                 Media Type Registration for the
      Society of Motion Picture and Television Engineers (SMPTE)
                   Material Exchange Format (MXF)

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   not specify an Internet standard of any kind. Distribution of this
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Abstract

   This document serves to register a media type for the Society of
   Motion Picture and Television Engineers (SMPTE) Material Exchange
   Format (MXF). MXF, defined by SMPTE 377M, is a standard wrapper
   format developed for the interchange of audiovisual material,
   including both audiovisual essence and rich metadata.

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1. Introduction

   The present document registers a media type for SMPTE Material
   Exchange Format (MXF). MXF, defined by SMPTE 377M [SMPTE377M], is a
   standard wrapper format developed for the interchange of audiovisual
   material, including both audiovisual essence and rich metadata.

   Essence is the raw video, audio, and data streams contained and
   described by MXF. Metadata carried by MXF includes structural
   metadata and descriptive metadata. Structural metadata relates to
   the structure and capabilities of the MXF file and is generally
   required for proper decoding. Some examples of structural metadata
   are descriptions of essence types, information to help synchronize
   playout of audio and video, and content length. Descriptive metadata
   gives information about the program content in the file and is not
   essential for decoding. Some examples of descriptive metadata are
   program title, actors, and scene descriptions. The essence in MXF
   files may itself carry data, such as vertical blanking interval data
   used for carriage of Closed Captioning and other purposes.

   MXF is an important tool in providing interoperation between
   different video systems as well as digital cinema systems. MXF also
   aids in the development of video production and distribution
   workflows that are more efficient, multi-vendor, file based, and IT
   oriented.

   SMPTE currently has standards for the mapping of the following
   essence types to the MXF generic container: MPEG (including MPEG-1
   and MPEG-2 video streams, as well as MPEG audio), DV-DIF (Digital
   Video Digital Interface Format for the DV family of related video
   encodings), Uncompressed Pictures, SDTI-CP (Serial Digital Transport
   Interface Content Package for delivering packetized audiovisual
   content over the SDI interface), D-10 (a specialized video stream
   incorporating MPEG-2 4:2:2P@ML), D-11 (a high-definition video
   compression standard), AES3 audio, Broadcast Wave audio, and A-Law
   audio. The flexibility of the MXF generic container allows for the
   possibility of mappings of additional essence types in the future.

   The media type defined here is needed to correctly identify MXF files
   when they are served over HTTP or other network connections, included
   in multi-part documents, indexed by operating systems and digital
   asset management systems, or used in other places where media types
   are used.

2. Security Considerations

   Security requirements for the application/mxf media type are
   discussed in the IANA media type registration (Section 3.1).

3. IANA Considerations

   The IANA has registered the media type application/mxf as specified
   in Section 3.1. The registration uses the template present in
   [RFC4288].

3.1. Media Type for SMPTE Material Exchange Format (MXF)

   To: ietf-types@iana.org
   Subject: Registration of media type application/mxf

   Type name: application

   Subtype name: mxf

   Required parameters: none

   Optional parameters: ULs

   The optional parameter ULs is a single Uniform Resource Name (URN),
   or a comma-separated list of multiple URNs of SMPTE Universal Labels
   (which are defined by SMPTE 400M [SMPTE400M]).

   This optional parameter provides hints to the decoder regarding the
   structure of the MXF file, which could include Operational Pattern,
   essence types, descriptive metadata schemes, and other elements that
   are identified by their SMPTE Universal Label.

   SMPTE Universal Labels are Object Identifiers (OIDs), as specified by
   [ASN1]. Thus, a URN of a SMPTE Universal Label can use the OID URN
   namespace specified in [RFC3061], or any other future URN namespace
   that is appropriate for SMPTE Universal Labels.

   Note that, per [RFC2045], some characters (including the comma used
   to separate multiple values) require that the entire parameter value
   be enclosed in quotes.

   Below is an example of use of the optional parameter. The two SMPTE
   Universal Labels indicate that the MXF file uses the OP1a Operational
   Pattern and contains IEC DV video at 25 Mbps, 525 lines, 59.94 fps
   interlaced essence.

```
   Content-Type:  application/mxf;
      ULs="urn:oid:1.3.52.4.1.1.1.13.1.2.1.1.1,
      urn:oid:1.3.52.4.1.1.1.4.1.2.2.2.1.1"
```

Encoding considerations: binary

Security considerations: Application/mxf objects are not signed but
may be partially encrypted internally. External security mechanisms
must be employed to ensure content confidentiality. MXF, through
metadata extensions, may allow executable code to be transferred in
the file. It is suggested that no unauthenticated executables
decoded from an MXF file be executed. Some compressed essence types
carried in MXF may carry a risk that certain pathological bitstreams
could lead to potential denial-of-service attacks against these
essence decoders.

Interoperability considerations: MXF provides a standard wrapping for
a number of audio and video essence types according to a number of
different Operational Patterns (OP). Thus, interoperability depends
upon whether the MXF file decoder has the capability to match the
features of the MXF file encoder. An Application Specification (AS)
can ensure that MXF encoders and decoders can interoperate
effectively.

Published specification: RFC 4539, SMPTE 377M [SMPTE377M]

Applications that use this media type: MXF is a wrapper for many
types of audio and video essence types in use by many applications in
the broadcast and digital cinema industries. These include
non-linear editing systems, video servers, video camera systems,
digital asset management systems, and digital video distribution
systems.

Additional information:

   Magic number(s): none

   File extension(s): .mxf

   Macintosh File Type Code(s): "mxf "

Person & email address to contact for further information:
Thomas Edwards
email: tedwards@pbs.org

Intended usage: COMMON

Restrictions on usage: none

   Author/Change controller:

   Thomas Edwards
   email: tedwards@pbs.org

4. References

4.1. Normative References

   [SMPTE377M] Society of Motion Picture and Television Engineers,
               "Material Exchange Format (MXF) File Format
               Specification", SMPTE 377M-2004, <http://www.smpte.org>.

   [SMPTE400M] Society of Motion Picture and Television Engineers,
               "SMPTE Labels Structure", SMPTE 400M-2004,
               <http://www.smpte.org>.

4.2. Informative References

   [ASN1]   International Telephone and Telegraph Consultative
               Committee, "Specification of Basic Encoding Rules for
               Abstract Syntax Notation One (ASN.1)",
               CCITT Recommendation X.209, January 1988.

   [RFC2045]   Freed, N. and N. Borenstein, "Multipurpose Internet Mail
               Extensions (MIME) Part One: Format of Internet Message
               Bodies", RFC 2045, November 1996.

   [RFC3061]   Mealling, M., "A URN Namespace of Object Identifiers",
               RFC 3061, February 2001.

   [RFC4288]   Freed, N. and J. Klensin, "Media Type Specifications and
               Registration Procedures", BCP 13, RFC 4288, December
               2005.

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