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C. Malamud  
Internet Multicasting Service  
M. Rose  
Dover Beach Consulting, Inc.  
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Principles of Operation for the TPC.INT Subdomain:  
Remote Printing -- Technical Procedures

Status of this Memo

This memo defines an Experimental Protocol for the Internet community. It does not specify an Internet standard. Discussion and suggestions for improvement are requested. Please refer to the current edition of the "Internet Official Protocol Standards" for the standardization state and status of this protocol. Distribution of this memo is unlimited.

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1. Introduction

Although electronic mail is preferable as a means of third-party communication, in some cases it may be necessary to print information, in hard-copy form, at a remote location. The remote output device may consist of a standard line printer, a printer with

multiple fonts and faces, a printer that can reproduce graphics, or a facsimile device. Remote output may be accompanied by information that identifies the intended recipient. This memo describes a technique for "remote printing" using the Internet mail infrastructure. In particular, this memo focuses on the case in which remote printers are connected to the international telephone network.

## 2. Naming, Addressing, and Routing

A printer is identified by a telephone number which corresponds to a G3-facsimile device connected to the international telephone network, e.g.,

+1 415 968 2510

where "+1" indicates the IDDD country code, and the remaining string is a telephone number within that country.

### 2.1 Addressing

This number is used to construct the address of a remote printer server, which forms the recipient address for the message, e.g., either

remote-printer@0.1.5.2.8.6.9.5.1.4.1.tpc.int

or

remote-printer.ATOM@0.1.5.2.8.6.9.5.1.4.1.tpc.int

where "ATOM" is an (optional) RFC 822 atom [1], an opaque string for use in recipient identification when generating a cover-sheet, and the domain-part is constructed by reversing the telephone number, converting each digit to a domain-label, and being placed under "tpc.int."

Note that the mailbox syntax is purposefully restricted in the interests of pragmatism. To paraphrase RFC 822, an atom is defined as:

```
atom      = 1*atomchar

atomchar= <any upper or lowercase alphabetic character
          (A-Z a-z)>
          / <any digit (0-9)>
          / "!" / "#" / "$" / "%" / "&" / "'" / "*" / "+"
          / "-" / "/" / "=" / "?" / "^" / "_" / "`" / "{"
          / "|" / "}" / "~"
```

Finally, note that some Internet mail software (especially gateways from outside the Internet) impose stringent limitations on the size of a mailbox-string. Thus, originating user agents should take care in limiting the local-part to no more than 70 or so characters.

## 2.2 Routing

The message is routed in exactly the same fashion as all other electronic mail, i.e., using the MX algorithm [2]. Since a remote printer server might be able to access many printers, the wildcarding facilities of the DNS [3,4] are used accordingly. For example, if a remote printer server residing at "dbc.mtview.ca.us" was willing to access any printer with a telephone number prefix of

```
+1 415 968
```

then this resource record might be present

```
*.8.6.9.5.1.4.1.tpc.int.    IN MX 10 dbc.mtview.ca.us.
```

Naturally, if several remote printer servers were willing to access any printer in that prefix, multiple MX resource records would be present.

It should be noted that the presence of a wildcard RR which matches a remote printer server's address does not imply that the corresponding telephone number is valid, or, if valid, that a G3-facsimile device is connected at the phone number.

## 3. Procedure

When information is to be remotely printed, the user application constructs an RFC 822 message, containing a "Message-ID" field.

If the local-part of the address does not contain an opaque string for use in recipient identification, then the body must consist "multipart/mixed" content [5] having at two parts, the first being a "application/remote-printing" content-type (defined in Appendix A), which will be used to generate a cover-sheet, and the second being an arbitrary content-type corresponding to the information to be printed. If the local-part of the address does contain an opaque string for use in recipient identification, then the body consists of an arbitrary content-type corresponding to the information to be printed.

Regardless, the message is then sent to the remote printer server's electronic mail address.

### 3.1 Content-Types

It should be noted that not all content-types have a natural printing representation, e.g., an "audio" or "video" content. For this reason, the second part of the "multipart/mixed" content should be one of the following:

text/plain, message/rfc822, application/postscript image/tiff (defined in Appendix B), any multipart.

Note that:

- (1) With the "text/plain" content-type, not all character sets may be available for printing.
- (2) With the "message" content-type, the subordinate content will be processed recursively.
- (3) With the "application/postscript" content-type, the remote printer server should evaluate the contents in a safe execution environment.
- (4) With the "multipart" content-type the subordinate contents will be processed recursively: for a "multipart/mixed" or "multipart/digest" content, each subordinate content will start on a new page, whilst for a "multipart/parallel" content, all subordinate contents will, if possible, start on the same page. Naturally, when processing a "multipart/alternative" content, only one subordinate content will be printed.

### 3.2 Generating a Cover-Sheet

If the "application/remote-printing" content-type is present, this contains all the information necessary to generate a

cover-sheet. Otherwise, the cover-sheet must be generated based on other information available.

Typically, a cover sheet consists of three sections:

- o information identifying the originator;
- o information identifying the recipient; and,
- o additional information supplied by the remote printer server.

To identify the originator, the remote printer server will use the message headers, usually by stripping any trace headers (i.e., "Received" and "Return-Path") and then re-ordering the remaining headers starting with the "From" header.

To identify the recipient, the opaque string from the local- part of the remote printer server's address is consulted. For example, if the remote printer server's address is

```
remote-printer.Arlington_Hewes/Room_403@0.1.5.2.8.6.9.5.1.4.1.tpc.int
```

then the opaque string

```
Arlington_Hewes/Room_403
```

is consulted. lp When generating a cover-sheet using this opaque string, the remote printer server will interpret an underscore character ("\_") as a space, and a solidus character ("/") as an end-of-line sequence. A remote printer server will interpret two consecutive underscore characters in the opaque string as a single underscore, and two consecutive solidus characters as a single solidus. So, the opaque string,

```
Arlington_Hewes/Room_403
```

might appear on the cover-sheet as

```
To: Arlington Hewes  
Room 403
```

### 3.3 Return Receipt

When the remote printer server finishes its processing, a message is returned to the originator, indicating either success (i.e., the message was successfully sent to the facsimile device), or failure, with an explanation (e.g., after several repeated attempts, there was no answer).

## 4. Usage Examples

### 4.1 Explicit Cover Sheet

```
To: remote-printer@0.1.5.2.8.6.9.5.1.4.1.tpc.int
From: Carl Malamud <carl@malamud.com>
Date: Thu, 22 Jul 1993 08:38:00 -0800
Subject: First example
Message-ID: <19930722163800.1@malamud.com>
MIME-Version: 1.0
Content-Type: multipart/mixed;
    boundary="-----=_aaaaaaaaaa0"
```

```
-----=_aaaaaaaaaa0
Content-Type: application/remote-printing
```

```
Recipient:    Arlington Hewes
Telephone:    +1 415 968 1052
Facsimile:    +1 415 968 2510
```

```
Originator:   Carl Malamud
Organization: Internet Multicasting Service
Address:      Suite 1155, The National Press Building
              Washington, DC 20045
              US
Telephone:    +1 202 628 2044
Facsimile:    +1 202 628 2042
EMail:        carl@malamud.com
```

Any text appearing here would go on the cover-sheet.

```
-----=_aaaaaaaaaa0
Content-Type: text/plain; charset="us-ascii"
```

Here are my comments...

```
-----=_aaaaaaaaaa0--
```

#### 4.2 Implicit Cover Sheet

To:remote-printer.Arlington\_Hewes/Room\_403@0.1.5.2.8.6.9.5.1.4.1.tpc.int  
cc: Marshall Rose <mrose@dbc.mtview.ca.us>  
From: Carl Malamud <carl@malamud.com>  
Date: Thu, 22 Jul 1993 08:38:00 -0800  
Subject: Second example  
Message-ID: <19930722163800.2@malamud.com>  
MIME-Version: 1.0  
Content-Type: application/postscript

%!

Note that in this latter example, both remote printing and e-mail recipients can be identified in the same message.

#### 4.3 Minimal, Text-only

To:remote-printer.Arlington\_Hewes/Room\_403@0.1.5.2.8.6.9.5.1.4.1.tpc.int  
cc: Marshall Rose <mrose@dbc.mtview.ca.us>  
From: Carl Malamud <carl@malamud.com>  
Date: Thu, 22 Jul 1993 08:38:00 -0800  
Subject: Third example  
Message-ID: <19930722163800.3@malamud.com>

Here are my comments...

#### 5. Prototype Implementation

A prototype implementation is openly available. The MIME instructions for retrieval are:

```
MIME-Version: 1.0
Content-Type: multipart/alternative;
    boundary="-----=_aaaaaaaaa0"
Content-Description: pointers to ftp and e-mail access

-----=_aaaaaaaaa0
Content-Type: message/external-body;
    access-type="mail-server";
    server="archive-server@ftp.ics.uci.edu"

Content-Type: application/octet-stream; type="tar";
    x-conversions="x-compress"
Content-ID: <4599.735726126.1@dbc.mtview.ca.us>

mimesend mrose/tpc/rp.tar.Z

-----=_aaaaaaaaa0
Content-Type: message/external-body;
    access-type="anon-ftp"; name="rp.tar.Z";
    directory="mrose/tpc"; site="ftp.ics.uci.edu"

Content-Type: application/octet-stream; type="tar";
    x-conversions="x-compress"
Content-ID: <4599.735726126.2@dbc.mtview.ca.us>

-----=_aaaaaaaaa0--
```

This package contains software for UNIX-based systems, and was developed and tested under SunOS, with an openly-available facsimile package (Sam Leffler's FlexFAX package), and contains information for sites acting as either client or server participants, and zone administrators.



## 6. Future Issues

Note that several issues are not addressed, e.g.,

- o determining which content-types and character sets are supported by a remote printer server;
- o introduction of authentication, integrity, privacy, authorization, and accounting services;
- o preferential selection of a remote printer server; and,
- o aggregation of multiple print recipients in a single message.

Subsequent work might consider these issues in detail.

## 7. Security Considerations

Internet mail may be subject to monitoring by third parties, and in particular, message relays.

## 8. Acknowledgements

This document is based on RFC 1486, "An Experiment in Remote Printing".

## 9. References

- [1] Crocker, D., "Standard for the Format of ARPA Internet Text Messages", STD 11, RFC 822, UDEL, August 1982.
- [2] Partridge, C., "Mail Routing and the Domain System" STD 14, RFC 974, CSNET CIC BBN, January 1986.
- [3] Mockapetris, P., "Domain Names -- Concepts and Facilities", STD 13, RFC 1034, USC/Information Sciences Institute, November 1987).
- [4] Mockapetris, P., "Domain Names -- Implementation and Specification", STD 13, RFC 1035, USC/Information Sciences Institute, November 1987.
- [5] Borenstein, N., and N. Freed, "MIME (Multipurpose Internet Mail Extensions) Part One: Mechanisms for Specifying and Describing the Format of Internet Message Bodies", RFC 1521, Bellcore, Innosoft, September 1993.

## 10. Authors' Addresses

Carl Malamud  
Internet Multicasting Service  
Suite 1155, The National Press Building  
Washington, DC 20045  
US

Phone: +1 202 628 2044  
Fax: +1 202 628 2042  
Email: carl@malamud.com

Marshall T. Rose  
Dover Beach Consulting, Inc.  
420 Whisman Court  
Mountain View, CA 94043-2186  
US

Phone: +1 415 968 1052  
Fax: +1 415 968 2510  
Email: mrose@dbc.mtview.ca.us

## Appendix A. The application/remote-printing Content-Type

- (1) MIME type name: application
- (2) MIME subtype name: remote-printing
- (3) Required parameters: none
- (4) Optional parameters: none
- (5) Encoding considerations: 7bit preferred
- (6) Security considerations: none
- (7) Specification:

The "application/remote-printing" content-type contains originator and recipient information used when generating a cover-sheet. Using the ABNF notation of RFC 822, the syntax for this content is:

```

<content>          ::= <recipient-info> CRLF
                    <originator-info>
                    [CRLF <cover-info>]

<recipient-info>  ::=  "Recipient"   ":" <value> CRLF
                    <address-info>

<originator-info> ::=  "Originator"  ":" <value> CRLF
                    <address-info>

<address-info>   ::=  ["Title"       ":" <value> CRLF]
                    ["Department"   ":" <value> CRLF]
                    ["Organization"  ":" <value> CRLF]
                    ["Mailstop"     ":" <value> CRLF]
                    ["Address"       ":" <value> CRLF]
                    ["Telephone"     ":" <value> CRLF]
                    "Facsimile"     ":" <value> CRLF
                    ["Email"        ":" <value> CRLF]

<value>          ::=  *text
                    [CRLF LWSP-char <value> ]

<cover-info>     ::=  *(*text CRLF)

```

Note that the value of the "Email" field is an RFC 822 mailbox address.

## Appendix B. The image/tiff Content-Type

- (1) MIME type name: image
- (2) MIME subtype name: tiff
- (3) Required parameters: none
- (4) Optional parameters: none
- (5) Encoding considerations: base64
- (6) Security considerations: none
- (7) Published specification: TIFF class F, as defined in:

Tag Image File Format (TIFF) revision 6.0

Developer's Desk  
Aldus Corporation  
411 First Ave. South  
Suite 200  
Seattle, WA 98104  
206-622-5500