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Principles of Operation for the TPC.INT Subdomain: Radio Paging -- Technical Procedures

Status of this Memo

This memo provides information for the Internet community. This memo does not specify an Internet standard of any kind. Distribution of this memo is unlimited.

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1. Introduction

As an adjunct to the usual, two-way electronic mail service, it is at times useful to employ a one-way text notification service, called radio paging. This memo describes a technique for radio paging using the Internet mail infrastructure. In particular, this memo focuses on the case in which radio pagers are identified via the international telephone network.

The technique described by this memo, mapping telephone numbers to domain names, is derived from the TPC.INT subdomain. Consult RFC 1530, "Principles of Operation for the TPC.INT Subdomain: General Principles and Policy" for overview information.

2. Naming, Addressing, and Routing

A radio pager is identified by a telephone number, e.g.,

```
+1 415 940 8776
```

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 radio pager server, which forms the recipient address for the message, e.g., one of:

```
pager-alpha@6.7.7.8.0.4.9.5.1.4.1.tpc.int
pager-numeric@6.7.7.8.0.4.9.5.1.4.1.tpc.int
```

where the domain-part is constructed by reversing the telephone number, converting each digit to a domain-label, and being placed under "tpc.int." (The telephone number must not include any international access codes.)

In addition, addresses of the form

```
pager.ATOM@6.7.7.8.0.4.9.5.1.4.1.tpc.int
pager-alpha.ATOM@6.7.7.8.0.4.9.5.1.4.1.tpc.int
pager-numeric.ATOM@6.7.7.8.0.4.9.5.1.4.1.tpc.int
```

where "ATOM" is an (optional) RFC 822 atom [1], are reserved for future use. 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 radio pager server might be able to access many radio pagers, the wildcarding facilities of the DNS [3,4] are used accordingly. For example, if a radio pager server residing at "dbc.mtview.ca.us" is willing to access any radio pager with a telephone number prefix of

+1 415 940

then this resource record might be present

*.0.4.9.5.1.4.1.tpc.int. IN MX 10 dbc.mtview.ca.us.

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

It should be noted that the presence of a wildcard RR which matches a radio pager server's address does not imply that the corresponding telephone number is valid, or, if valid, that a radio pager is identified by the phone number. Rather, the presence of a wildcard RR indicates that a radio pager server is willing to attempt access.

3. Procedure

When information is to be sent to a radio pager, the user application constructs an RFC 822 message, containing a "Message-ID" field and a textual content (e.g., a "text/plain" content [5]).

The message is then sent to the radio pager server's electronic mail address.

The radio pager server begins by looking at the local part of the address. If the local-part is the literal string "pager-alpha" then this indicates that the recipient is using an alpha-numeric pager. The radio pager server consults a local database to determine how to send the page based on the domain-part. This local knowledge includes information about the protocol used to talk to the paging network and the access number. As such, a radio pager server will register itself in the DNS as providing service only to those phone numbers for which it has such knowledge.

Otherwise, if the local-part is the literal string "pager-numeric" then this indicates that the recipient is using a numeric pager. The radio pager server may consult a local database to determine how to send the page based on the domain-part; or, it may dial the number

specified in the domain-part directly.

For alpha-numeric pagers, the radio pager server determines which information found in the headers and body of the message are used when constructing the paging message. For example, some radio pager servers might choose to examine the "To" and "Subject" fields, in addition to the body, whilst other radio pager servers might choose to simply send the body verbatim.

For numeric pagers, the radio pager server sends only the body, which must consistent solely of digits.

3.1. MAILing versus SENDing

An SMTP client communicating with a radio pager server may use attempt either the MAIL or SEND command. The radio pager server MUST support the MAIL command, and MAY support any of the SEND, SOML, or SAML commands.

If the MAIL command is used, then a positive completion reply to both the RCPT and DATA commands indicates, at a minimum, that the message has been queued for transmission into the radio paging network for the recipient, but is at least queued for transmission into the radio paging network.

If the SEND command is used, then a positive completion reply to both the RCPT and DATA commands indicates that the message has been accepted by the radio paging network for delivery to the recipient.

If the SOML or SAML command is used, then a positive completion reply to both the RCPT and DATA commands indicates that the message may have been accepted by the radio paging network for delivery to the recipient.

3.2. Latency

Although the Internet electronic mail service tends to perform delivery in a timely and reliable manner, some paging services will wish to provide a higher degree of assurance to their clients, in particular guaranteeing that a positive reply code means that the page has been sent on the radio network. For such requirements, the primary constraints are server implementation and client/server network connectivity.

A client that uses the SEND or SAML commands is explicitly requesting real-time transmission on the radio network and is requiring that the server reply code will carry a statement of success or failure about that transmission.

The IP level of the Internet performs datagram store-and-forward service, but gives the end system hosts the appearance of direct connectivity, by virtue of allowing interactive service. The Internet electronic mail service adds another layer of store-and-forward indirection, so that messages may go through any number of relays (and/or gateways). This may introduce arbitrarily large delays of minutes, hours, or days.

A client that configures their Internet attachment to permit "direct" SMTP connectivity to a pager server will be able to submit paging requests to the server directly, without additional SMTP-relaying. That is, transmission from paging client to paging server will be one "SMTP-hop"only. This will eliminate any possibility of non-deterministic delay by the Internet itself.

The combination of configuring paging server and paging client to allow direct IP/SMTP-level interaction and ensuring that they use SEND or SAML commands only will mean that a client receiving a positive reply from the server is assured that the page has been sent on the radio network.

4. Usage Examples

4.1. MIME-based

```
To: pager-alpha@6.7.7.8.0.4.9.5.1.4.1.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: First example, for an alphanumeric pager
Message-ID: <19930908220700.1@malamud.com>
MIME-Version: 1.0
Content-Type: text/plain; charset=us-ascii

A brief textual message.
```

4.2. Non-MIME

```
To: pager-numeric@6.7.7.8.0.4.9.5.1.4.1.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, for a numeric pager
Message-ID: <19930908220700.2@malamud.com>

2026282044
```

5. Security Considerations

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

6. Acknowledgements

This document was motivated by "Simple Network Paging Protocol - Version 1", by Allen Gwinn of Southern Methodist University.

David H. Crocker and Carl Malamud also provided substantive comments.

7. References

[1] Crocker, D., "Standard for the Format of ARPA Internet Text Messages", STD 11, RFC 822, University of Delaware, August 1982.

[2] Partridge, C., "Mail Routing and the Domain System", STD 14, RFC 974, BBN, January 1986.

[3] Mockapetris, P., "Domain Names -- Concepts and Facilities", STD 13, RFC 1034, Information Sciences Institute, November 1987.

[4] Mockapetris, P., "Domain Names -- Implementation and Specification", STD 13, RFC 1035, 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.

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