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A MIME Body Part for FAX

Status of this Memo

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1. Introduction

This document contains the definitions, originally contained in RFC 1494, on how to carry CCITT G3Fax in MIME, and how to translate it to its X.400 representation.

NOTE: At the moment, this format does not seem appropriate for a "general purpose image format for the Internet", if such a beast can exist. It exists only to carry information that is already in G3 Fax format, and may be usefully converted to other formats when used in specific contexts.

2. The image/g3fax content-type

This content-type is defined to carry G3 Facsimile byte streams.

In general, a G3Fax image contains 3 pieces of information:

(1) A set of flags indicating the particular coding scheme. CCITT Recommendation T.30 defines how the flags are transmitted over telephones. In this medium, the flags are carried as parameters in the MIME content-type header field.

(2) A structure that divides the bits into pages. CCITT recommendation T.4 describes a "return to command mode" string; this is used here to indicate page breaks.

(3) For each page, a sequence of bits that form the encoding of the image. CCITT recommendation T.4 defines the bit image format. This is used without change. The highest bit of the first byte is the first bit of the T.4 bitstream.

2.1. G3Fax Parameters

The following parameters are defined:

(1) page-length - possible values: A4, B4 and Unlimited

(2) page-width - possible values: A3, A4, B4

(3) encoding - possible values: 1-dimensional, 2-dimensional, Uncompressed

(4) resolution - possible values: Fine, Coarse

(5) DCS - a bit string, represented in Base64.

(6) pages - an integer, giving the number of pages in the document

If nothing is specified, the default parameter settings are:

```
page-length=A4
page-width=A4
encoding=1-dimensional
resolution=Coarse
```

It is possible (but misleading) to view the representation of these values as single-bit flags. They correspond to the following bits of the T.30 control string and X.400 G3FacsimileParameters:

Parameter	T.30 bit	X.400 bit
page-length=A4	no bit set	
page-length=B4	19	21
page-length=Unlimited	20	20
page-width=A4	no bit set	
page-width=A3	18	22
page-width=B4	17	23
encoding=1-dimensional	no bit set	
encoding=2-dimensional	16	8
encoding=Uncompressed	26	30
resolution=Coarse	no bit set	
resolution=Fine	15	9

The reason for the different bit numbers is that X.400 counts bits in an octet from the MSB down to the LSB, while T.30 uses the opposite numbering scheme.

If any bit but these are set in the Device Control String, the DCS parameter should be supplied.

2.2. Content Encoding

X.400 defines the g3-facsimile data stream as a SEQUENCE of BIT STRINGs. Each BIT STRING is a page of facsimile image data, encoded as defined by Recommendation T.4. The following content encoding is reversible between MIME and X.400 and ensures that page breaks are honored in the MIME representation.

An EOL is defined as a bit sequence of

    000000000001 (eleven zeroes and a one).

Each page of the message is delimited by a sequence of six (6) EOLs that MUST start on a byte boundary. The image bit stream is padded with zeroes as needed to achieve this alignment.

Searching for the boundary is a matter of searching for the byte sequence (HEX) 00 10 01 00 10 01 00 10 01, which cannot occur inside the image.

See Section 7.5 for the algorithm on conversion between this encoding and the X.400 encoding.

The Base64 content-transfer-encoding is appropriate for carrying this content-type.

3. g3-facsimile - image/g3fax

X.400 Body part: g3-facsimile
MIME Content-Type: image/g3fax
Conversion Type: nearly Byte copy
Comments:

The Parameters of the X.400 G3Fax body part are mapped to the corresponding Parameters on the MIME Image/G3Fax body part and vice versa. Note that:

(1) If fineResolution is not specified, pixels will be twice as tall as they are wide

(2) If any bit not corresponding to a specially named option is set in the G3Fax NonBasicParameters, the "DCS" parameter must be used.

(3) Interworking is not guaranteed if any bit apart from those specially named are used in the NonBasicParameters

From X.400 to G3Fax, the body is created in the following way:

(1) Any trailing EOL markers on each bitstring is removed. The bit order is changed to conform to the most common Internet encoding (highest bit of first byte = first bit of the G3Fax). The bitstring is padded to a byte boundary.

(2) 6 consecutive EOL markers are appended to each bitstring.

(3) The padded bitstrings are concatenated together

An EOL marker is the bit sequence 000000000001 (11 zeroes and a one).

From G3Fax to X.400, the body is created in the following way:

(1) The body is split into bitstrings at each occurrence of 6 consecutive EOL markers. Trailing EOLs must NOT be removed, since the X.400 Implementor Guide recommends that each page should end with 6 consecutive EOLs. (This is a change from RFC 1494).

(2) Each bitstring is made into an ASN.1 BITSTRING, reversing the order of bits within each byte to conforom to the X.400 Implementors Guide recommendation for bit order in the G3Fax body part.

(3) The bitstrings are made into an ASN.1 SEQUENCE, which forms the body of the G3Fax body part.

4. Usability of G3Fax body parts

This section is not part of the proposed standard, but is intended as guidance for people implementing G3Fax handling, so that they know a little about what to expect.

The DCS bitstring is a LONG thing; the T.30 Recommendation (1993) gives 67 bits with specific functions, SG8 Report R33 extends this to 75 bits, and Report R41 (approved in 1995) extends it to 79 bits. (For curiosity - bit 68 says that the coding is JPEG; bit 27 is "error correcting mode). No sane implementor will send such things without being able to negotiate them down if the recipient doesn't support it, but there is no guarantee that messages with such bits set in the DCS won't arrive through X.400.

The ISO P2 profile from 1995 [PROFILE] says that the profile makes support for reception of two-dimensional and fine-resolution mandatory if g3-facsimile is supported at all. Research by Andrew Gordon of Net-Tel indicates that it is easy for an access unit to support fine resolution, unlimited length and B4 length, while support for B4 width is nearly impossible, and A3 width is hard.

Another interesting point is that some fax machines have trouble if the scan lines do not contain exactly the declared number of pixels on each scan line, so "omitting right-hand white space" is likely to give trouble.

5. Security Considerations

There are no known security issues specific to the FAX body part.

6. References

[MIME]
Freed, N., and N. Borenstein, "Multipurpose Internet Mail Extensions (MIME) Part One: Format of Internet Message Bodies", RFC 2045, November 1996.

[GUIDE]
X.400 Implementor's Guide, version 8.

[PROFILE]
ISO/IEC ISP 12062-2: 1995:

[T.30]
ITU-T Recommendation T.30 (1993): Procedures for document facsimile transmission in the general switched telephone network.

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