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2 Internet Printing Protocol (IPP):
3 Requirements for Job, Printer, and Device Administrative Operations
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14 Abstract

15 This document is a submission to the Internet Printing Protocol Working Group of the Internet Engineering
16 Task Force (IETF). After approval, it is intended to be an Informational RFC. Comments should be
17 submitted to the ipp@pwg.org mailing list.

18 This document specifies the requirements and use cases for some OPTIONAL administrative operations for
19 use with the Internet Printing Protocol/1.0 (IPP) [RFC2565, RFC2566] and IPP/1.1 [ipp-mod, ipp-pro].
20 Some of these administrative operations operate on the IPP Job and Printer objects. The remaining
21 operations operate on a new Device object that more closely models a single output device (see [ipp-mod]).

22 The scope of IPP, is characterized in RFC2526 “Design Goals for an Internet Printing Protocol”. It is not
23 the intent of this document to revise or clarify this scope or conjecture as to the degree of industry adoption
24 or trends related to IPP within printing systems. It is the intent of this document to extend the original set
25 of operations - in a similar fashion to the Set1 extensions which referred to IPP/1.0 and were later
26 incorporated into IPP/1.1.

27 The full set of IPP documents includes:

- 28 Design Goals for an Internet Printing Protocol [RFC2567]
 - 29 Rationale for the Structure and Model and Protocol for the Internet Printing Protocol [RFC2568]
 - 30 Internet Printing Protocol/1.1: Model and Semantics [IPP-MOD]
 - 31 Internet Printing Protocol/1.1: Encoding and Transport [IPP-PRO]
 - 32 Internet Printing Protocol/1.1: Implementer’s Guide [IPP-IIG]
 - 33 Mapping between LPD and IPP Protocols [RFC2569]
- 34

35 The “Design Goals for an Internet Printing Protocol” document takes a broad look at distributed printing
36 functionality, and it enumerates real-life scenarios that help to clarify the features that need to be included
37 in a printing protocol for the Internet. It identifies requirements for three types of users: end users,
38 operators, and administrators. It calls out a subset of end user requirements that are satisfied in IPP/1.0. A
39 few OPTIONAL operator operations have been added to IPP/1.1.

40 The “Rationale for the Structure and Model and Protocol for the Internet Printing Protocol” document
41 describes IPP from a high level view, defines a roadmap for the various documents that form the suite of
42 IPP specification documents, and gives background and rationale for the IETF working group’s major
43 decisions.

44 [The “Internet Printing Protocol/1.1: Model and Semantics”, describes a simplified model with abstract
45 objects, their attributes, and their operations that are independent of encoding and transport. It introduces a
46 Printer object and a Job object. The Job object optionally supports multiple documents per Job. It also
47 addresses security, internationalization, and directory issues.](#)

48 The “Internet Printing Protocol/1.1: Encoding and Transport” document is a formal mapping of the abstract
49 operations and attributes defined in the model document onto HTTP/1.1 [RFC2616]. It defines the
50 encoding rules for a new Internet MIME media type called “application/ipp”. This document also defines
51 the rules for transporting over HTTP a message body whose Content-Type is “application/ipp”. This
52 document defines a new scheme named ‘ipp’ for identifying IPP printers and jobs.

53 The “Internet Printing Protocol/1.1: Implementer’s Guide” document gives insight and advice to
54 implementers of IPP clients and IPP objects. It is intended to help them understand IPP/1.1 and some of the
55 considerations that may assist them in the design of their client and/or IPP object implementations. For
56 example, a typical order of processing requests is given, including error checking. Motivation for some of
57 the specification decisions is also included.

58 The “Mapping between LPD and IPP Protocols” document gives some advice to implementers of gateways
59 between IPP and LPD (Line Printer Daemon) implementations.

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74 1 Introduction

75 The Internet Printing Protocol (IPP) is an application level protocol that can be used for distributed printing
76 using Internet tools and technologies. IPP version 1.1 ([ipp-mod, ipp-pro]) focuses on end user
77 functionality with a few administrative operations included. This document defines the requirements and
78 use cases for additional OPTIONAL end user, operator, and administrator operations used to control Job
79 objects, Printer objects (see [ipp-mod]) and a new Device object. The new Device object more closely
80 models a single output device and has no notion of a job, while the Printer object models a print service
81 which understands jobs and MAY represent one or more output devices.

82 2 Terminology

83 This section defines terminology used throughout this document and the corresponding documents that
84 define the Administrative operations on Job, Printer, and Device objects.

85 This document uses terms such as “attributes”, “keywords”, and “support”. These terms have special
86 meaning and are defined in the model terminology [ipp-mod] section 12.2.

87 In addition, the following capitalized terms are defined:-

88 **IPP Printer object (or Printer for short)** - a software abstraction defined by [ipp-mod].

89 **Printer Operation** - an operation whose target is an IPP Printer object and whose effect is on the
90 Printer object.

91 **Output Device** - the physical imaging mechanism that an IPP Printer controls. Note: while this term is
92 capitalized in this specification (but not in [ipp-mod]), there is no formal object called an Output
93 Device.

94 **Device Operation** - an operation whose target is an IPP Printer object and whose defined effect is
95 on an Output Device.

96 **Output Device Fan-Out** - a configuration in which an IPP Printer controls more than one output-
97 device.

98 **Printer fan-out** - a configuration in which an IPP Printer object controls more than one Subordinate
99 IPP Printer object.

100 **Printer fan-in** - a configuration in which an IPP Printer object is controlled by more than one IPP
101 Printer object.

102 **Subordinate Printer** - an IPP Printer object that is controlled by another IPP Printer object. Such a
103 Subordinate Printer MAY have one or more Subordinate Printers.

104 **Leaf Printer** - a Subordinate Printer that has no Subordinate Printers.

105 **Non-Leaf Printer** - an IPP Printer object that has one or more Subordinate Printers.

106 **Chained Printer** - a Non-Leaf Printer that has exactly one Subordinate Printer.

107 **Job Creation operations** - IPP operations that create a Job object: Print-Job, Print-URI, and Create-
108 Job.

109 3 Requirements and Use Cases

110 The Administrative operations for Job and Printer objects will be defined in one document [ipp-admin-ops].
111 The Administrative operations for Device objects will be defined in a separate document (see [ipp-device-
112 ops]). The requirements are presented here together to show the parallelism.

- 113 1. Have separate operations for affecting the IPP Printer versus affecting the Output Device, so its clear
114 what the intent of each is and implementers can implement one or the other or both.
- 115 2. Support fan-out of Printer objects.
- 116 3. Support fan-out of Output Devices.
- 117 4. Support fan-in of Printer objects, as long as it doesn't make the semantics more complicated when not
118 supporting fan-in.
- 119 5. Support fan-in of output objects, as long as it doesn't make the semantics more complicated when not
120 supporting fan-in.
- 121 6. Instead of having operation attributes that alter the behavior of the operation significantly, have separate
122 operations, so that it is simple and clear to a client which semantics the Printer is supporting (by
123 querying the "operations-supported" attribute) and it is simple to describe the capabilities of a Printer
124 implementation in written documentation (just list the OPTIONAL operations supported).
- 125 7. Need a Printer Operation to prevent a Printer object from accepting new IPP jobs, but currently
126 accepted jobs continue unaffected to be scheduled and processed. Need a companion one to restore the
127 Printer object to accept new IPP jobs.

128 Usage: Operator is preparing to take the IPP Printer out of service or to change the configuration of the
129 IPP Printer.

130 Suggested name and operations: **Disable-Printer** and **Enable-Printer**

- 131 8. Need a Device Operation to prevent an Output Device from accepting any new jobs from any job
132 submission protocol and a companion one to restore the Output Device to accepting any jobs.

133 Usage: Operator is preparing to take the Output Device out of service.

134 Suggested name and operations: **Disable-Device** and **Enable Device**

- 135 9. Need a Printer Operation to stop the processing after the current IPP job completes and not start
136 processing any additional IPP jobs (either by scheduling the jobs or sending them to the Output Device),
137 but continue to accept new IPP jobs. Need a companion operation to start processing/sending IPP jobs
138 again.

139 Usage: Operator wants to gracefully stop the IPP Printer at the next job boundary. The Pause-Printer-
140 After-Current-Job operation is also invoked implicitly by the Deactivate-Printer and the Shutdown-
141 Printer Operations.

142 Suggested name and operations: **Pause-Printer-After-Current-Job, (IPP/1.1) Resume-Printer**

143 10. Need a Device Operation to stop the processing the current job “immediately”, no matter what protocol.
144 Its like the Pause button on the Output Device. This operation is for emergencies. The stop point
145 depends on implementation, but can be mid page, end of page, end of sheet, or after a few sheets for
146 Output Devices that can’t stop that quickly. The paper path isn’t run out. Need a companion operation
147 to start processing the current any-protocol job without losing any thing.

148 Usage: Operator sees something bad about to happen, such as the paper is about to jam, or the toner is
149 running out, or the device is overheating or wants to add more paper.

150 Suggested name and operations: **Pause-Device-Now, Resume-Device**

151 11. Need a Printer Operation to stop the processing of IPP jobs after all of the currently accepted jobs have
152 been processed, but any newly accepted jobs go into the ‘processing-held’ state.

153 Usage: This allows an operator to reconfigure the Output Device in order to let jobs that are held
154 waiting for resources, such as special media, to get a chance. Then the operator uses another operation
155 after reconfiguring. He repeats the two operations to restore the Output Device to its normal media.

156 Suggested name and operations: **Hold-New-Jobs, Release-Held-New-Jobs**

157 12. Need a Device Operation to stop the processing the current any-protocol job at a convenient point, such
158 as after the current copy (or end of job if last or only copy). Need a companion operation to start
159 processing the current any-protocol job or next job without losing any thing.

160 Usage: The operator wants to empty the output bin that is near full. The paper path is run out.

161 Suggested name and operations: **Pause-Device-After-Current-Copy, Resume-Device**

162 13. Need a Device Operation that always pauses on a device-defined boundary, no matter how many copies,
163 in order to not break up a job. Need a companion operation to start processing the current any-protocol
164 job or next job without losing any thing.

165 Usage: The operator wants to empty the output bin that is near full, but he doesn’t want to break up a
166 job in case it has multiple copies. The paper path is run out.

167 Suggested name and operations: **Pause-Device-After-Current-Job, Resume-Device**

168 14. Need a Printer Operation that combines Disable-Printer, Pause-Printer-After-Current-Job, and rejects all
169 other Job, Printer, and Device Operations, except Job and Printer queries, System Administrator Set-
170 Printer-Attributes, and the companion operation to resume activity. In other words, this operation
171 makes the Printer a read-only object in a graceful manner for end-users and the operator.

172 Usage: The administrator wants to reconfigure the Printer object using the Set-Printer-Attributes
173 operation without disturbing the current in process work, but wants to make sure that the operator isn't
174 also trying to change the Printer object as part of running the Printer.

175 Suggested name and operation: **Deactivate-Printer, Activate-Printer**

176 15. Need a Device Operation that combines Disable-Device, Pause-Device-After-Current-Job, and rejects
177 all other Device Operations, except Job and Printer queries and the companion operation to resume
178 activity. In other words, this operation makes the Output Device a read-only object in a graceful
179 manner.

180 Usage: The field service person wants to open up the device without disturbing the current in process
181 work, perhaps to replace staples, or replace the toner cartridge.

182 Suggested name and operation: **Deactivate-Device, Activate-Device**

183 16. Need a Printer Operation to recover from the IPP Printer software that has gotten confused (run out of
184 heap memory or gotten into a state that it doesn't seem to be able to get out of). This is a condition that
185 shouldn't happen, but does in real life. Any volatile information is saved if possible before the software
186 is re-initialized. No companion operation is needed to undo this. We don't want to go back to the
187 "confused" state :-).

188 Usage: The IPP Printer software has gotten confused or isn't responding properly.

189 Suggested name and operation: **Restart-Printer**

190 17. Need a Device Operation to recover from the Output Device hardware and software that has gotten
191 confused (gotten into a state that it doesn't seem to be able to get out of, run out of heap memory, etc.).
192 This is a condition that shouldn't happen, but does in real life. This is the same and has the same
193 options as the Printer MIB reset. No companion operation is needed to undo this. We don't want to go
194 back to the "confused" state :-).

195 Usage: The Output Device has gotten confused or need resetting to some initial conditions.

196 Suggested name and operation: **Reset-Device**

197 18. Need a Printer Operation to put the IPP Printer object out of business with no way in the protocol to
198 bring that instantiation back to life (but see Startup-Printer which brings up exactly one new
199 instantiation to life with the same URL). Any volatile information is saved if possible.

200 Usage: The Printer is being moved or the building's power is being shut off.

201 Suggested name and operation: **Shutdown-Printer**

202 19. Need a Printer Operation to bring an IPP Printer to life when there is an already running host.

203 Usage: After the host is started (by means outside the IPP protocol), the operator is able to ask the host
204 to bring up any number of Printer objects (that the host has been configured in some way) each with
205 distinct URLs.

206 Suggested name and operation: **Startup-Printer**

207 20. Need a Device Operation to power off the Output Device after writing out any software state. It is
208 assumed that other operations have more gracefully prepared the Output Device for this drastic and
209 immediate. There is no companion Device Operation to bring the power back on.

210 Usage: The Output Device is going to be moved, the power in the building is going to be shutoff, the
211 repair man has arrived and needs to take the Output Device apart.

212 Suggested name and operation: **Power-Off-Device**

213 21. Need a Device Operation to startup a powered-off device.

214 Usage: After a Power-Off-Device, if the device can be powered back up (possibly by an intervening
215 host that supports the Device Operation).

216 Suggest name and operation: Power-On-Device

217 The tentative list of Printer and the corresponding Device Operations is shown in Table 1:

218

Table 1 - List of Printer Operations and corresponding Device Operations

Printer Operation	Corresponding Device Operation equivalent (see [ipp-device-ops])
Disable-Printer	Disable-Device
Enable-Printer	Enable-Device
Pause-Printer (IPP/1.1 - [ipp-mod] - one interpretation)	Pause-Device-Now
no	Pause-Device-After-Current-Copy
Pause-Printer-After-Current-Job	Pause-Device-After-Current-Job
Resume-Printer (IPP/1.1 - [ipp-mod])	Resume-Device
Hold-New-Jobs	no
Release-Held-New-Jobs	no
Deactivate-Printer	Deactivate-Device
Activate-Printer	Activate-Device
Purge-Jobs (IPP/1.1 - [ipp-mod])	Purge-Device
Restart-Printer	Reset-Device
Shutdown-Printer	Power-Off-Device
Startup-Printer	Power-On-Device

219 There are no conformance dependencies between Printer Operations and Device Operations. Either MAY
 220 be supported without supporting the corresponding operations.

221

222 4 IANA Considerations

223 The operations and attributes in this registration proposal will be published by IANA according to the
 224 procedures in RFC 2566 [rfc2566] section 6.4 for operations with the following URL:

225 <ftp://isi.edu/iana/assignments/ipp/operations/ipp-admin-ops.txt>

226 5 Internationalization Considerations

227 This document has the same localization considerations as the [ipp-mod].

228 6 Security Considerations

229 The IPP Model and Semantics document [ipp-mod] discusses high level security requirements (Client
 230 Authentication, Server Authentication and Operation Privacy). Client Authentication is the mechanism by

231 which the client proves its identity to the server in a secure manner. Server Authentication is the mechanism
232 by which the server proves its identity to the client in a secure manner. Operation Privacy is defined as a
233 mechanism for protecting operations from eavesdropping.

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279 **9 Appendix A: Full Copyright Statement**

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