Internet Printing Protocol Working Group — Bob Herriot
INTERNET DRAFT — Xerox
Expires 11 July 2001 — Ira McDonald
High North
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Internet Printing Protocol (IPP): IPP URL Scheme

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Status of this Memo

Abstract

This document is a product of the Internet Printing Protocol Working Group of the Internet Engineering Task Force (IETF). Comments should be submitted to the ipp@pwg.org mailing list.

The open issues in this document each begin 'ISSUE_n:'.

This document specifies the "ipp" URL (Uniform Resource Locator) scheme for specifying the location of an IPP Printer which implements IPP/1.0 [RFC-2565] [RFC-2566], IPP/1.1 [RFC-2910] [RFC-2911], or any later version of IPP. This document is intended for use in registering the "ipp" URL scheme with IANA and fully conforms to the requirements in [RFC-2717].

The IPP URL scheme defined in this document is based on the ABNF for the basic hierarchical URL syntax in [RFC-2396]; however relative URL forms, parameters, and/or query parts are NOT allowed in an IPP URL. The IPP URL scheme is case-insensitive in the host name or host address part; however the path part is case-sensitive, as in [RFC-2396]. Codepoints outside [US-ASCII] MUST be hex escaped by the mechanism defined in [RFC-2396].

Table of Contents

1. Introduction

See section 1 'Introduction' in [RFC-2911] for a full description of the IPP document set and overview information about IPP.

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This document specifies the "ipp" URL (Uniform Resource Locator) scheme for specifying the location of an IPP Printer which implements IPP/1.0 [RFC-2565] [RFC-2566], IPP/1.1 [RFC-2910] [RFC-2911], or any later version of IPP. This document is intended for use in registering the "ipp" URL scheme with IANA and fully conforms to the requirements in [RFC-2717].

This document defines:

- IPP URL scheme applicability and intended usage;
- IPP URL scheme associated MIME type (i.e., "application/ipp");
- IPP URL scheme syntax in ABNF [RFC-2234];
- IPP URL scheme character encoding;
- IPP URL scheme IANA, internationalization, and security considerations.

This document is laid out as follows:

- Section 2 is the terminology used throughout the document.

- Section 3 provides references to the IPP Printer and IPP Job object model.

- Section 4 specifies IPP URL scheme.

- Section 5 specifies the conformance requirements for IPP Clients and IPP Printers that claim conformance to this document.

- Section 6, 7, and 8 specify IANA, internationalization, and security considerations.

- Sections 9, 10, 11, 12, and 13 list references, acknowledgements, authors' addresses, change history, and full IETF copyright statement.

2. Terminology

This specification document uses the terminology defined in this section.

2.1. Conformance Terminology

The uppercase terms "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT" "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [RFC-2119]. These terms are used to specify conformance requirements for all implementations of this specification.

2.2. Model Terminology

See section 12.2 'Model Terminology' in [RFC-2911].

3. IPP Model for Printers and Jobs

See section 2 'IPP Objects', section 2.1 'Printer Object', and section 2.2 'Job Object' in [RFC-2911] for a full description of the IPP object model and terminology.

4. IPP URL Scheme

4.1. IPP URL Scheme Applicability and Intended Usage

In this document, "IPP Client" means the software (on some hardware platform) that submits, monitors, and/or manages print jobs via IPP/1.0 [RFC-2565] [RFC-2566], IPP/1.1 [RFC-2910] [RFC-2911], or any later version of IPP to a spooler, gateway, or actual printing device.

In this document, "IPP Printer" means the software (on some hardware platform) that receives print jobs and/or job operations via IPP/1.0 [RFC-2565] [RFC-2566], IPP/1.1 [RFC-2910] [RFC-2911], or any later version of IPP from an "IPP Client".

The "IPP Printer" is identified via an IPP URL. This IPP URL MUST NOT contain any parameters or query part.

The IPP URL scheme defined in this document is based on the ABNF for the basic hierarchical URL syntax in [RFC-2396]; however relative URL forms, parameters, and/or query parts are NOT allowed in an IPP URL. The IPP URL scheme is case-insensitive in the host name or host address part; however the path part is case-sensitive, as in [RFC-2396]. Codepoints outside [US-ASCII] MUST be hex escaped by the mechanism defined in [RFC-2396].

4.2. IPP URL Scheme Associated IPP Port

All IPP URLs which do NOT explicitly specify a port MUST be used over IANA-assigned port 631 for the IPP protocol described in [RFC-2910].

See: Appendix A in this document which updates the existing IPP port registration with IANA.

4.3. IPP URL Scheme Associated MIME Type

All IPP protocol operations (requests and responses) MUST be conveyed in an 'application/ipp' MIME media type as registered in [IANA-MIMEREG]. IPP URLs MUST refer to IPP Printers which support this 'application/ipp' MIME media type.

See: Appendix B in this document.

4.4. IPP URL Scheme Syntax in ABNF

The "ipp" URL scheme syntax is formally specified below in ABNF [RFC-2234]. This URL syntax is derived from [RFC-2396], [RFC-2732], and [RFC-2373].

```
                ; note - parameters are NOT allowed on IPP URLs
                ; note - query part is NOT allowed on IPP URLs
ippURI          = "ipp://" hostport [ path ]

hostport        = host [ ":" port ]
host            = hostname | IPv4address | IPv6reference
hostname        = *( domainlabel "." ) toplabel [ "." ]
domainlabel     = alphanum | alphanum *( alphanum | "-" ) alphanum
toplabel        = alpha | alpha *( alphanum | "-" ) alphanum
port            = *digit

                ; note - IPv6 support is added here
                ; see RFC 2732 and RFC 2373 which update RFC 2396
IPv6reference   = "[" IPv6address "]"
IPv6address     = hexpart [ ":" IPv4address ]
IPv4address     = 1*3digit "." 1*3digit "." 1*3digit "." 1*3digit

hexpart         = hexseq | hexseq "::" [ hexseq ] | "::" [ hexseq ]
hexseq          = hex4 *( ":" hex4)
hex4            = 1*4hex

path            = "/" segments
segments        = segment *( "/" segment )

                ; note - parameters are NOT allowed on IPP URLs
                ; see RFC 2396 which does allow parameters
segment         = *segchar
segchar         = unreserved | escaped |
                  ":" | "@" | "&" | "=" | "+" | "$" | ","

                ; note - "[" and "]" are ADDED to 'reserved' for IPv6
                ; see RFC 2732 and RFC 2373 which update RFC 2396
reserved        = ";" | "/" | "?" | ":" | "@" | "&" | "=" | "+" |
                  "$" | "," | "[" | "]"

unreserved      = alphanum | mark
mark            = "-" | "_" | "." | "!" | "~" | "*" | "'" |
                  "(" | ")"

escaped         = "%" hex hex
hex             = digit | "A" | "B" | "C" | "D" | "E" | "F" |
                          "a" | "b" | "c" | "d" | "e" | "f"

alphanum        = alpha | digit
```

```
   alpha         = lowalpha | upalpha

   lowalpha      = "a" | "b" | "c" | "d" | "e" | "f" | "g" | "h" | "i" |
                   "j" | "k" | "l" | "m" | "n" | "o" | "p" | "q" | "r" |
                   "s" | "t" | "u" | "v" | "w" | "x" | "y" | "z"
   upalpha       = "A" | "B" | "C" | "D" | "E" | "F" | "G" | "H" | "I" |
                   "J" | "K" | "L" | "M" | "N" | "O" | "P" | "Q" | "R" |
                   "S" | "T" | "U" | "V" | "W" | "X" | "Y" | "Z"
   digit         = "0" | "1" | "2" | "3" | "4" | "5" | "6" | "7" |
                   "8" | "9"
```

4.5. IPP URL Scheme Character Encoding

The IPP URL scheme defined in this document is based on the ABNF for the basic hierarchical URL syntax in [RFC-2396]; however relative URL forms, parameters, and/or query parts are NOT allowed in an IPP URL. The IPP URL scheme is case-insensitive in the host name or host address part; however the path part is case-sensitive, as in [RFC-2396]. Codepoints outside [US-ASCII] MUST be hex escaped by the mechanism defined in [RFC-2396].

5. Conformance Requirements

5.1. Conformance Requirements for IPP Clients

IPP Clients that conform to this specification:

a) MUST send valid IPP Jobs on port 631 (IANA-assigned default port for IPP) when contacting IPP Printers via IPP URLs that do NOT specify an explicit port;

b) MUST NOT send otherwise valid IPP Jobs on any port other than 631 (IANA-assigned default port for IPP) when contacting IPP Printers via IPP URLs that do NOT specify an explicit port;

c) MUST conform to the ABNF for IPP URLs specified in section 4.4 of this document.

5.2. Conformance Requirements for IPP Printers

IPP Printers that conform to this specification:

a) MUST accept valid IPP Jobs on port 631 (IANA-assigned default port for IPP) from IPP Clients that follow required client authentication and security mechanisms;

b) MUST reject otherwise valid IPP Jobs on any port other than 631 (IANA-assigned default port for IPP) from IPP Clients that follow required client authentication and security mechanisms, unless explicitly configured by system administrators or site policies (e.g., 'trap doors' on port 80 are prohibited);

c) MUST reject received IPP URLs (e.g. in the "printer-uri" operation attribute in 'Print-Job') that do not conform to the ABNF for IPP URLs specified in section 4.4 of this document.

6. IANA Considerations

This IPP URL Scheme specification does not introduce any additional IANA considerations, beyond those described in [RFC-2910] and [RFC-2911].

See: Section 6 'IANA Considerations' in [RFC-2910]
See: Section 6 'IANA Considerations' in [RFC-2911].

7. Internationalization Considerations

This IPP URL Scheme specification does not introduce any additional internationalization considerations, beyond those described in [RFC-2910] and [RFC-2911].

See: Section 7 'Internationalization Considerations' in [RFC-2910].
See: Section 7 'Internationalization Considerations' in [RFC-2911].

8. Security Considerations

This IPP URL Scheme specification does not introduce any additional security considerations, beyond those described in [RFC-2910] and [RFC-2911].

See: Section 8 'Security Considerations' in [RFC-2910].
See: Section 8 'Security Considerations' in [RFC-2911].

9. References

See: Section 10 'References' in [RFC-2910].
See: Section 9 'References' in [RFC-2911].

[IANA-CHARREG] IANA Charset Registry.
ftp://ftp.isi.edu/in-notes/iana/assignments/character-sets

[IANA-MIMEREG] IANA MIME Media Types Registry.
ftp://ftp.isi.edu/in-notes/iana/assignments/media-types/...

[NET-SSL3] Netscape. The SSL Protocol, Version 3 (text version 3.02), November 1996.

[RFC-1759] R. Smith, F. Wright, T. Hastings, S. Zilles, J. Gyllenskog. Printer MIB, RFC 1759, March 1995.

[RFC-1766] H. Alvestrand. Tags for the Identification of Languages, RFC 1766, March 1995.

[RFC-2046] N. Freed, N. Borenstein. MIME Part Two: Media Types, RFC 2046, November 1996.

[RFC-2048] N. Freed, J. Klensin, J. Postel. MIME Part Four: Registration Procedures, RFC 2048, November 1996.

[RFC-2234] D. Crocker, P. Overell. Augmented BNF for Syntax Specifications: ABNF, RFC 2234, November 1997.

[RFC-2373] R. Hinden, S. Deering. IP Version 6 Addressing Architecture, RFC 2373, July 1998.

[RFC-2396] T. Berners-Lee, R. Fielding, L. Masinter. Uniform Resource Identifiers (URI): Generic Syntax, RFC 2396, August 1998.

[RFC-2246] T. Dierks, C. Allen. The TLS Protocol Version, RFC 2246, January 1999.

[RFC-2277] H. Alvestrand. IETF Policy on Character Sets and Languages, RFC 2277, January 1998.

[RFC-2279] F. Yergeau. UTF-8, a Transformation Format of ISO 10646, RFC 2279, January 1998.

[RFC-2565] R. Herriot, S. Butler, P. Moore, R. Turner. IPP/1.0 Encoding and Transport, RFC 2565, April 1999.

[RFC-2566] R. deBry, T. Hastings, R. Herriot, S. Isaacson, P. Powell. IPP/1.0 Model and Semantics, RFC 2566, April 1999.

[RFC-2579] K. McCloghrie, D. Perkins, J. Schoenwaelder. Textual Conventions for SMIv2, RFC 2579, April 1999.

[RFC-2616] R. Fielding, J. Gettys, J. Mogul, H. Frystyk, L. Masinter, P. Leach, T. Berners-Lee. Hypertext Transfer Protocol -- HTTP/1.1, RFC 2616, June 1999.

[RFC-2617] J. Franks, P. Hallam-Baker, J. Hostetler, S. Lawrence, P. Leach, A. Luotonen, L. Stewart. HTTP Authentication: Basic and Digest Access Authentication, RFC 2617, June 1999.

[RFC-2717] R. Petke, I. King. Registration Procedures for URL Scheme Names, RFC 2717, November 1999.

[RFC-2718] L. Masinter, H. Alvestrand, D. Zigmond, R. Petke. Guidelines for new URL Scheme Names, RFC 2718, November 1999.

[RFC-2732] R. Hinden,B. Carpenter, L. Masinter. Format for Literal IPv6 Addresses in URL's, RFC 2732, December 1999.

[RFC-2910] R. Herriot, S. Butler, P. Moore, R. Turner, J. Wenn. IPP/1.1 Encoding and Transport, RFC 2910, September 2000.

[RFC-2911] T. Hastings, R. Herriot, R. deBry, S. Isaacson, P. Powell. IPP/1.1 Model and Semantics, RFC 2911, September 2000.

[RFC-2978] N. Freed, J. Postel. IANA Charset Registration Procedures, RFC 2978, October 2000.

[US-ASCII] Coded Character Set -- 7-bit American Standard Code for Information Interchange, ANSI X3.4-1986.

10. Acknowledgments

This document is a product of the Internet Printing Protocol Working Group of the Internet Engineering Task Force (IETF). Comments should be submitted to the ipp@pwg.org mailing list.

Thanks to Pat Fleming (IBM), Tom Hastings (Xerox), Harry Lewis (IBM), and Hugo Parra (Novell).

Section 5 'IPP URL Scheme' in IPP/1.1 Encoding and Transport [RFC-2910] was the primary input to this IPP URL Scheme specification.

11. Authors' Addresses

Robert Herriot
Xerox Corp
3400 Hill View Ave, Building 1
Palo Alto, CA 94304

Phone: +1 650-813-7696
Fax: +1 650-813-6860
Email: robert.herriot@pahv.xerox.com

Ira McDonald
High North Inc
221 Ridge Ave
Grand Marais, MI 49839

Phone: +1 906-494-2434
Email: imcdonald@crt.xerox.com
Email: imcdonald@sharplabs.com

12. Appendix A - Registration of IPP Port

[Placeholder for updated IANA registration of IPP Port (631) - need input from Carl-Uno Manros].

13. Appendix B - Registration of MIME "application/ipp"

This appendix contains the information that IANA requires for registering a MIME media type. The information following this paragraph will be forwarded to IANA to update the registration of "application/ipp", whose contents are defined in Section 3 'Encoding of the Operation Layer' in [RFC-2910].

MIME type name: application

MIME subtype name: ipp

A Content-Type of "application/ipp" indicates an Internet Printing Protocol message body (request or response). Currently there are two versions: a) IPP/1.0 [Experimental], whose syntax is described in Section 3 'Encoding of the Operation Layer' in [RFC-2565], and whose semantics are described in [RFC-2566]; and b) IPP/1.1 [Standards Track], whose syntax is described in Section 3 'Encoding of the Operation Layer' of [RFC-2910], and whose semantics are described in [RFC-2911].

Required parameters: none

Optional parameters: none

Encoding considerations:

IPP/1.1 protocol requests/responses MAY contain long lines and ALWAYS contain binary data (for example attribute value lengths).

Security considerations:

IPP/1.1 protocol requests/responses do not introduce any security risks not already inherent in the underlying transport protocols. Protocol mixed-version interworking rules in [RFC-2911] as well as protocol encoding rules in [RFC-2910] are complete and unambiguous.

Interoperability considerations:

IPP/1.1 requests (generated by clients) and responses (generated by servers) MUST comply with all conformance requirements imposed by the normative specifications [RFC-2911] and [RFC-2910]. Protocol

encoding rules specified in [RFC-2910] are comprehensive, so that interoperability between conforming implementations is guaranteed (although support for specific optional features is not ensured). Both the "charset" and "natural-language" of all IPP/1.1 attribute values which are a LOCALIZED-STRING are explicit within IPP protocol requests/responses (without recourse to any external information in HTTP, SMTP, or other message transport headers).

Published specifications:

[RFC-2565] R. Herriot, S. Butler, P. Moore, R. Turner.
"Internet Printing Protocol/1.0: Encoding and Transport",
RFC 2565, April 1999 (EXPERIMENTAL, obsolete).

[RFC-2566] R. deBry, T. Hastings, R. Herriot, S. Isaacson, P. Powell.
"Internet Printing Protocol/1.0: Model and Semantics",
RFC 2566, April 1999 (EXPERIMENTAL, obsolete).

[RFC-2910] R. Herriot, S. Butler, P. Moore, R. Turner, J. Wenn.
"Internet Printing Protocol/1.1: Encoding and Transport",
RFC 2910, September 2000 (STANDARDS TRACK).

[RFC-2911] T. Hastings, R. Herriot, R. deBry, S. Isaacson, P. Powell.
"Internet Printing Protocol/1.1: Model and Semantics",
RFC 2911, September 2000 (STANDARDS TRACK).

Applications which use this media type:

Internet Printing Protocol (IPP) print clients and print servers, communicating using HTTP/1.1 (see [RFC-2910]), SMTP/ESMTP, FTP, or other transport protocol. Messages of type "application/ipp" are self-contained and transport-independent, including "charset" and "natural-language" context for any LOCALIZED-STRING value.

Person & email address to contact for further information:

Tom Hastings
Xerox Corporation
737 Hawaii St. ESAE-231
El Segundo, CA

Phone: 310-333-6413
Fax: 310-333-5514
Email: hastings@cp10.es.xerox.com

or

Robert Herriot
Xerox Corporation
3400 Hillview Ave., Bldg #1
Palo Alto, CA 94304

Phone: 650-813-7696
Fax: 650-813-6860
Email: robert.herriot@pahv.xerox.com

Intended usage:

COMMON

14. Appendix C - Change History

[To be deleted before RFC publication]

11 January 2001 - draft-ietf-ipp-url-scheme-00.txt
- initial version - simple 'ipp:' URL scheme without parameters or query part (consistent with existing IPP/1.0 and IPP/1.1 implementations).

15. Full Copyright Statement