

Job Submission Protocol Mapping Recommendations
for the Job Monitoring MIB

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Abstract

This document defines the recommended mapping for many currently popular Job submission protocols to objects and attributes in the Job Monitoring MIB.

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1.0 INTRODUCTION

The Job Monitoring MIB [JobMIB] is intended to be implemented in a device or server that supports any job submission protocol. However, the information available and the method of presentation varies significantly by job submission protocol. A common method of mapping job submission information to the Job Monitoring MIB is essential for interoperability of Job MIB agents and monitoring applications. This document defines recommended mappings for most popular job submission protocols to ensure this compatibility.

All mappings are unidirectional from the job submission protocol to the MIB. It is assumed that support of the job submission protocol in the printer implies that the reverse information flow is presently defined and does not require interaction from the MIB. This mapping is not defined in this document as it should be obvious.

This document refers to system configurations that are defined in the Job Monitoring MIB [JobMIB]. For those readers that are familiar with the configuration descriptions, a short summary appears here. Please see the Job MIB document for further details.

Configuration 1: This is a simple peer-to-peer system which contains only a client and a printer. The Job MIB agent is resident in the printer.

Configuration 2: This system contains a client, server, and a printer. The Job MIB agent is resident in the server.

Configuration 3: This system, as in configuration 2, contains a client, server, and a printer. In this case the Job MIB agent is implemented within the printer.

The most important object to be mapped is jmJobSubmissionID, since this is a method for the user or client to determine the jmJobIndex for a submitted job. Therefore, jmJobSubmissionID is specified for all job submission protocols defined in this document. The remaining objects mapped include only those items that have the equivalent information presented to the printer by the job submission protocol.

While this document places a strong emphasis on jmJobSubmissionID mapping to obtain jmJobIndex, the preferred method is through the use of a bi-directional job submission protocol that returns the equivalent value of jmJobIndex to the client, such as IPP. When a bi-directional protocol that returns jmJobIndex is in use, the jmJobSubmissionID object has no value to the client. When the jmJobIndex cannot be returned, the use of a client defined jmJobSubmissionID is preferred over an agent derived value. The client defined version allows for retrieval of jmJobIndex using a single SNMP Get operation, since jmJobSubmissionID is the index into the jmJobIDTable. An agent derived value will require a search through multiple entries in the jmJobIDTable.

The majority of the protocols mapped in this document are oriented towards network job submission. However, the Job Monitoring MIB is also intended to monitor print jobs received from other than network ports, such as parallel and serial ports. Some of the job submission protocols included that are used with non-networked ports are PJI,

PostScript, and TIP/SI. In addition, the Job Monitoring MIB can be used with print jobs that are internally generated, such as self test pages. In this latter case, no mapping is required since all job submission protocols are bypassed.

2.0 LINE PRINTER DAEMON (LPR/LPD) PROTOCOL

The LPR/LPD printing protocol [LPD] is used with BSD UNIX systems in the client-server-printer configuration. Usage of the Job Monitoring MIB with LPR/LPD will most likely conform to Configuration 3, where the monitor application or the server uses SNMP to obtain job information from the printer. The client communicates with the UNIX server using the existing LPD protocol to obtain job information.

The LPR/LPD protocol is also used in the Windows environment to implement peer-to-peer printing, as shown in configuration 1. In this case, SNMP is used by the client and/or the monitor application to obtain the job information.

One of the major problems of LPR/LPD is the large number of vendor unique extensions currently used with the protocol and the resulting compatibility issues between available implementations. To avoid these issues, this mapping of LPR/LPD is restricted to the protocol as defined by RFC 1179.

The LPR/LPD protocol transfers print job data and control information in separate files, known as the Data File and Control File, respectively. Most of the information concerning the print job is contained in the Control File. In many LPD implementations, the Control File is transferred following the Data File. Thus much of the information concerning the job may not be available until the completion of the data transmission.

2.1 jmJobSubmissionID Mapped to LPR/LPD

The LPR/LPD Receive Data File command contains a parameter which defines the name of the data file. This name field is structured as follows:

dfaXXX<host-name> or daXXXX<host-name>

Where XXX or XXXX is the numeric job number assigned by the network entity submitting the print job to the printer. The recommended mapping of this name field to jmJobSubmissionID is:

octet 1: '9'

octets 2-40: Contains the <host-name> portion of the name field. If the <host-name> portion is less than 40 octets, the left-most character in the string shall appear in octet position 2. Any unused portion of this field shall be filled with spaces. Otherwise, only the last 39 bytes shall be included.

octets 41-48: '00000XXX' or '0000XXXX', where XXX or XXXX is the decimal (ASCII coded) representation of the LPR/LPD job number.

2.2 jmJobIndex Mapped to LPR/LPD

The job index (jmJobIndex) is assigned by the SNMP job monitoring agent and is independent of the XXX (or XXXX) index assigned by the LPR/LPD client. This will allow the SNMP agent to track jobs received from multiple sources.

2.3 Other MIB Objects Mapped to LPR/LPD

MIB Object	LPR/LPD Parameter
jmJobKOctetsPerCopyRequested	Number of bytes as defined in the Data File
jmJobOwner	Control file command code = P (User Id)

2.4 The Attribute Group Mapped to LPD

Other attributes that are applicable, but not defined in this section such as attributes that map to a vendor unique extension, may also be included.

MIB attribute	LPR/LPD information	Data type
jobName	Job Name (notes 1, 2)	Octet String
queueNameRequested	Queue name from the Data File	Octet String
fileName	Source File Name (notes 1, 3)	Octet String

Notes:

1. The information is optional in the Control File. The attribute should be included if present in the Control File.
2. Control file command code = J. If this optional field is omitted from the control file, then the agent returns the file name (command code = N), if present.
3. Control file command code = N.

3.0 APPLETalk PROTOCOL

AppleTalk was originally developed as a peer-to-peer network protocol, as described in configuration 1, for use with Apple Macintosh computers. Today, print spoolers are also available for use with Macintosh computer networks that conform to configurations 2/3. In addition, printing with the AppleTalk protocol is supported from both Windows NT servers and Novell servers also per configurations 2/3.

The AppleTalk protocol provides very little information that can be used with the Job Monitoring MIB. The Macintosh print drivers are able to provide information concerning the user and document name but imbed this information in the PDL, which is typically PostScript. The preferred jmJobSubmissionID is constructed from the information in the PostScript file, as defined in section 9.0.

3.1 jmJobSubmissionID Mapped to AppleTalk

An alternative jmJobSubmissionID may be constructed from the Connection Identifier contained in the AppleTalk Printer Access Protocol (PAP) header. Since the Connection Id is not readily available in any of the defined AppleTalk implementations, this approach may be of little utility.

octet 1: 'A'

octets 2-40: Contains the AppleTalk printer name, with the first character of the name in octet 2. AppleTalk printer names are a maximum of 31 characters. Any unused portion of this field shall be filled with spaces.

octets 41-48: '00000XXX', where 'XXX' is the decimal (ASCII coded) representation of the Connection Id.

3.2 Other AppleTalk Mappings

No other Job MIB objects or parameters can be derived from information available in the AppleTalk headers

4.0 INTERNET PRINTING PROTOCOL (IPP)

The Internet Printing Protocol [IPP] supports printing using any one of the three possible configurations. For configuration 2, the mapping defined herein is performed on an agent within the server. Otherwise, the mapping is performed on an agent within the printer.

4.1 jmJobSubmissionID Mapped to IPP

IPP contains a rich set of parameters which allow several methods of creating the jmJobSubmissionID object. To prevent interoperability problems, the preferred method is to use the IPP job-uri attribute as follows:

octet 1: '4'

octets 2-40: Contains the IPP job-uri job description attribute generated by the printer. (The job-uri is returned to the client by IPP.) If the job-uri is less than 40 octets, the left-most character in the string shall appear in octet position 2. Any unused portion of this field shall be filled with spaces. Otherwise, only the last 39 bytes shall be included.

octets 41-48: Contains the decimal (ASCII coded) representation of the job-id job description attribute. Leading zeros shall be inserted to fill the entire 8 octet field.

NOTE - Since IPP returns the "job-identifier" attribute with the jmJobIndex value for a job when the job is submitted, the use of the jmJobSubmissionID table should not be needed by a management application. See Section 1.0.

4.2 jmJobIndex Mapped to IPP

The job index (jmJobIndex) assigned by the SNMP job monitoring agent is returned to the client by IPP as the job-id job description attribute. (Since IPP does not require consecutively generated job-ids, the agent may receive jobs from multiple clients and can assign jmJobIndex in an ascending sequence independent of the submitting job client.) The IPP job-id must be restricted to the range of 1 to 99,999,999 (decimal) to allow the value to be properly represented in jmJobSubmissionID.

4.3 Other MIB Objects Mapped to IPP

MIB Object	IPP Job attribute
jmJobState	job-state
jmJobStateReasons1	job-state-reasons (note 1)
jmNumberOfInterveningJobs	number-of-intervening-jobs
jmJobKOctetsPerCopyRequested	job-k-octets
jmJobKOctetsProcessed	job-k-octets-processed
jmJobImpressionsPerCopyRequested	job-impressions
jmJobImpressionsCompleted	job-impressions-completed
jmJobOwner	job-originating-user-name

Notes:

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1. jmJobStateReasons1 is a bit map which can describe up to 31 job state reasons. Also the IPP "job-state-reasons" attribute is a multi-valued attribute with each value being a keyword. The IPP condition may change multiple bits in this object. The IPP "job-state-reasons" attribute may also change one or more of the jobStateReasonsN attributes (see section 4.4).

4.4 The Attribute Group Mapped to IPP

The following mappings are required if the listed IPP job template attribute is provided.

MIB attribute	IPP job attribute	Data type
jobStateReasonsN(N=2, 3, 4)	job-state-reasons (note 3)	Integer
jobCodedCharSet	attributes-charset (note 1)	Octet String
jobNaturalLanguageTag	attributes-natural-language	Octet String
jobURI	job-uri	Octet String
jobName	job-name	Octet String
physicalDevice	output-device-assigned	Octet String
numberOfDocuments	number-of-documents	Integer
jobPriority	job-priority	Integer
jobHoldUntil	job-hold-until	Octet String
sides	sides (note 2)	Integer
finishing	finishings	Integer
printQualityRequested	print-quality	Integer
printerResolutionRequested	printer-resolution	Integer
jobCopiesRequested	copies (note 4)	Integer
documentCopiesRequested	copies (note 4)	Integer
jobCollationType	multiple-document-handling	Integer
sheetsRequested	job-media-sheets	Integer
sheetsCompleted	job-media-sheets-completed	Integer
mediumRequested	media	Octet String
jobSubmissionTime	time-at-submission	Integer
jobStartedProcessingTime	time-at-processing	Integer
jobCompletionTime	time-at-completed	Integer

Notes:

1. jobCodedCharSet is an enum from the IANA registry which is also used in the Printer MIB. The IPP attributes-charset is the name (MIME preferred name) of the character set.
2. The Job MIB sides attribute uses the integer values "1" and "2". The IPP sides attribute uses three keywords.
3. jobStateReasonsN are three attributes (N=2, 3, 4). Also the IPP "job-state-reasons" attribute is a multi-valued attribute with each value being a keyword. The IPP condition may change multiple bits in one or more of these Job MIB attributes. See also jmJobStateReasons1 in section 4.3.
4. The IPP "copies" attribute maps to the Job MIB:
 - (1) jobCopiesRequested when the job has only one document OR IPP "multiple-document-handling" is 'single-valued'
 - (2) documentCopiesRequested, in which case the MIB value is the total number of document copies that the job will produce as a whole.

5.0 INTELLIGENT PRINTER DATA STREAM (IPDS)

The IPDS datastream facilitates a close relationship between the print supervisor (Print Services Facility - PSF) and the printer. There are PSF applications for UNIX, Windows, OS/2, OS/400 and host operating systems such as VM, MVS and VSE. Together, PSF and IPDS represent a complete, mature and robust job management framework which includes font and resource management, page progress tracking, job cancellation, complete error recovery and end-user notification. Because PSF and the printer correspond via the use of locally assigned IDAs, there is a limited amount of clear text information provided during submission for use by the Job MIB.

5.1 jmJobSubmissionId Mapped to IPDS

For IPDS on the MVS or VSE platform:

octet 1: 'E'

octets 2-40: Contains bytes 2-27 of the XOH Define Group Boundary Group ID triplet. Octet position 2 must carry the value x'01'. Bytes 28-40 must be filled with spaces.

octets 41-48: Contains a decimal (ASCII coded) representation of the jmJobIndex assigned by the agent. Leading zeros shall be inserted to fill the entire 8 octet field.

For IPDS on the VM platform:

octet 1: 'F'

octets 2-40: Contains bytes 2-31 of the XOH Define Group Boundary Group ID triplet. Octet position 2 must carry the value x'02'. Bytes 32-40 must be filled with spaces.

octets 41-48: Contains a decimal (ASCII coded) representation of the jmJobIndex assigned by the agent. Leading zeros shall be inserted to fill the entire 8 octet field.

For IPDS on the OS/400 platform:

octet 1: 'G'

octets 2-40: Contains bytes 2-36 of the XOH Define Group Boundary Group ID triplet. Octet position 2 must carry the value x'03'. Bytes 37-40 must be filled with spaces.

octets 41-48: Contains a decimal (ASCII coded) representation of the jmJobIndex assigned by the agent. Leading zeros shall be inserted to fill the entire 8 octet field.

5.2 The Attribute Group Mapped to IPDS

For MVS/VSE:

MIB attribute	IPDS XOH DGB Group ID	Data type
-----+-----+-----		
jobSourcePlatformType sptMVS(7)	Byte 2 = x'01'	Integer
jobName	Bytes 4-11	Octet String

For VM:

MIB attribute	IPDS XOH DGB Group ID	Data type
-----+-----+-----		
jobSourcePlatformType sptVM(8)	Byte 2 = x'02'	Integer
fileName	Bytes 4-11	Octet String

For OS/400:

MIB attribute	IPDS XOH DGB Group ID	Data type
-----+-----+-----		
jobSourcePlatformType sptOS400(9)	byte 2 = x'03'	Integer
fileName	Bytes 23-32	Octet String
jobName	Bytes 37-46	Octet String

6.0 DOCUMENT PRINTING APPLICATION (DPA)

The ISO 10175 Document Printing Application (DPA) [DPA] supports printing using any one of the three possible configurations. For configuration 2, the mapping defined herein is performed on a server. Otherwise, the mapping is performed on an agent within the printer.

6.1 jmJobSubmissionID Mapped to DPA

DPA contains a rich set of parameters which allow several methods of creating the jmJobSubmissionID object. To prevent interoperability problems, the preferred method is to use the DPA job-owner attribute as follows:

octet 1: '0'

octets 2-40: Contains the DPA job-owner attribute supplied by the submitter. If the job-owner is less than 40 octets, the left-most character in the string shall appear in octet position 2. Any unused portion of this field shall be filled with spaces. Otherwise, only the last 39 bytes shall be included.

octets 41-48: Contains an 8-digit sequential decimal number.

6.2 jmJobIndex Mapped to DPA

The job index (jmJobIndex) assigned by the SNMP job monitoring agent is returned to the client by DPA as a decimal digit string as the value of the DPA job-identifier attribute. (Since DPA does not require consecutively generated job-identifiers, the agent may receive jobs from multiple clients and can assign the jmJobIndex in an ascending sequence independent of the submitting job client.) The DPA job-identifier must be restricted to the range of 1 to 99,999,999 (decimal) to allow the value to be properly represented in jmJobSubmissionID.

NOTE - Since DPA returns the "job-identifier" attribute with the jmJobIndex value for a job when the job is submitted, the use of the jmJobSubmissionID table should not be needed by a management application. See Section 1.0.

6.3 Other MIB Objects Mapped to DPA

MIB Object	DPA Job attribute
-----	-----
jmJobState	job-state
jmJobStateReasons1	job-state-reasons (note 2)
jmNumberOfInterveningJobs	intervening-jobs
jmJobKOctetsPerCopyRequested	total-job-octets (notes 1, 3)
jmJobKOctetsProcessed	job-octets-completed (note 1)
jmJobImpressionsPerCopyRequested	job-impression-count (note 3)
jmJobImpressionsCompleted	impressions-completed
jmJobOwner	job-owner

Notes:

-
1. jmJobKOctetsPerCopyRequested and jmJobKOctetsProcessed is in K octets while the DPA job-total-octets and job-octets-completed is in octets and is 63-bits of significance.

2. jmJobStateReasons1 is a bit map which can describe up to 31 job state reasons. Also the DPA "job-state-reasons" attribute is a multi-valued attribute with each value being an object identifier (OID). The DPA condition may change multiple bits in this object. The DPA condition may also change one or more of the jobStateReasonsN attributes (see section 4.4)
3. DPA octets include the multiplication factor due to job and document copies, while the MIB values do not.

6.4 The Attribute Group Mapped to DPA

The following mappings are required if the listed DPA job attribute is provided.

MIB attribute	DPA job attribute	IPP Data type
jobStateReasonsN(N=2, 3, 4)	job-state-reasons (note 2)	Integer
jobCodedCharSet	(note 1)	Octet String
jobAccountName	accounting-information	Octet String
jobName	job-name	Octet String
deviceNameRequested	printer-name-requested	Octet String
physicalDevice	printers-assigned	Octet String
numberOfDocuments	number-of-documents	Integer
fileName	file-name	Octet String
documentName	document-name	Octet String
jobComment	job-comment	Octet String
documentFormat	document-format	Octet String
jobPriority	job-priority	Integer
jobProcessAfterDateAndTime	job-print-after	Octet String
outputBin	results-profile.output-bin	Octet String
sides	sides (note 3)	Integer
finishing	job-finishing, finishing	Integer
printQualityRequested	print-quality	Integer
printerResolutionRequested	default-printer-resolution (note 4)	Integer
jobCopiesRequested	results-profile.job-copies	Integer
jobCopiesCompleted	job-copies-completed	Integer
documentCopiesRequested	copy-count (note 5)	Integer
documentCopiesCompleted	copies-completed (note 6)	Integer
sheetsRequested	job-media-sheet-count	Integer
sheetsCompleted	job-media-sheets-completed	Integer
pagesRequested	job-page-count	Integer
pagesCompleted	pages-completed	Integer
mediumRequested	page-media-select, default-medium	Octet String
jobSubmissionTime	submission-time (note 7)	Octet String
jobStartedProcessingTime	started-printing-time (note 7)	Octet String
jobCompletionTime	completion-time (note 7)	Octet String

Notes:

1. Every DPA attribute is tagged indicating the coded character set to be used for that attribute.
2. jobStateReasonsN are three attributes (N=2, 3, 4). The DPA condition may change one or more of the bits in one or more of these Job MIB items. Also the DPA job-state-reasons is a multi-valued attribute with each value being an OBJECT IDENTIFIER (OID).
3. The Job MIB sides attribute is an integer '1' or '2' while the DPA sides attribute has one of six OID values that includes plex.
4. printerResolutionRequested has x and y resolution and is intended to override the resolution instruction in the document, if any, while the DPA default-printer-resolution is the same in x and y and only takes effect if the document does not contain a resolution instruction
5. The DPA "copy-count" attribute is a per-document attribute, so the MIB value is the sum of the documents' "copy-count" values times the job's "results-profile.job-copies" value.
6. The DPA "copies-completed" attribute is a per-document attribute, so the MIB value is the sum of the documents' "copies-completed" values times the job's "results-profile.job-copies" value.
7. The DPA GeneratlizedTime data type is defined by ISO 8824 (ISO-8824) while the MIB DateAndTime is defined by SNMPv2-TC (SNMPv2-TC).

7.0 NOVELL DISTRIBUTED PRINT SERVICE (NDPS)

Novell Distributed Print Services is a DPA based job submission protocol that conforms to configuration 3.

7.1 jmJobSubmissionID Mapped to NDPS

NDPS supports the generation of a properly formatted jmJobSubmissionID for use in the Job MIB, via the attribute ndps-att-job-identifier.

7.2 jmJobIndex Mapped to NDPS

NDPS defines the attribute ndps-att-job-identifier-on-printer that can be used to return the value of jmJobIndex to the NDPS client. See Section 1.0.

7.3 Other MIB Objects Mapped to NDPS

MIB Object	NDPS Parameter
jmJobState	ndps-att-current-job-state (note 1)
jmJobStateReasons1	ndps-att-job-state-reasons (note 2)
jmNumberOfInterveningJobs	ndps-att-intervening-jobs
jmJobKOctetsPerCopyRequested	ndps-att-total-job-octets (notes 3,4)
jmJobKOctetsProcessed	ndps-att-octets-completed (note 3)
jmJobImpressionsPerCopyRequested	ndps-att-job-impressions-count
jmJobImpressionsCompleted	ndps-att-impressions-completed
jmJobOwner	ndps-att-job-owner (note 5)

Notes:

1. Some of the NDPS job states must be represented by both a jmJobState and a jmJobStateReasons1 object or a jobStateReasonsN attribute (N=2, 3, 4).
2. The NDPS job state reasons may be mapped to either the object jmJobStateReasons1 or the attribute jobStateReasonsN (N=2, 3, 4).
3. jmJobKOctetsPerCopyRequested and jmJobKOctetsProcessed is in K octets while the NDPS ndps-att-job-total-octets and ndps-att-job-octets-completed is in octets and is 63-bits of significance.
4. NDPS octets include the multiplication factor due to job and document copies, while the MIB values do not.
5. The Job MIB object must be multiplied by the attribute jobCopiesRequested to obtain the NDPS attribute value, if multiple copies have been requested.

7.4 The Attribute Group Mapped to NDPS

The following mappings are required if the listed PJL attribute or command option is provided.

MIB attribute	NDPS parameter	Data type
jobStateReasonsN(N=2, 3, 4)	ndps-job-state-reasons	Integer
jobAccountName	ndps-att-job-owner	Octet String
jobName	ndps-att-job-name	Octet String
jobOriginatingHost	ndps-att-job-originator	Octet String
deviceNameRequested	ndps-att-printer-name-- requested	Octet String
numberOfDocuments	ndps-att-number-of-documents	Integer
fileName	ndps-att-document-file-name	Octet String
documentName	ndps-att-document-name	Octet String
jobComment	ndps-att-job-comment	Octet String
documentFormatIndex	ndps-att-prtInterpreterIndex	Integer
documentFormat	ndps-att-document-format	Integer
jobPriority	ndps-att-job-priority	Integer
jobProcessAfterDateAndTime	ndps-att-job-print-after	Octet String
outputBin	ndps-att-results-profile (note 1)	Integer
sides	ndps-att-sides (note 2)	Integer
finishing	ndps-att-job-finishing	Integer
printQualityRequested	ndps-att-print-quality	Integer
printerResolutionRequested	ndps-att-default-printer-- resolution (note 3)	Integer
printerResolutionUsed	ndps-att-default-resolutions-- used	Integer
jobCopiesRequested	ndps-att-results-profile (note 4)	Integer
jobCopiesCompleted	ndps-att-job-copies-completed	Integer
documentCopiesRequested	ndps-att-copy-count (note 5)	Integer
documentCopiesCompleted	ndps-att-copies-completed (note 6)	Integer
sheetsRequested	ndps-att-job-media-- sheet-count	Integer
sheetsCompleted	ndps-att-media-sheets-- completed	Integer
mediumConsumed	ndps-att-media-used	Integer
jobSubmissionToServerTime	ndps-att-submission-time (note 7)	Octet String
jobSubmissionTime	ndps-att-started-printing-time (note 7)	Octet String
jobCompletionTime	ndps-att-completion-time (note 7)	Octet String

Notes:

1. The output-bin field in ndps-att-results-profile is to be used.
2. The Job MIB sides attribute is an integer '1' or '2' while the NDPS sides attribute has one of six OID values that includes plex.

3. printerResolutionRequested has x and y resolution and is intended to override the resolution instruction in the document, if any, while the ndps-att-default-printer-resolution is the same in x and y and only takes effect if the document does not contain a resolution instruction
4. The job-copies field in ndps-att-results-profile is to be used.
5. The NDPS "copy-count" attribute is a per-document attribute, so the MIB value is the sum of the documents' "copy-count" values times the job's "results-profile.job-copies" value.
6. The NDPS "copies-completed" attribute is a per-document attribute, so the MIB value is the sum of the documents' "copies-completed" values times the job's "results-profile.job-copies" value.
7. The NDPS GeneralizedTime data type is defined by ISO 8824 (ISO-8824) while the MIB DateAndTime is defined by SNMPv2-TC (SNMPv2-TC).

8.0 PRINTER JOB LANGUAGE (PJL)

PJL [PJL] has been developed by Hewlett-Packard to provide job control information to the printer and status information to applications, independent of the PDL.

8.1 jmJobSubmissionID Mapped to PJL

PJL has defined the SUBMISSIONID option for the JOB command which indicates a properly formatted jmJobSubmissionID for use in the Job MIB. The PJL JOB command is presented at the start of a print job with options that apply only the attached job. The syntax for this command option is:

```
@PJL JOB SUBMISSIONID = "id string"
```

Driver software that implements this PJL command option must provide the "id string" in one of the client version formats specified in the Job MIB for jmJobSubmissionID.

For drivers that are not able to create the SUBMISSIONID option, it is recommended that jmJobSubmissionID format 0 be created by the agent using the PJL attribute DocOwner or DocOwnerId.

octet 1: '0'

octets 2-40: Contains the string associated with DocOwner or DocOwnerId. If the string is less than 40 octets, the left-most character in the string shall appear in octet

position 2. Otherwise, only the last 39 bytes shall be included. Any unused portion of this field shall be filled with spaces. If DocOwner or DocOwnerId cannot be obtained, this field shall be blank.

octets 41-48: Contains the value of jmJobIndex associated with the job. Leading zeros shall be inserted to fill the entire 8 octet field.

8.2 jmJobIndex Mapped to PJL

PJL does not provide a value that can be mapped to jmJobIndex.

8.3 Other MIB Objects Mapped to PJL

MIB Object	PJL Job attribute
-----	-----
jobOwner	DocOwner or DocOwnerId attribute

8.4 The Attribute Group Mapped to PJL

The following mappings are required if the listed PJL attribute or command option is provided.

MIB attribute	PJL attribute or command option	Data type
-----	-----	-----
serverAssignedJobName	DocName attribute or the command	Octet String
	@PJL JOB Name = "string"	Octet String
submittingServerName	SrcServerName attribute	Octet String
jobOriginatingHost	SrcPort attribute	Octet String
queueNameRequested	SrcQ attribute	Octet String
fileName	JobFName attribute	Octet String
jobComment	JobDesc attribute	Octet String
jobSubmissionTime	TimeSubmit attribute	Octet String

9.0 POSTSCRIPT

The PostScript PDL permits comment fields which can be used by application drivers to include job information. Although there are no restrictions or requirements as to what information may be included, many drivers include job owner and/or document name.

9.1 jmJobSubmissionID Mapped to PostScript

The use of a standard format job submission id comment string will allow interoperability of printers and drivers from multiple vendors. The following comment string format is recommended for use with PostScript level 1 and level 2 data streams.

```
%%JMPJobSubmissionId:(id-string)
```

where "id string" can be any jmJobSubmissionID format reserved for clients.

9.2 Other MIB Objects and Attributes Mapped to PostScript

No Other mappings from PostScript comment strings are recommended, but many Job MIB objects and attributes can be defined using vendor unique comment strings.

10.0 NETWARE PSERVER

The NetWare PServer job submission protocol is implemented in a client- server-printer system on the server to printer link as defined in configuration 3.

10.1 jmJobSubmissionID Mapped to PServer

octet 1: 'B'

octets 2-40: Contains the Directory Path Name of the agent as recorded by the Novell File Server in the queue directory. If the string is less than 40 octets, the left-most character in the string shall appear in octet position 2. Otherwise, only the last 39 bytes shall be included. Any unused portion of this field shall be filled with spaces.

octets 41-48: '000XXXXX' The decimal (ASCII coded) representation of the Job Number as per the NetWare File Server Queue Management Services.

10.2 jmJobIndex Mapped to PServer

The job index (jmJobIndex) is assigned by the SNMP job monitoring agent and is independent of the Job Number assigned by the NetWare File Server Queue Management Services. This will allow the SNMP agent to track jobs received from multiple sources.

10.3 Other MIB Objects Mapped to PJL

MIB Object	PServer Job attribute
-----+-----	
jobOwner	Client Id Number

10.4 The Attribute Group Mapped to PServer

The following mappings are required if the listed PServer parameter is provided in the Novell File Server queue directory.

MIB attribute	PServer parameter	Data type
-----+-----		
serverAssignedJobName	Job File Name	Octet String
queueNameRequested	Queue Id	Integer
physicalDevice	Server Id Number	Integer
jobComment	Job Description	Octet String
jobPriority	(note 1)	Integer
jobProcessAfterDateAndTime	Target Execution Time	Octet String
jobCopiesRequested	Number of Copies	Integer
mediumRequested	Form Name	Octet String
jobSubmissionToServerTime	Job Entry Time	Octet String

Notes:

1. The job priority is determined by the priority assigned to the queue that contains the job. Each queue can be assigned a unique priority and the priority of the job is inherited from the queue.

11.0 NETWARE NPrinter or RPrinter

The NetWare NPrinter/RPrinter protocol was designed to transfer print data from a Novell File Server to a printer attached directly to a local port (e.g. parallel or serial) on a PC. NPrinter/RPrinter is an extremely lightweight printing protocol. Consequently, no information required by the Job Monitoring MIB is provided and a meaningful jmJobSubmissionID cannot be generated.

It is recommended that an additional job submission layer, such as PJL or another vendor private protocol, be included on top of NPrinter/RPrinter to provide the required information. The mapping should then be performed according to the recommendations of the higher layer submission protocol.

12.0 SERVER MESSAGE BLOCK (SMB) PROTOCOL

The Server Message Block protocol is used with several PC Network operating systems, such as Microsoft Windows for Workgroups, IBM LAN Server, and Artisoft Lantastic. SMB systems supporting the Job Monitoring MIB will conform to either configuration 1 or 3.

12.1 jmJobSubmissionID Mapped to SMB

octet 1: 'C'

octets 2-40: Contains a decimal (ASCII coded) representation of the 16 bit SMB Tree Id field, which uniquely identifies the connection that submitted the job to the printer. The most significant digit of the numeric string shall be placed in octet position 2. All unused portions of this field shall be filled with spaces. The SMB Tree Id has a maximum value of 65,535.

octets 41-48: Contains a decimal (ASCII coded) representation of the File Handle returned from the printer agent to the client in response to a Create Print File command. Leading zeros shall be inserted to fill the entire 8 octet field.

12.2 jmJobIndex Mapped to SMB

It is strongly recommended that the File Handle returned from the printer agent be identical to jmJobIndex. If these items are identical, there is no need for the client application to perform a search on jmJobSubmissionID. To be compatible with the 16 bit field allocated to this value by SMB, the maximum jmJobIndex is 65,535.

12.3 Other MIB objects Mapped to SMB

MIB Object	SMB Parameter
-----+-----	
jmJobOwner	SMB User Id field (note 1)

Notes:

1. A decimal (ASCII coded) representation of the SMB User Id numeric shall be presented as jmJobOwner.

13.0 TRANSPORT INDEPENDENT PRINTER/SYSTEM INTERFACE (TIP/SI)

The TIP/SI protocol, although currently specified as a part of the IEEE 1284 parallel port standards [TIP/SI], was originally developed as a network protocol. TIP/SI thus has the potential of being integrated into any network or non-network configuration.

13.1 jmJobSubmissionID Mapped to TIP/SI

octet 1: 'D'

octets 2-40: Contains the Job Name from the Job Control-Start Job (JC-SJ) command. If the Job Name portion is less than 40 octets, the left-most character in the string shall appear in octet position 2. Any unused portion of this field shall be filled with spaces. Otherwise, only the last 39 bytes shall be included.

octets 41-48: Contains a decimal (ASCII coded) representation of the jmJobIndex assigned by the agent. Leading zeros shall be inserted to fill the entire 8 octet field.

13.2 jmJobIndex Mapped to TIP/SI

jmJobIndex is returned to the client as the Printer Assigned Job Id in a Job Control-Start Job (JC-SJ) response packet. To be compatible with the 16 bit field allocated to this value by TIP/SI, the maximum jmJobIndex is 65,535.

13.3 Other MIB Objects Mapped to TIP/SI

MIB Object	TIP/SI Parameter
-----+-----	
jmJobOwner	User string

13.4 The Attribute Group Mapped to TIP/SI

MIB attribute	TIP/SI information	Data type
-----+-----+-----		
jobName	Job Name string	Octet String
jobComment	Additional Information string	Octet String

14.0 Security Considerations

This document provides mapping recommendations of job submission protocols for use with the Job Monitoring MIB. The mapping procedures defined do not enhance or compromise any security provisions available within the job submission protocols contained within this document.

The security considerations specified for the Job Monitoring MIB [JobMIB] are also unaffected by any of the recommendations in this document.

The security provisions available in the job submission protocols are documented in the appropriate specifications that define the protocols. The degree of security available varies from very good, for protocols such as the Internet Printing Protocol [IPP], to non-existent, for example the Line Printer Daemon Protocol [LPD].

Since the defined mapping operation occurs as a secondary operation after the user has been authenticated and there is no storage of any authorization credentials other than the user name, no security breaches are anticipated. Also, the Job MIB does not provide any back-door mechanism for access to any other security parameters. However, implementers must always consider the impact of the defined mapping procedures upon the security model desired from the protocol.

15.0 REFERENCES

- [DPA] ISO/IEC 10175-1:1996(E), "Information technology - Text and office systems - Document Printing Application (DPA) - Part 1: Abstract service definition and procedures", JTC1/SC18.
- [IPP] deBry, R., Hastings, T., Herriot, R., Issacson, S. and P. Powell, "The Internet Printing Protocol/1.0: Model and Semantics", RFC 2566, April 1999.
- [ISO-8824] ISO/IEC 8824:1990, "Information technology - Open Systems Interconnection - Specification of Abstract Syntax Notation (ASN.1)".
- [JobMIB] Bergman, R., Hastings, T., Isaacson, S. and H. Lewis, "The Job Monitoring MIB - V1.0", RFC 2707, November 1999.
- [LPD] McLaughlin, L., "Line Printer Daemon Protocol", RFC 1179, August 1990.

- [PJL] Printer Job Language Technical Reference Manual,
 Hewlett-Packard part number 5021-0328.
- [PrtMIB] Smith, R., Wright, F., Hastings, T., Zilles, S. and J.
 Gyllenskog, "Printer MIB", RFC 1759, March 1995.
- [SNMPv2-TC] McCloghrie, K., Perkins, D. and J. Schoenwaelder,
 "Textual Conventions for SMIV2", STD 58, RFC 2579, April
 1999.
- [TIP/SI] IEEE Standard 1284.1, Transport Independent
 Printer/System Interface.

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