin1 when there are characters outside the repertoire of the destination coded character set is harder. Alternatives:

1. Return the characters that the server cannot represent in the requested coded character set using a closely related character, such as the unaccented latin letter, or some error condition such as * or ? for those characters that don't have obvious closely related characters.
2. Don't return anything; make the client request one of the other coded character representations (by writing a different value into the xcmGeneralCurrentCodedCharSet object).
3. Convert Unicode into the two character mnemonic representation contained in RFC 1345 which has a two character ASCII representation for all characters of Unicode Do the same for conversion of ISO Latin1 into ASCII. For example, RFC 1345 represents LATIN SMALL LETTER A WITH ACUTE as a' and MICRO SIGN as My.
4. RFC 1345 was designed for use by software and implementors and, therefore, avoids the use of so-called national-use characters (ACCENT GRAVE (`), CIRCUMFLEX ACCENT (^), TILDE (~). This fourth alternative is to use better two-character approximations than those in RFC 1345 that would be recognized by end-users without special training and would use the obvious national-use characters I such approximations.

O(255)	**OctetString**(of 255 octets maximum length).
Cardinal	32-bit **Cardinal** - but don't use the sign bit to avoid implementation problems with signed vs. unsigned representation.
Cardinal64	64-bit **Cardinal** - but don't use the sign bit to avoid implementation problems with signed vs. unsigned representation.
Ordinal32~~PosInt~~	32-bit **Ordinal~~PositiveInteger~~** - but don't use the sign bit to avoid implementation problems with signed vs. unsigned representation.
Ordinal16	16-bit **Ordinal** - but don't use the sign bit to avoid implementation problems with signed vs. unsigned representation.
DateAndTime	**DateAndTime** from SNMPv2 textual-conventions

index	index into another table
enum	enumerated data type
bit-vector	32-bit integer with each bit being significant

Listing of job attributes

The jobs table is like the alerts table, in that the printer (SNMP agent) adds jobs to the end of the table as the jobs are submitted to the printer and removes jobs from the beginning of the table when they have exceeded the time that completed jobs remain in the table. The job table is indexed by the **hrDeviceIndex** and the **job-identifier** generated by the server when the server accepted the job.

The following tables *lists* all the ISO DPA job and document attributes from the table of contents of the Final Text, dated May 1995 and copies the specification from ISO DPA only for the *subset* of those ISO DPA attribute are being proposed for the Printer Job Monitoring MIB/MIF and the spooler job monitoring MIB/MIF:

Legend

Column Heading	Description
Section	The section number in the ISO DPA standard that describes the attribute that corresponds to the object. A blank section number indicates an object that doesn't have a corresponding ISO DPA attribute. PSIS indicates that the attribute is specified by the X/Open Print Systems Interoperability Specification (PSIS) draft standard.
MIB	Indicates which MIF/MIB the attribute/object is intended: **P**: printer job monitoring MIF/MIB **S**: spooling job monitoring MIF/MIB (future) **<blank>**: not proposed for either MIF/MIB
M/O	Proposed conformance for the job monitoring MIB: **M**: mandatory ~~**C**: conditionally mandatory if implementing a (spooling) print service (as opposed to a printer)~~ **O**: optional **<blank>**: proposed *not* to be included in the either the printer or the spooling job monitoring MIB
E	**E** indicates an event - generates a trap when the value changes
MIB Datatype	Proposed datatype for the MIB object
Attribute	Name of the corresponding ISO DPA attribute
page no	Page number of the ISO DPA attribute specification. A blank page number indicates that this object does not have a corresponding ISO DPA attribute

The following general group contains a single object to control localization of job attributes for all jobs:

Section	MIB	M/O	E	MIB/MIF Datatype	Attribute	page no
	P	M		Ordinal16 ~~Integer32~~	GeneralCurrentLocalization The value of the GenLocalizationIndex corresponding to the current language, country, and character set which shall be used for all objects of type **InternationalDisplayString** in all current and future MIBs. See the **GenCurrentLocalizationIndex**	

					object in the General MIB and the explanation in the General MIB textual conventions.[2] **Note** - the Printer MIB has a similar mechanism which controls only objects (of type **OCTET STRING**) which are in the Printer MIB.	

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Section	MIB	M/O	E	MIB/MIF Datatype	Attribute	page no
9.2.1					*job information attributes:*	104
9.2.1.1	P	M		A(255)	Job-identifier This attribute provides the job-identifier for this job on the server. The server shall generate a job-identifier value that is unique on that server, but need not be unique across the distributed environment. The value of the **job-identifier** attribute shall be returned by the server as part of the **PrintResult** in the first Print operation for the job (see 8.2.1). The client shall pass its value as part of the **PrintArgument** in subsequent Print operations for the same job.	104
9.2.1.2	P?	O?		A(255)	Job-identifier-on-printer This attribute provides the job-identifier for this job to uniquely identify it on the printer or next server downstream, and it shall be assigned by that printer or server. The value of the **job-identifier-on-printer** attribute shall be the job-identifier that the printer or the next server downstream generates at the time the server submits the job to the printer or the next server downstream. If the printer or the next server downstream does not generate its own job identifier, the server shall leave the value of this attribute unspecified. NOTE – This attribute is intended for jobs submitted to other servers, such as a gateway to a legacy server, or to printers which have their own internal queue and assign their own job identifiers.	104
9.2.1.3	P	O ~~M~~		A(255)	Job-identifier-on-client This attribute provides the job-identifier for this job to uniquely identify the job on the client submitting the job, and the value shall be assigned by that client. The client shall supply the value of the **job-identifier-on-client** attribute at the time that the client submits the job to the server, if such client has its own job-identifier for the job. NOTE – This attribute is intended for jobs submitted from legacy servers which have their own job-identifier for the job. If a job passes through a chain of servers between the client	104

[2] The General MIB is in files: gen.doc, .txt, .ps and the General MIB textual conventions is in the files: gentc.doc, .txt, .ps in the ftp server: ftp-out.external.hp.com/snmpmib/jobs-mib/

					initiating the job and the output device, the value of the job attribute **job-identifier-on-client** shall be the value of the job's **job-identifier** on the immediate upstream server and the value of the job attribute **job-identifier-on-printer** shall be the value of the job's **job-identifier** on the immediate downstream server or printer. NOTE – A job has attributes for identifying itself on the current server, on the immediate upstream server (where the job came from), and on the immediate downstream server or printer (where the job went). These attributes are **job-identifier**, **job-identifier-on-client,** and **job-identifier-on-printer**, respectively.	
9.2.1.4	P	M		T(255)	Job-client-id This attribute supplies a human-readable descriptor for the job. This descriptor may be printed by the server on auxiliary sheets to help identify the user's printed output, and discriminate between different jobs. Use and treatment of this attribute is implementation and site specific. If the client specifies the value of the job attribute **job-client-id**, no server shall change it. If the client does not specify the value of the job attribute **job-client-id**, the first server shall set it to the value of the job attribute **job-identifier**, so that no downstream server shall change it. These rules ensure that if an implementation prints the value of the **job-client-id** on an auxiliary sheet, it has a value that is meaningful to the client originally submitting the job, no matter how many servers the job passes through. For example, client A submits a job to server B and does not specify a value for the job attribute **job-client-id**. Server B assigns a **job-identifier** of **123** to the job, and forwards this job to server C. Server C assigns a **job-identifier** of **456** to the job and forwards this job to printer D. Printer D is not a DPA server, but it has its own queue and assigns a job-id of **789** to the job. The following table shows the value of the relevant job attributes in the two servers B and C:	105

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	job-client-id	job-identifier-on-client	job-identifier	job-identifier-on-printer
server B	123	unspecified	123	456
server C	123	123	456	789*

184 * If printer D did not assign a job-id to its jobs, then the value of the
185 job attribute **job-identifier-on-printer** for server C would be
186 unspecified.

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Section	MIB	M/O	E	MIB/MIF Datatype	Attribute	page no
9.2.1.5	P	M		T(255)	Job-name	105

					This attribute supplies a human readable string for the print-job. This string is used for naming the print-job in human-readable "free-form" fashion. This attribute is intended for enabling a user or the user's application to convey a job name that may be printed on a start sheet, returned in a ListObjectAttributes result, or used in notification or logging messages. If this attribute is not specified, no job name is assumed, but implementation specific defaults are allowed, such as the value of the **document-name** attribute of the first document in the job.	
9.2.1.6	P	M		T(255)	Job-originator This attribute supplies the name of the human or programmatic originator of the print-job. If this attribute is not specified, no value for job originator is assumed, but implementation specific defaults are allowed. NOTE – This attribute may be different from **job-owner** (1) when a program submits the print-job on behalf of a user or (2) when an operator must resubmit a misprinted job on behalf of the original job owner. However, an operation to resubmit a print-job is outside the scope of this part of ISO/IEC 10175.	106
9.2.1.7	P	O ~~M~~		T(255)	Job-owner This attribute supplies the name of the human owner of the print-job. The value of **job-owner** will often be the same as **job-originator**. The **job-owner** will be different from **job-originator** when the job has been submitted by the originator on behalf of the owner. This attribute is not to take the place of the security parameters or the access-and-accounting attributes. If this attribute is not specified, the value of **user-name** or **job-originator** should be used for any circumstances which require a value for **job-owner**.	106
9.2.1.8	P	O		T(255)	Job-comment This attribute supplies an arbitrary human-readable text string associated with the print-job. This attribute is intended for enabling a user to convey a text string that may be printed on a job start sheet, for example, in an implementation-dependent manner.	106
9.2.1.9					Job-start-message	106
9.2.1.10					Job-end-message	107
9.2.1.11					Job-non-compulsory-attributes	107
9.2.1.12					Initial-value-job	107
	S	M		Oid~~enum~~	Job-s~~S~~ource-~~job-~~type This attribute specifies the type of the source of this job. The following standard values are defined:	

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Descriptive Name	Object Identifier	Descriptor Text

scanner	id-val-source-scanner	The source of this job is a scanner, e.g., this job was created at the scanner by an operator selecting a job template for the scan job.
document-pository	id-val-source-document-repository	The source of this job is a document-repository, e.g., a client submitted this job using the Print operation.
fax	id-val-source-fax	The source of this job is from an input FAX, e.g., this job was created in response to a FAX receiving device, which is typically dial-in.
e-mail	id-val-source-e-mail	The source of this job is from electronic mail.

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Section	MIB	M/O	E	MIB/MIF Datatype	Attribute	page no
	S	M		Oid~~enum~~	Job-d~~D~~estination~~-job~~-type This attribute specifies the type of the destination of this job. The following standard values are defined:	

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Descriptive Name	Object Identifier	Descriptor Text
printer	id-val-destination-printer	The destination of this job is a printer, e.g., the output device is a printer that puts marks on a medium using a PDL interpreter.
document-repository	id-val-destination-repository	The destination of this job is a document repository, e.g., the results of this (scan or FAX) job is a set of document files, one for each document in the job.
fax	id-val-destination-fax	The destination of this job is an output FAX, e.g., this job is being sent using a FAX sending device, which is typically dial-out.
e-mail	id-val-destination-e-mail	The destination of this job is electronic mail.
distribute-list	id-val-destination-distribution-list	The destination of this job is specified by a distribution list.

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Section	MIB	M/O	E	MIB/MIF Datatype	Attribute	page no

	P	M		PrtChannelType	The type of channel of the source of the print job, e.g., chSerialPort(3), chParallelPort(4), ... , chNPAP(33). See RFC 1759.[3]	
	P	M		PrtChannelType	The type of channel of the destination of the print job, e.g., chSerialPort(3), chParallelPort(4), ... , chNPAP(33). See RFC 1759.	
	P	M		CodedCharSet	The coded character set that the submitting client used to encode text attributes (IANA MIBenum character set number values). See RFC 1759 for the CodedCharSet textual convention.	

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9.2.2					*Job-results-handling attributes:*	108
9.2.2.1					Results-profile	108
9.2.2.1	S	M		Ordinal32~~PosInt~~	number-of-job-sets The hardcopy output of a print-job consists of one or more *job sets*, each of which may be specified to be delivered to, or held for, one particular recipient who is not necessarily the job creator. Each job set may be specified to contain one or more *job copies*. Each job copy shall contain one or more copies of each of the documents specified by means of the Print operations that compose the job.	
9.2.2.1	P	M		Ordinal32~~PosInt~~	job-copies Total number of job copies in the job, i.e., number of job copies summed across the job-result-sets. NOTE - In ISO DPA, job-copies is a separate value for each job result set, not the summation. But it didnt seem worth the effort to make job-copies a table,	108
9.2.2.1	P	O		index32[4]	output-bin Special MIB definition: specifies the index of the output subunit table for the job. A 0 value indicates that the job does not specify an output-bin. NOTE - ISO DPA allows the output-bin to be specified diferrently for each job result set in a job. However, it doesnt seem worth the effort to make output-bin a table, since multiple job-result-sets is an unlikely feature to be supported and/or used, especially with different output-bins.	110
9.2.2.2					Job-finishing	111
9.2.2.3					Finishing-includes-job-sheets	111
9.2.2.4					Job-sheets	112
9.2.2.5					Document-sheets	112

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9.2.3					*Job-event-handling attributes:*	112

[3] RFC 1759 does not have a tectual convention for PrtChannelType, so that the job monitoring MIB is not able to import these enum definitions from the Printer MIB. I propose that when we progress the Printer MIB to draft standart status that we create a PrtChannelType textual convention in the Printer MIB, so that the job monitoring MIB can import PrtChannelType.

[4] The index for output-bin could be changed from index32 to index16, if a (1..65535) limit was put on prtOutputIndex in RFC 1579 as has been done with prtInputIndex.

9.2.3.1					Job-abort-criteria	113
9.2.3.2					Job-warning-criteria	113
9.2.3.3					Document-abort-criteria	114

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9.2.4					*Job-scheduling-instruction attributes:*	114
9.2.4.1					Job-start-wait	114
9.2.4.2					Job-end-wait	114
9.2.4.3					Job-hold	115
9.2.4.4					Job-password	115
9.2.4.5	S	M ~~O~~		GenTime	Job-print-after This attribute specifies the calendar date and time of day after which the print-job shall become a candidate to be scheduled for printing. If the value of this attribute is in the future, the server shall set the value of the job's **current-job-state** to **held** and add the **job-print-after-specified** value to the job's **job-state-reasons** attribute and shall not schedule the print-job for printing until the specified date and time has passed. When the specified date and time arrives, the server shall remove the **job-print-after-specified** value from the job's **job-state-reason** attribute and, if no other reasons remain, shall change the job's **current-job-state** to **pending** so that the job becomes a candidate for being scheduled on printer(s). The server shall assign an empty value (see 9.1.2) to the **job-print-after** attribute when no print after time has been assigned, so that the job shall be a candidate for scheduling immediately.	116
9.2.4.6	S	O	E	Int(1..100)	Job-priority This attribute specifies a priority for scheduling the print-job. It is used by servers that employ a priority-based scheduling algorithm. A higher value specifies a higher priority. The value **1** is defined to indicate the lowest possible priority (a job which a priority-based scheduling algorithm shall pass over in favour of higher priority jobs). The value **100** is defined to indicate the highest possible priority. Priority is expected to be evenly or 'normally' distributed across this range. The mapping of vendor-defined priority over this range is implementation-specific. The omission of this attribute implies that the user places no constraints concerning priority on the scheduling of the print-job.	116
9.2.4.7	S	O		DateAndTime	Job-deadline-time This attribute specifies the calendar date and time of day by which the user desires the print-job to be completed. This attribute is treated as a scheduling hint only. If the specified deadline time arrives before completion of the job, the server shall generate the **error-past-deadline** event for the job, but the current-job-state shall not be changed. This attribute is intended for use by servers that implement some form of deadline scheduling. The server shall assign an empty value (see 9.1.2) to the **job-deadline-time** attribute when there is no deadline for the job.	116

9.2.4.8	S	O		DateAndTime	Job-discard-time This attribute specifies the calendar date and time of day at which the print-job should be discarded, whether or not the job has printed. If this attribute is supported and the discard time has not arrived, the server shall retain job and document attributes and status; the server is not required to retain job document files if the job has completed processing and has exceeded the job's **job-retention-period**. When the **job-discard-time** arrives, the server shall set the job's **job-retention-period** to zero and shall perform a CancelJob operation on the specified job. Whether or not the print-job is discarded if the **error-past-discard** event occurs while the job is being printed is implementation-dependent. The server shall assign an empty value (see 9.1.2) to the **job-discard-time** attribute when there is no discard time for the job.	117
9.2.4.9	S	M		DeltaTime	Job-retention-period This attribute specifies the minimum period of time following the completion of job processing and printing that the server shall keep job attributes, document attributes, and document data. The server may keep these attributes and data longer than the value of the **job-retention-period** attribute. **Job-retention-period** specifies a lower bound on how long job attributes, document attributes and document data shall be retained by a server after printing has completed, whilst **job-discard-time** sets an upper bound on retention of the job and document attributes independent of whether the job is ever scheduled for, starts or completes printing. In addition to providing status information to a user after a job has completed printing, the **job-retention-period** also provides the mechanism for retaining job's document data after it has been printed, so that the job may be printed again, possibly with modified attributes, such as the **job-copies** component of the **job-results** attribute. However, the mechanism to reprint the job is outside the scope of this part of ISO/IEC 10175.	117
9.2.4.10	S	O		T(255)	Job-message-to-operator This attribute carries a message from the user to the operator to indicate something about the processing of this print-job. This message, unlike the **job-start-message,** is not necessarily related to other job-scheduling attributes. The server shall make this message available to the operator when the job has been accepted.	117
9.2.4.11					Job-scheduling	117
9.2.4.12					Job-validate	118

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9.2.5					*Printer-selection attributes:*	118
9.2.5.1	S	M ~~O~~		T(255)	Printer-name-requested This attribute identifies the printer to be used for printing the	118

					job. The client shall specify the value of this attribute with the first invocation of the **Print** operation for the print-job as the explicit **printer-name** component of the **PrintArgument**, rather than as an attribute (see 8.2.1.1). NOTES 1 To cause a server to select a printer according to other attributes, the system administrator should define a logical printer that supports ALL of the physical printers supported by the server. 2 For the server that supports only a single printer, the logical printer name may be the same as the server name, as long as they cannot be confused for each other in the name service directory. 3 Initial-value-job objects should have the value of their **printer-name-requested** attribute specified as an empty value in order to indicate that no printer-name is defaulted.	
9.2.5.2					Physical-printers-requested	119
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9.2.5.4					Printer-models-requested	119
9.2.5.5					Printer-types-requested	119
9.2.5.6					Printer-speed-range-requested	120

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9.2.6					*Access-and-accounting attributes:*	120
9.2.6.1	P	M ~~O~~		T(255)	User-name This attribute specifies the name of the user requesting access to print service operations. The usage of this attribute may be mandatory, depending upon the local security policy used.	120
9.2.6.2	P	M ~~O~~		O(255)	Accounting-information This attribute specifies information required by accounting services (e.g. the account to be charged for any services rendered). Accounting information is intended to be interpreted by an accounting system, and may be opaque to the print service.	120

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9.2.7					*Job-security-handling attributes:*	120
9.2.7.1					Job-security-confidentiality-level	121
9.2.7.2					Job-security-confidentiality-category	122
9.2.7.3					Job-security-confidentiality-policy	122
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9.2.7.7					Job-security-label	124

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9.2.8					*Job-status attributes:*	124
9.2.8.1	P	M	E	DPAJobState ~~enum~~	Current-job-state	124

					This attribute identifies the current state of the job (pending, printing, held, etc.) The following job state standard values are defined:	

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Descriptive Name	Object Identifier	Descriptor Text
unknown	id-val-job-state-unknown	The job state is not known, or is indeterminate, or is not returned by the operation.
pre-processing	id-val-job-state-pre-processing	The job has been created on the server by the **create-job** sub-operation of the Print request, but a Print request with a **TRUE** value for the **job-submission-complete** component of the PrintArgument has not yet been received and no document has started processing. The job maybe in the process of being checked by the server for attributes, defaults being applied, a printer being selected, etc.
held	id-val-job-state-held	The job is waiting to be released for scheduling for any number of reasons as specified by the value of the job's **job-state-reasons** attribute.
pending	id-val-job-state-pending	The job's **job-submission-complete** attribute is **TRUE** since the server has received a Print request with the **job-submission-complete** parameter **TRUE** and the job is waiting to start processing on a printer.
processing	id-val-job-state-processing	The server is processing the job, or has made the job ready for printing, but the output device is not yet printing it, either because the job hasn't reached the output device or because the job is queued in the output device or some other spooler, awaiting the output device to print it.
printing	id-val-job-state-printing	The server has completed processing the job and the output device is currently printing the job on at least one printer. That is, a print engine is either printing pages of the job, or failing in its attempt to print pages of the job because of some wait state, such as, start-wait, end-wait, needs-attention, etc. The complete job state includes the detailed status represented in the printers' **printer-state** attribute(s).
paused	id-val-job-state-paused	The job has been paused as a result of a PauseJob operation.
interrupted	id-val-job-state-interrupted	The job was interrupted by the InterruptJob request for an intervening job, and shall resume processing automatically once the intervening job has completed.
terminating	id-val-job-state-terminating	The job has been cancelled by a CancelJob request or aborted by the server and is in the process of terminating. The job's **job-state-reasons** attribute contains the reasons that the job is being terminated.

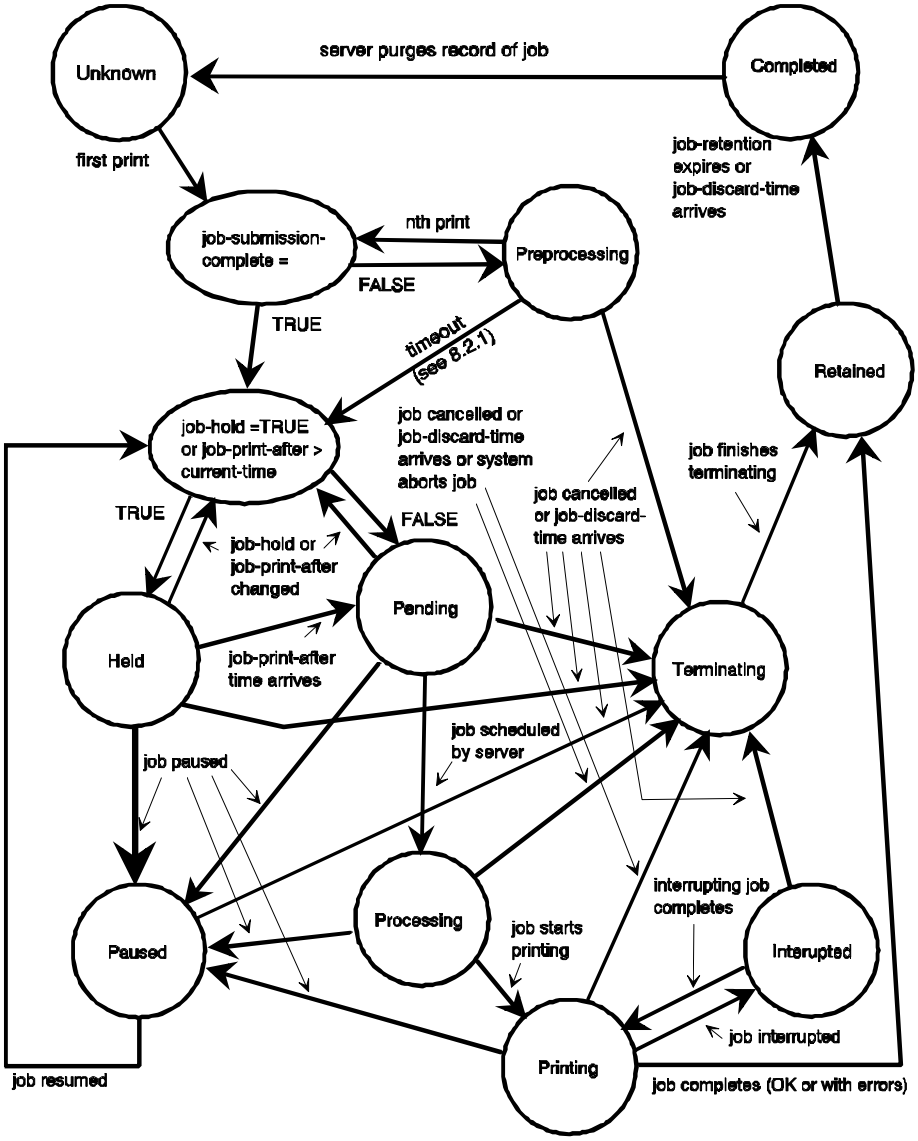
retained	id-val-job-state-retained	The job is being retained at the server as a result of the job's **job-retention-period** being non-zero. The job has (1) completed successfully or with warnings or errors, (2) been aborted while printing by the server, or (3) been cancelled by the CancelJob request before or during processing. The job's **job-state-reasons** attribute contains the reasons that the job has been retained. While in the retained state, all of the job's document data (and resources, if any) shall be retained by the server; thus a job in the **retained** state could be reprinted, using some means outside the scope of ISO/IEC 10175-Part 1.
completed	id-val-job-state-completed	The job has: (1) completed successfully or with warnings or errors, (2) been aborted by the server while printing, or (3) been cancelled by the **CancelJob** request, AND the job's: (1) **job-retention-period** was zero or has expired, or (2) **job-discard-time** has arrived. The job's **job-state-reasons** attribute contains the reason(s) that the job has been completed. While in the **completed** state, a job's document data (and resources if any) need not be retained by the server; thus a job in the **completed** state could not be reprinted. The length of time that a job may be in this state, before transitioning to **unknown**, is implementation-dependent. However, servers that implement the **completed** job-state shall retain, as a minimum, the following attributes for any job in the completed state: **job-identifier**, **job-owner**, **job-name**, **current-job-state**, **printers-assigned**, and **job-state-reasons**.

Print clients and DP-Servers shall be prepared to receive all the standard job states. DP-Servers are not required to generate all job states, only those which are appropriate for the particular implementation.

If a server implementation or policy is to start processing documents before the last Print request (with a **TRUE** value for the **job-submission-complete** parameter) and the value of the job's **job-scheduling** attribute is not **after-complete**, the server shall change the job's **current-job-state** from **pre-processing** directly to the **processing** state when the server begins processing any of the job's documents.

9.2.8.1.1 Job state transition

The legal job state transitions are shown in the state transition diagram presented in Figure 9-1.



208 **Figure 9-1 - Job state transition diagram**

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Section	MIB	M/O	E	MIB/MIF Datatype	Attribute	page no
9.2.8.2	P	M	E	bit-vector	Job-state-reasons This attribute identifies the reason or reasons that the job is in the **held, terminating**, **retained**, or **completed** state. The server shall indicate the particular reason(s) by setting the value of the **job-state-reasons** attribute. When the job is not in any of these states, the server shall set the value of the **job-state-reasons**	127

					attribute to the empty set. The following standard values are defined:	

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Descriptive Name	Object Identifier	Descriptor Text
documents-needed	id-val-reasons-documents-needed	The complete job has been accepted by the server (the value of the **job-submission-complete** element was **TRUE** in the last Print request for the job), but the server is waiting for its files to start and/or finish being transferred before the job can be scheduled to be printed.
job-hold-set	id-val-reasons-job-hold-set	The value of the job's **job-hold** attribute is **TRUE**.
job-print-after-specified	id-val-reasons-job-print-after-specified	The value of the job's **job-print-after** attribute has specified a time specification that has not yet occurred.
required-resources-not-ready	id-val-reasons-required-resources-not-ready	At least one of the resources needed by the job, such as media, fonts, resource objects, etc., is not ready on any of the physical printer's for which the job is a candidate.
successful completion	id-val-reasons-successful completion	The job completed successfully.
completed-with-warnings	id-val-reasons-completed-with-warnings	The job completed with warnings.
completed-with-errors	id-val-reasons-completed-with-errors	The job completed with errors (and possibly warnings too).
cancelled-by-user	id-val-reasons-cancelled-by-user	The job was cancelled by the user using the CancelJob request.
cancelled-by-operator	id-val-reasons-cancelled-by-operator	The job was cancelled by the operator using the CancelJob request.
aborted-by-system	id-val-reasons-aborted-by-system	The job was aborted by the system.
logfile-pending	id-val-reasons-logfile-pending	The job's logfile is pending file transfer.
logfile-transferring	id-val-reasons-logfile-transferring	The job's logfile is being transferred.

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Section	MIB	M/O	E	MIB/MIF Datatype	Attribute	page no
9.2.8.3	P	M		DPAJobState	Previous-job-state This attribute identifies the state of the job (pending, printing, held, etc.) before the last change of job state. Standard values are defined in the specification for the	128

					current-job-state job-status attribute.	
9.2.8.4	S	M		hrDeviceIndex	Devices~~Printers~~-assigned[5] This attribute identifies the physical device or devices to which this job has been assigned, if any. When the job is first submitted and the server has not yet assigned any devices to the job, the **SEQUENCE** shall be empty. If the server intends to use a single device for the job, and the server has assigned a device to the job, the **SEQUENCE** shall contain just that device. If a server has split the job into multiple pieces and assigned each piece to a different device, the **SEQUENCE** shall contain n elements, one for each assigned device. A job with multiple job-result-sets is an example of a job that would be easy to split into multiple pieces. A **SEQUENCE** with no elements shall be returned if this attribute is supported, but this job has not yet been assigned to any physical device. The number of elements in the **SEQUENCE** for this attribute shall be the same as the number of elements in the **SEQUENCE** for the associated job attribute **device-state-of-devices-assigned**. In addition, the *i*th element of each of this associated attributes shall be a value that pertains to the printer named by the *i*th element of **devices-assigned**. The **devices-assigned** value shall not be the same as the printer requested by the user if the job's **printer-name-requested** attribute specified a logical printer that supports one or more different physical printers. The **devices-assigned** value might differ also if the job has been re-assigned by an operator to ensure successful completion of the job, allowing the user to find out where a job has been re-assigned (when necessary). The value of the job's **devices-assigned** attribute shall remain after the job has completed, so that users can determine the physical devices(s) on which the job was printed.	128
9.2.8.5	S	M	E ~~?~~	enum	Devices~~Printer~~-state-of-Devices~~printers~~-assigned[6] This attribute identifies the current state of each assigned printer. This attribute gives the client access to information within each assigned printer. Because this attribute contains a value that is updated within the printer, the server may choose to update the value of this attribute only when a client queries its value.	129

[5] The ISO DPA attribute (printers-assigned) is proposed to be generalized in the MIB to be devices-assigned, so that it may be used with other types of devices, since it is multivalued, i.e., a table.

[6] The ISO DPA attribute (printer-state-of-printers-assigned) is proposed to be generalized in the MIB to be device-state-of-devices-assigned, so that it may be used with other types of devices, since it is multi-valued, i.e., a table.

					See the **printers-assigned** attribute for the correspondence between elements of this attribute and those of **printers-assigned**. Standard values are define in the specification for the **printer-state** printer attribute, as follows:.	

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Descriptive Name	Object Identifier	Descriptor Text
unknown	id-val-printer-state-unknown	The printer state is not known, or is indeterminate, or is not returned by the operation
idle	id-val-printer-state-idle	The printer is ready to accept jobs, but none have been scheduled on it.
printing	id-val-printer-state-printing	The printer is currently printing a job
needs-attention	id-val-printer-state-needs-attention	The printer needs human attention (no special skills required). This state typically includes adding paper, clearing a jam, changing the medium, etc.
paused	id-val-printer-state-paused	The operator has (temporarily) paused the printer, by means outside the scope of this part of ISO/IEC 10175.
shutdown	id-val-printer-state-shutdown	The printer has been taken out of service, (for a long time), whether for repairs or others reasons. The printer's **message** generic attribute may be used to record a reason and estimated time for return to service
job-start-wait	id-val-printer-state-job-start-wait	The currently processing job was started with the **job-start-wait** attribute set, and is awaiting operator intervention or time-out.
job-end-wait	id-val-printer-state-job-end-wait	The currently processing job was started with the **job-end-wait** attribute set, and is awaiting operator intervention or time-out.
job-password-wait	id-val-printer-state-job-password-wait	The currently processing job was started with the **job-password** attribute set, and is awaiting the operator or user to enter the password supplied by the **job-password** attribute.
needs-key-operator	id-val-printer-state-needs-key-operator	The printer needs the attention of a key operator. Key operator functions are printer-specific, but typically include adding toner or developer, or attending to a hardware fault.
connecting-to-printer	id-val-printer-state-connecting-to-printer	The server has scheduled a job on the printer and is in the process of connecting to a shared network printer (and may not be able to actually start printing the job for an arbitrarily long time depending on the usage of the printer by other servers).
timed-out	id-val-printer-state-timed-out	The server was able to connect to the printer (or is always connected), but was unable to get a response from the printer in the time specified by the printer's **printer-timeout-period** attribute.

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Section	MIB	M/O	E	MIB/MIF Datatype	Attribute	page no
9.2.8.6	P	O		DateAndTime	Estimated-completion-time This attribute indicates the estimated time by which this job will be completed. The time to complete one job is dependent on the time required to complete all other jobs that the scheduling algorithm determines must be printed before this job may be printed. The time to complete each individual job may depend on when on-request resources are available. The time to print each individual job is dependent on the characteristics of the document formats in which the individual documents of the job are encoded and on the complexities and other characteristics of the documents themselves. This attribute is highly implementation-dependent. The **estimated-completion-time** may be easy to calculate for some combinations of document formats and scheduling algorithms. It may be impossible to calculate for other combinations. It is recommended that, where possible, document creators provide system hints to the print system (perhaps appropriately encoded in document format headers) that help the print system understand which features of the document formats the document will be exercising.	129
9.2.8.7	P	O		DateAndTime	Submission-time This attribute indicates the time at which the latest Print request for this job was accepted by the server.	130
9.2.8.8					Modification-time	130
9.2.8.9	P	O		DateAndTime	Started-printing-time This attribute indicates the time at which this job started printing.	130
9.2.8.10	P	O		Counter~~C~~ ~~ardinal~~32	Job-copies-completed This attribute indicates the number of job-copies of the job that the printer(s) have completed printing. The server shall not reset its value during the processing of multiple print-job results that are part of the same job (see the **results-profile** job attribute). Since this attribute is intended to measure the progress of a job, the value shall include repeated job-copies due to multiple print-job results for the same job. The accuracy of this value is implementation-dependent. It is expected that the value reported is never greater than the actual value. This attribute may not be supported for all printers and all page description languages. The value of this attribute shall be **0** if printing has not started for this job.	130
9.2.8.11	P	O		Counter~~C~~ ~~ardinal~~32	Pages-completed This attribute indicates the number of pages of the job that the printer(s) have completed printing. NOTE – The number of source pages, impressions and sheets of media may differ. The following examples illustrate how they may differ when attributes, rather than	130

					the document contents, control the printing. If **number-up** is 0 or 1, there is one source page per impression, and if **number-up** is 2, there are two source pages per impression. If **sides** is 1, there is one impression per sheet of media, but if **sides** is 2, there are two impressions per sheet of media. By inference, if **number-up** is 4 and **sides** is 2, there are 4 source pages per impression and 8 source pages per sheet of media. The server shall not reset its value during the processing of multiple copies of documents or the job. Since this attribute is intended to measure the progress of a job, the value shall include repeated pages due to multiple copies. When the job completes, this attribute should contain the value of the total number of source pages that the printer processed for the print-job. The accuracy of this value is implementation-dependent. It is expected that the value reported is never greater than the actual value. This attribute may not be supported for all printers and all page description languages. The value of this attribute shall be **0** if printing has not started for this job.	
9.2.8.12	P	O		Counter~~C ardinal~~32	Impressions-completed This attribute indicates the number of impressions that the printer engine(s) have placed on the media for the job. See the note in the **pages-completed** attribute for the relationship of the **pages-completed**, **impressions-completed** and **media-sheets-completed** attributes. The server shall not reset its value during the processing of multiple copies of documents or the job. Since this attribute is intended to measure the progress of a job, the value shall include repeated pages due to multiple copies. When the job completes, this attribute should contain the value of the total number of impressions that the printer made for the print-job. The accuracy of this value is implementation-dependent. It is expected that the value reported is never greater than the actual value. This attribute may not be supported for all printers and all page description languages. The value of this attribute shall be 0 if printing has not started for this job.	131
9.2.8.13	P	O		Counter32 ~~Cardinal~~	Media-sheets-completed This attribute indicates the number of sheets of media that the printer(s) have completed printing for the job. See the note in the **pages-completed** attribute for the relationship of the **pages-completed**, **impressions-completed** and **media-sheets-completed** attributes. The server shall not reset its value during the processing of multiple copies of documents or the job. Since this attribute is intended to measure the progress of a job, the value shall include repeated pages due to multiple copies. When the job completes, this attribute should contain the value of the total	131

					number of sheets of media used for the print-job. The accuracy of this value is implementation-dependent. It is expected that the value reported is never greater than the actual value. This attribute may not be supported for all printers and all page description languages. The value of this attribute shall be 0 if printing has not started for this job.	
PSIS~~?~~	P	O		index16~~/PosInt table~~	Media-consumed-type-index - a table This attribute indicates the medium type (index into the **MediaSupportedTable**) that have been consumed by the printer(s) for this print job or that are expected to be consumed. ~~This attribute indicates the number of sheets of each medium that have been consumed by the printer(s) for the print job.~~	
PSIS	P	O		Counter32	Media-consumed-sheet-count - a table This attribute indicates the number of sheets of the medium that have been consumed by the printer(s) for this print job. A value of 0 may be set when the job is accepted for printing to indicate that the job expects to use media of this type.	
PSIS?	P	O		index16~~enum/PosInt table~~	Color-impressions-type-consumed-index - a table This attribute indicates one of the colorant type (index into the prtColorantsTable) that have been consumed by the printer(s) for this print job.~~This attribute indicates the number of impressions that the printer engine(s) have placed on the media for the job for each colorant used.~~	
PSIS?	P	O		Counter32	Color-impressions-consumed-count - a table This attribute indicates the number of impressions that have been consumed by the printer(s) for this print job and this colorant.	
9.2.8.14	P	M		Counter~~Cardinal~~64	Octets-completed This attribute indicates the number of octets of the job that the printer(s) have completed printing. The server shall not reset its value during the processing of multiple copies of documents or the job. Since this attribute is intended to measure the progress of a job, the value shall include repeated pages due to multiple copies. The accuracy of this value is implementation-dependent. It may be approximated by the number of octets conveyed to the printer. This attribute may not be supported for all printers and all page description languages. The value of this attribute shall be **0** if printing has not started for this job.	132
9.2.8.15	P	M		Counter~~Cardinal~~64	Total-job-octets This attribute indicates the size of the job in octets, including document and job copies. The server may update the value of this attribute after each document has been transferred to the server or the server may provide this value after all documents have been transferred to the server, depending on implementation. In other words, while the job is in the **pre-processing** state and when the job is in the **held** state with the **job-state-reasons** containing a	132

					document-needed value, the value of the **total-job-octets** job status attribute depends on implementation and may not correctly reflect the size of the job. In computing this value, the server shall include the multiplicative factors contributed by the (1) **copy-count** document attribute, (2) the **results-profile**.**job-copies** job attribute element and (3) multiple values of the **results-profile** job attribute, independent of whether the printer can process multiple copies of the job or document without making multiple passes over the job or document data and independent of the value of the **output** document attribute (**page-collate** vs. **no-page-collate**). Thus the server computation is independent of the printer implementation and shall be: a) Document contribution: Multiply each **copy-count** by the size of the document in octets. b) Add each document contribution together c) Job result contribution: Multiply the job size by the number **job-copies** in the result set. d) Add each job result contribution together e) Multiply the value by the number of values in the job's **result-profile** attribute.	
9.2.8.16	P	M ~~O~~		Cardinal32	Intervening-jobs This attribute indicates the number of other jobs to be printed before this job may be scheduled for printing. The server shall set the value of this attribute to **0** when the job begins printing.	132
9.2.8.17					Print-checkpoint	132
9.2.8.18					New-job-identifier	133
9.2.8.19					On-request-resources-required	134
9.2.8.20	S	O	E	T(255)	Job-message-from-administrator This attribute provides a message from an operator, system administrator or 'intelligent' process to indicate to the user the reasons for modification or other management action taken on a job.	134
9.2.8.21					Last-job-events	134
9.2.8.22					Name-of-last-accessor	135
9.2.8.23	P	O		Cardinal32	Error-count This attribute provides the number of error events occurring while processing the job.	135
9.2.8.24	P	O		Cardinal32	Warning-count This attribute provides the number of warning events occurring while processing the job.	135
9.2.8.25	P	O		Cardinal32	Processing-time This attribute indicates how long an individual job has been processing.	135
9.2.8.26	P	O		DateAndTime	Completion-time This attribute indicates the time at which this job completed. Providing this time is useful for jobs which are retained after printing.	135

9.2.8.27	P	M		Cardinal32	Number-of-documents This attribute indicates the number of documents in the job. The number indicates how many Print operations that specified a document (of any **document-type**) have been submitted for printing until job submission has been completed; at that point this attribute shall then indicate the total number of printable documents, fonts, and resource objects submitted by the client in the job. If the first Print operation does not contain a **first-document** component (see 8.2.1), the value of this attribute shall be **0**. The server shall count fonts and resource objects passed to the server by means of Print operation invocations, as documents for the purposes of this attribute.	135
9.2.8.28					Job-submission-complete	136
9.2.8.29					Ignored-attributes	136

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9.2.9					*Job-size attributes:*	136
9.2.9.1	P	O		Cardinal32	Job-page-count This attribute contains the number of source pages in the job that the server expects to image. The server shall compute this value by the following procedure: a) For each document in the job object, multiply the value of document's **page-count** attribute by the value of its **copy-count** attribute and call the result *document-set-page-count*. b) Add up all the *document-set-page-counts* from the previous step and call this sum the *job-copy-page-count*. c) For each job-result-set, multiply the value of *job-copy-page-count* from the previous step by the value of **job-copies** element of the job-result-set and call the result *job-result-set-page-count*. d) Add up all the *job-result-set-page-counts* from the previous step and set this sum into the **job-page-count** attribute. The value of this attribute is a measure of the amount of computation involved. The accuracy of this value is dependent on the accuracy of the **page-count** attribute in each document. If some documents have a **page-count** value of 0, the server may set the value of this attribute to 0 and not use it for scheduling.	137
9.2.9.2					Job-impression-count	137
9.2.9.3					Job-media-sheet-count	138
	P	M		index32	Document-table (pointer to documents for this job in document table	

Listing of document attributes

The following table lists all the ISO DPA document attributes and indicates which ones will be in the MIB. The document table is a single table for all jobs, so that each job points to the first document in the table that is part of the job. The job's number-of-documents attribute indicates the number of consecutive rows in the document table that belong to the job.

Section	MIB	M/O	E	MIB Datatype	Attribute	page no
9.3					*Document object attributes:*	138
9.3.1					*Document-information attributes:*	139
9.3.1.1	P	M		T(255)	Document-name This attribute supplies a human readable string for the document. This string is used for naming the document in a human-readable "free-form" fashion. This attribute is intended for enabling a user or the user's application to convey a document name that may be printed on a start sheet, returned in a ListObjectAttributes result, or used in notification or logging messages. If this attribute is not specified, no document name is assumed, but implementation specific defaults are allowed, such as the simple-name part of the value of the **document-file-name** attribute. It is suggested, however, that the server not supply additional text for this attribute when printing its value (e.g. on a start sheet). This string only has meaning to the clients and can therefore take several forms, e.g. the name of a mail folder, name of a revisable document, the file specification minus the file path, the title of a document, etc.	139
9.3.1.2	S	M		T(255)	Document-file-name This attribute specifies the file name of the document, if the document came from a file. The file name may include the full path to the file, in which case the **name-syntax** element of the **DistinguishedNameString** data type shall specify the syntax of the file name. If the document did not come from a file, the client should not specify this attribute.	139
9.3.1.3					Document-authors	140
9.3.1.4					Document-comment	140
9.3.1.5					Document-revision-date	140

9.3.2					*Document production instructions:*	140
9.3.2.1	S	O		index16	Default-medium This attribute identifies a medium that the server shall use as the medium default for the pages of the document that require a specification. Standard values are defined in the specification of the **medium-**	140

identifier medium attribute.

If the **page-media-select** attribute is specified (either by the client or by a server default, i.e., the **page-media-select** attribute of the initial-value-job object specified by the logical or physical printer), then the server shall use the **page-media-select** value to override the **default-medium** specification on a page by page basis.

The **default-medium** attribute may contain a value of **id-val-generic-none** (see 9.1.2) indicating that the server shall not use a default medium. Instead, the server shall rely on lower precedence document attributes (such as **default-input-tray**) for the media specification.

If the document data, itself, specifies media, such specification shall override the **default-medium** attribute on a page by page basis. If the document data specifies media which are not also values of **media-used**, then a printer may receive a document which requires media that are not ready. In such a case, an implementation may either abort the document or try printing the document on some alternative medium, such as the **default medium**.

A client has numerous ways to specify the media to be used when printing a document and different document pages can be specified in different ways. The client can specify the media in the document contents or with attributes. Some attributes override the document contents, and other attributes may be overridden by the document contents. In addition, the client can specify the media by name or by the input-tray containing it.

Before printing each page of a document, the server determines the medium or input-tray for that page by finding the first condition in the list of numbered steps below that is satisfied. For this discussion, either the medium or the input-tray is sufficient information:

a) If **page-media-select** has a medium value for the current page, use that medium, regardless of document contents and other attributes.

b) If **input-tray-select** has a value, use that tray.

c) If the document contents specify a medium, and that medium is the same as the value of one of the original-medium elements in the **media-substitution** attribute, then use the corresponding substitution-medium in the **media-substitution** attribute.

d) If the document contents specify a medium, use that medium.

e) If the document contents specify an input-tray, use that input-tray.

f) If the **default-medium** has a value, and the document

					format interpreter allows its use, and that medium is the same as the value of one of the **original-medium** elements in **media-substitution** attribute, then use the corresponding **substitution-medium** in the **media-substitution** attribute. g) If the **default-medium** has a value and the document format interpreter allows its use, use the **default-medium**. h) If the **default-input-tray** has a value and the document format interpreter allows its use, use the **default-input-tray**. i) Use the medium or input-tray selected by the document format processor in the printer. This selection is implementation-dependent.	
9.3.2.2	S	O		index16	Default-input-tray This attribute identifies an input-tray that the server shall use as the input-tray default for the pages of the document that require a specification. The correspondence between the simple-name of an input-tray (alphanumeric or numeric) and the actual tray in the printer is printer-dependent, and a tray named by such a simple-name may also have an OBJECT IDENTIFER that names it as well. A server may try to convert a simple-name received from a client to one of the server's OIDs, depending on implementation. However, a server shall always return an input-tray as an OID to the client if the server identifies the input-tray using an OID. Examples: The simple-name strings: **envelope**, **top**, **2**, or **02**, or the OID value: **id-val-input-tray-top**. If the **default-medium** attribute is specified (either by the client or by a server default, i.e., the **default-medium** attribute of the initial-value-job object specified by the logical or physical printer), then the server shall use the **default-medium** value and shall ignore the **default-input-tray** attribute, if specified. If the **page-media-select** attribute is specified (either by the client or by a server default, i.e., the **page-media-select** attribute of the initial-value-job object specified by the logical or physical printer), then the server shall use the **page-media-select** value to override the **default-input-tray** specification on a page by page basis. If the document data, itself, specifies media or input trays, such specification shall override the **default-input-tray** attribute on a page by page basis. If the document data specifies media or input-trays which are not also values of **media-used** or **input-trays-used**, respectively, then a printer may receive a document which requires media or input-trays which are not ready. In such a case, an implementation may either abort the document or try printing the document using some alternative input-tray,	141

					such as the **default input-tray**. The following standard values are defined:	

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Descriptive Name	Object Identifier	Descriptor Text
top	id-val-input-tray-top	The top input tray in the printer.
middle	id-val-input-tray-middle	The middle input tray in the printer.
bottom	id-val-input-tray-bottom	The bottom input tray in the printer.
envelope	id-val-input-tray-envelope	The envelope input tray in the printer.
manual	id-val-input-tray-manual	The manual feed input tray in the printer.
large-capacity	id-val-input-tray-large-capacity	The large capacity input tray in the printer.
main	id-val-input-tray-main	The main input tray
side	id-val-input-tray-side	The side input tray

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Section	MIB	M/O	E	MIB/MIF Datatype	Attribute	page no
9.3.2.3					Default-font	142
9.3.2.4					Default-resources	143
9.3.2.5					Default-character-set	143
9.3.2.6					Default-character-repertoire	150
9.3.2.7					Default-character-mapping	150
9.3.2.8					Default-printer-resolution	151
9.3.2.9					Medium-substitution	151
9.3.2.10					Input-tray-select	152
9.3.2.11					Font-substitution	152
9.3.2.12					Resource-context	153
		O		T(255)	Document-template-name This attribute specifies the name of the document template that the scanner shall use to scan the document.	
9.3.2.13	P?				Finishing [future?]	153
9.3.2.14					Finishing-includes-document-sheets	154
9.3.2.15	P	O		enum	Output [method] This attribute identifies the output processing for the media on which the document is to be printed. The following standard values are defined:	154

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Descriptive Name	Object Identifier	Descriptor Text
Page-Collate	id-val-output-page-collate	This value specifies that the pages of a document are to be in sequence, when multiple copies of the document are specified by the **copy-count** attribute (possibly up to some implementation-defined maximum number of copies). Whether this effect is achieved by placing copies of the document in multiple output bins or in the same output bin with implementation-defined document separation is implementation-dependent. Also whether it is achieved by making multiple passes over the document or by using an output sorter is implementation-dependent
No Page-Collate	id-val-output-no page-collate	This value specifies that the copies of the pages of a document are to follow one another when multiple copies are specified by the **copy-count** attribute. That is, if 3 copies are specified, three copies of page 1 are printed then three copies of page 2, etc., and no collating of these pages is desired. This may be useful in some implementations where multiple copies requires re-interpretation of the document format and the document contains some compute intensive pages (such as images)
Decollate	id-val-output-decollate	The parts of a multi-part form are to be separated and sorted into stacks for each part
No Decollate	id-val-output-no decollate	The parts of a multi-part form are to remain intact
Burst	id-val-output-burst	Continuous media is to be separated into individual sheets, generally by bursting along perforations
No Burst	id-val-output-no burst	Continuous media is to remain continuous, no bursting is desired
Stacking-Default	id-val-output-stacking-default	A site-defined output-stacking operation is to be applied

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Section	MIB	M /O	E	MIB/MIF Datatype	Attribute	page no
9.3.2.16					*Imposition attributes:*	154
9.3.2.16.1					Number-up	155
9.3.2.16.2					Plex	159
9.3.2.16.3					Binding-edge	160
9.3.2.16.4					Binding-edge-image-shift	160
9.3.2.16.5					x-image-shift	161
9.3.2.16.6					y-image-shift	161
9.3.2.17					Print-quality	162
9.3.2.18					Medium-fidelity	162
9.3.2.19	P	M		~~Pos~~Int(1..2)	Sides This attribute specifies the number of printable surfaces of the medium to be imaged.	163
9.3.2.20					Page-select	163
9.3.2.21					Page-media-select	164
9.3.2.22	P	M		Cardinal32	Copy-count	165

					This attribute specifies the number of copies of the documents, or of the selected pages of the document, to be printed. A value of **1** for **copy-count** shall generate a single human perceptible copy of the electronic document. If a value of **0** is supplied, the job may be processed normally, but no print output shall be produced or the server shall return an **unsupported-attribute-value** AttributeError.	
9.3.2.23					Reset-printer	165
9.3.2.24					Initial-value-document	165

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9.3.3					*Document-description attributes:*	166
9.3.3.1	S	M		enum	Document-type This attribute indicates that the document being passed by the current Print abstract-operation is either a printable document, a font, or a -resource. How resources are managed during the printing process is necessarily dependent on the characteristics of the server and printer implementations. These methods are considered implementation-specific, and shall not be dictated by ISO/IEC 10175. In particular, ISO/IEC 10175 does not require that resources be passed in advance of the documents that use them; i.e., resources may be passed to the server in any order within the job, subject only to the requirement that the resources be present at the server before processing begins on the documents that use them. The following standard values are defined:	166

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Descriptive Name	Object Identifier	Descriptor Text
printable	id-val-document-type-printable	Specifies that this document is to be printed on the assigned printer.
font	id-val-document-type-font	Specifies that this document is a font resource which may be required by one or more of the printable documents associated with the print-job. See the **font** object class.
resource	id-val-document-type-resource	Specifies that this document contains resource data, of some type other than font, which may be required to print one or more of the printable documents associated with the print-job. See the **resource** object class.

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Section	MIB	M/O	E	MIB/MIF Datatype	Attribute	page no
9.3.3.2					Transfer-method	166
9.3.3.3	P	M		enum	Document-format	167

					This attribute identifies the overall print document format used for the document. It consists of three elements, a **document-format**, a **document-format-variants** and a **document-format-version**. The latter two elements are optional. The **document-format** element identifies a particular family of document formats, of which there may exist several versions or variants. The **document-format-variants** and **document-format-version** elements identify a specific instance of a document format. The variant refers to a particular functional subset of a format. For example, the format PostScript has variants of level 1 and level 2, and the format PCL has several variants, including PCL4 and PCL5. The version distinguishes among successive releases of the same basic format and variant. For example, successive versions of Xerox Interpress include versions 2.0, 2.1, 3.0, 3.1, etc.	
9.3.3.3	P	M		T(255)	Document-format-variants The **document-format-variants** and **document-format-version** elements identify a specific instance of a document format. The variant refers to a particular functional subset of a format. For example, the format PostScript has variants of level 1 and level 2, and the format PCL has several variants, including PCL4 and PCL5. The **document-format-variants** element consiststs of a single text string. If it is necessary to identify more than one variant, the respective variant values shall all be contained in the document-format-variants element, separated from one another by commas. If the client omits the **document-format-variants** or **document-format-version** elements, the server may supply a format-specific default which will restrict the outcome of the rules described in the next paragraph. This rule shall not cause a job to fail in validation if it would have succeeded with the rules of the next paragraph. If the client omits the **document-format-variants** element, the server shall print the document if the requested printer's **document-formats-supported** attribute contains a **DocFormat** which differs from the specified **document-format** only in the value of its **document-format-variants**. If the **document-format-variants** is omitted from the **printer document-formats-supported** attribute, the printer shall accept documents with any variant of the specified format. Similar rules apply if the **document-format-version** element is omitted. If the client omits the **document-format-variants** or **document-format-version** elements, the server may supply a format-specific default. Such a default shall be one that could have matched a document-format according to the rules of the preceding paragraph.	167

					Proprietary values for the **document-format**, **document-format-variants**, and **document-format-version** elements are assigned by the owners of those formats. Annex F contains a set of document-formats and variants for various commercially available formats and variants that are currently in common use.	
9.3.3.3	P	M		T(255)	Document-format-version The version distinguishes among successive releases of the same basic format and variant. For example, successive versions of Xerox Interpress include versions 2.0, 2.1, 3.0, 3.1, etc.	167
9.3.3.4					Document-content	167
9.3.3.5					Non-compulsory-attributes	168
9.3.4					*Document-characteristic attributes:*	
9.3.4.1					Intended-page-size	169
9.3.4.2					Content-orientation	170
9.3.4.3					Presentation-direction	171
9.3.4.4					Page-order-received	172
9.3.4.5					Media-used	172
9.3.4.6					Assured-reproduction-areas-used	173
9.3.4.7					Input-trays-used	173
9.3.4.8					Fonts-used	173
9.3.4.9					Resources-used	173
9.3.4.10					Character-sets-used	174
9.3.4.11					Character-repertoires-used	174
9.3.4.12					Character-mappings-used	174
9.3.4.13					Printer-resolutions-used	174
9.3.4.14					Content-orientations-used	175
9.3.4.15					Presentation-directions-used	175

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9.3.4.16					*System-hint attributes:*	175
9.3.4.16.1	P	M		Cardinal64	Octet-count This attribute specifies the size of the document in octets.	175
9.3.4.16.2					Page-count	175
9.3.4.16.3					Glyph-count	176
9.3.4.16.4					Font-count	176
9.3.4.16.5					Font-change-count	176
9.3.4.16.6					Maximum-fonts-per-page	176
9.3.4.16.7					Percent-graphics	176
9.3.4.16.8					Percent-images	176

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9.3.5					*Document-status attributes:*	177
9.3.5.1					Document-sequence-number	177
9.3.5.2	P	M	E	enum	Document-state This attribute identifies the current state of the document. The following standard values are defined:	177

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Descriptive Name	Object Identifier	Descriptor Text
transfer-pending	id-val-document-state-transfer-pending	The server has created the document object, but the data transfer of the document data has not started or completed
pending	id-val-document-state-pending	The server has received the document data and the document is waiting for processing to begin. The job may already be in the **processing** state, if the job's **job-scheduling** attribute in not **after-complete** (see the **current-job-state** and **job-scheduling** job attributes.
processing	id-val-document-state-processing	The server has started processing this document, or has made the document ready for printing, but the output device is not yet printing it, either because the document hasn't reached the output device or because the document is queued in the output device or some other spooler, awaiting the output device to print it.
printing	id-val-document-state-printing	The server has completed processing the document and the output device is currently printing the document on at least one printer. That is, a print engine is either printing pages of the document, or failing in its attempt to print pages of the document because of some wait state, such as, start-wait, end-wait, needs-attention, etc. The complete document state includes the detailed status represented in the printers' **printer-state** attribute(s).
completed	id-val-document-state-completed	The server has completed printing this document. The job may still be in the **printing** state, or may be in the **retained** state.

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Section	MIB	M/O	E	MIB/MIF Datatype	Attribute	page no
9.3.5.3	P	M		Cardinal32	Copies-completed This attribute indicates the number of complete copies of this document that have been printed. Some printers print multiple copies of each individual page of a document, completing the printing of all copies at the same time, printing as many of these pages as necessary to satisfy the **copy count**. The value of **copies-completed** is 0 if printing has not started for this document.	178
9.3.5.4					File-reference	178
9.3.5.5					Current-page-order	178

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Media Supported Table

There will be a MediaSupported table which is Mandatory. It contains the media supported by this printer, whether installed in the input tray(s) (ready) or not. Representing the supported (system Administrator's policy), as opposed to what is ready, is a deviation from the strategy agreed to by the IETF Printer MIB working group in developing RFC 1759. Indicating MediaSupported is moving away from representing just the output device and moving towards representing the service.

Section	MIB	M/O	E	MIB Datatype	Attribute	page no
					MediaSupported (table):	
	P	O		A(255)	ASCII-name This attribute identifies the medium in the locale of the server. Examples: iso-a4-white, a in English.	
9.6.1	P	O		~~I~~T(255)	Name This attribute identifies the medium in the locale specified by GenCurrentLocalization. Examples are: iso-a4-white, a.	217
	P	O		enum	MediaSpportedSizeUnit (.0001 inches or micrometers).	
9.6.6	P	O		Ordinal32 ~~Cardinal~~	X-dimension~~-in-micro-m~~ This attribute indicates the x-dimension of the medium ~~in micro metres,~~ as measured in the Reference Coordinate System (see DPA 6.5.4) and expressed in MediaSupportedSizeUnit.	223
9.6.6	P	O		Ordinal32 ~~Cardinal~~	Y-dimension~~-in-mm~~ The attribute indicates the y-dimension of the medium ~~in micro metres,~~ as measured in the Reference Coordinate System (see DPA 6.5.4) and expressed in MediaSupportedSizeUnit.	223
9.6.4	P	O		A(255)	Type This attribute identifies the type of this medium. (e.g. stationery, envelope, transparency, etc.) The following standard [ASCII string] values are defined:	220

Descriptive Name	Object Identifier	Descriptor Text
stationery	id-val-medium-type-stationery	Separately cut sheets of an opaque material
transparency	id-val-medium-type-transparency	Separately cut sheets of a transparent material
envelope	id-val-medium-type-envelope	Envelopes that can be used for conventional mailing purposes
envelope-plain	id-val-medium-type-envelope-plain	Envelopes that are not preprinted and have no windows
envelope-window	id-val-medium-type-envelope-window	Envelopes that have windows for addressing purposes
continuous-long	id-val-medium-type-continuous-long	Continuously connected sheets of an opaque material connected along the long edge
continuous-short	id-val-medium-type-continuous-short	Continuously connected sheets of an opaque material connected along the short edge
tab-stock	id-val-medium-type-tab	Media with tabs

multi-part-form	id-val-medium-multi-part-form	Form medium composed of multiple layers not pre-attached to one another; each sheet may be drawn separately from an input source
labels	id-val-medium-labels	Label-stock
multi-layer	id-val-medium-type-multi-layer	Form medium composed of multiple layers which are pre-attached to one another, e.g. for use with impact printers

Section	MIB	M/O	E	MIB/MIF Datatype	Attribute	page no
9.6.11	P	O		Cardinal32	Weight This attribute indicates the weight of this medium in grams per square metre.	224
9.6.7	P	O		A(255)	Color This attribute indicates the colour of this medium. The following standard [ASCII string] values are defined:	223

Descriptive Name	Object Identifier	Descriptor Text
white	id-val-medium-colour-white	White colour
pink	id-val-medium-colour-pink	Pink colour
yellow	id-val-medium-colour-yellow	Yellow colour
buff	id-val-medium-colour-buff	Buff colour
goldenrod	id-val-medium-colour-goldenrod	Goldenrod colour
blue	id-val-medium-colour-blue	Blue colour
green	id-val-medium-colour-green	Green colour
transparent-untinted	id-val-medium-colour-transparent-untinted	Transparent (no colour)

Change History

Changes made from Version 0.2 (7-Aug-1995) to Version 0.8 (2-Dec-1995)

1. Updated the goals and requirements to be the same as the companion List of objects/attributes document (see job-list.doc, .ps, .txt in ftp-out.external.hp.com/snmpmib/jobs-mib).
2. Reduced the scope to job monitoring performed by printers, not by spooling systems. Changed the name to “Printer Job Monitoring MIB”. Now there are only 25 mandatory printer job monitoring MIB/MIF objects/attributes and 31 optional printer job monitoring MIB/MIF objects/attributes. There are 9 mandatory spooler job monitoring MIB/MIF objects/attributes and 4 optional spooler job monitoring MIB/MIF objects/attributes.
3. Eliminated the goal of making this MIB useful by itself for non-printing, so removed the concept of conditional mandatory. If a scan job monitoring MIB is every developed, it can call out for groups from the printer job monitoring MIB, so we will still segragate objects that are not print-specific from print-specific ones by putting them in separate groups. Then a scan job monitoring MIB could simply require implementation of the non-print groups in this MIB.

4. Added terminology and diagrams. Clarified that a client can be any of: an end-user PC or workstation, a spooling system, or a printer superivsor control program.
5. Added a column indicating which job monitoring MIB: **P** for printer job monitoring MIB or **S** for spooler job monitoring MIB.
6. Deleted the ISO DPA data types column.
7. Added spefications for objects/attributes to align with the companion List proposal.
8. Numerous changes to align the specification with the companion list document.

Changes made from Version 0.1 (24-July-1995) to Version 0.2 (7-Aug-1995)

1. Added specifications from ISO DPA for all job and document attributes
2. Deleted product-name and product-instance-qualifier. These had been taken from DMTF LMO (Large Mail Operation) MIF work. For LMO, a product is like a DPA job, and we already have a job-name.
3. Deleted job-ticket-name which was also from LMO. Replaced it with document-template-name for scan jobs.