SMPTE STANDARD

for Television — Metadata Groups Registry Structure

1 Scope

The metadata groups registry structure defined in this standard covers the use of metadata for all types of essence (picture, sound, data, in their various forms). Applications of individual registry entries will vary but, when used, shall conform to the definitions and formats in this metadata groups registry structure standard.

The metadata groups registry defines groups of metadata elements for the exchange of information in all kinds of groups (sets and packs) defined by SMPTE 336M, clause 5.

This standard and the metadata groups registry shall be used together as a pair — neither shall be used in isolation.

2 Normative references

ANSI/SMPTE 298M-1997, Television — Universal Labels for Unique Identification of Digital Data

SMPTE 336M-2001, Television — Data Encoding Protocol Using Key-Length-Value

SMPTE 359M-2001, Television and Motion Pictures — Dynamic Documents

3 Metadata groups registry structure

The metadata groups registry structure provides flexibility in capturing metadata and exchanging it among applications through a standardized hierarchy of universal labels for the metadata elements, grouped to aid their management within a small but comprehensive number of classes. Metadata group classes are collections of metadata elements with common characteristics or attributes. Additional classes are provided for user-defined metadata.

The metadata groups registry references an individual item or element of metadata using a two-part 16-byte Universal label that is numerical (and hence language independent) and unique. The first 8 bytes identify the second as a tag in a specific version of a designated metadata dictionary (tags are defined in SMPTE 336M). This tag is used to index the meaning or definition of the metadata element.

The KLV coding of groups of metadata items is defined in SMPTE 336M; different kinds of groups include universal, global, and local sets, fixed-length and variable-length packs.

The first 8 bytes of the 16-byte group key are the universal label (UL) header and designator and are defined in clause 3.1 and tables 2 and 3 of SMPTE 336M. The metadata groups registry defined by this standard shall specify the contents of bytes 6-8 of the metadata universal set UL header and designator:

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– Byte 6 (registry designator) of the UL defines the set or pack syntax used in a given instance of a metadata group. This may be universal or global set, several variants of local set (with different tag field width and length field width), fixed pack, and variable pack (with variants of length field width);

– Byte 7 (structure designator);

– Byte 8 (version number).

All allowable syntaxes for a given group are defined by the same entry in the metadata groups registry.

Universal and global and sets use a lossless form of coding the ULs of each data item in the set and hence can losslessly map the data items to the appropriate dictionary.

Sets do not require any specific ordering of the elements, and also allow some elements to be optional (i.e.; not present)

Packs require that the elements are presented in a specific order, and all the elements must be present (although in a variable pack, some may have zero length).

3.1 Compatibility with other metadata structures

The metadata groups registry structure is a framework that supports global interoperability by defining metadata tags in a way that enables the interchange of SMPTE metadata with metadata from different sources and originated by other bodies.

Many different cataloging conventions are used by communities who focus on a specific domain or subject or who have specific needs for archive and retrieval of multimedia data including, for example, intellectual rights. The metadata groups registry is not intended to replace conventions already in use, for example, in textual naming or key words. Within the framework of the metadata groups registry structure, different content creation communities, media indexing professionals, or metadata extractors and users can develop metadata conventions that meet their specific requirements.

3.2 Individual classes of metadata groups

Metadata groups may contain metadata items from one or from many classes in the SMPTE 335M metadata dictionary. Mandatory and optional items in each group are listed in the groups registry entries (see below).

Within the metadata groups registry, metadata groups are organized into a hierarchical structure, where each is assigned to a metadata group class, as shown in the overview of figure 1, based upon the primary role of the group or the class of the primary metadata in the group or both. The list of metadata group classes defined by this standard consists of:

Class 1: Identification and location
Class 2: Administrative
Class 3: Interpretive
Class 4: Parametric
Class 5: Process
Class 6: Relational
Class 7: Spatio-temporal
Class 12: Compound
Class 13: Organizationally registered for public use
Class 14: Organizationally registered as private
Class 15: Experimental

This list mirrors the classes defined by SMPTE 335M and adds the compound class (class 12) to cover groups constructed from diverse metadata components.

The number of metadata classes may be extended in the future to a maximum of 127.

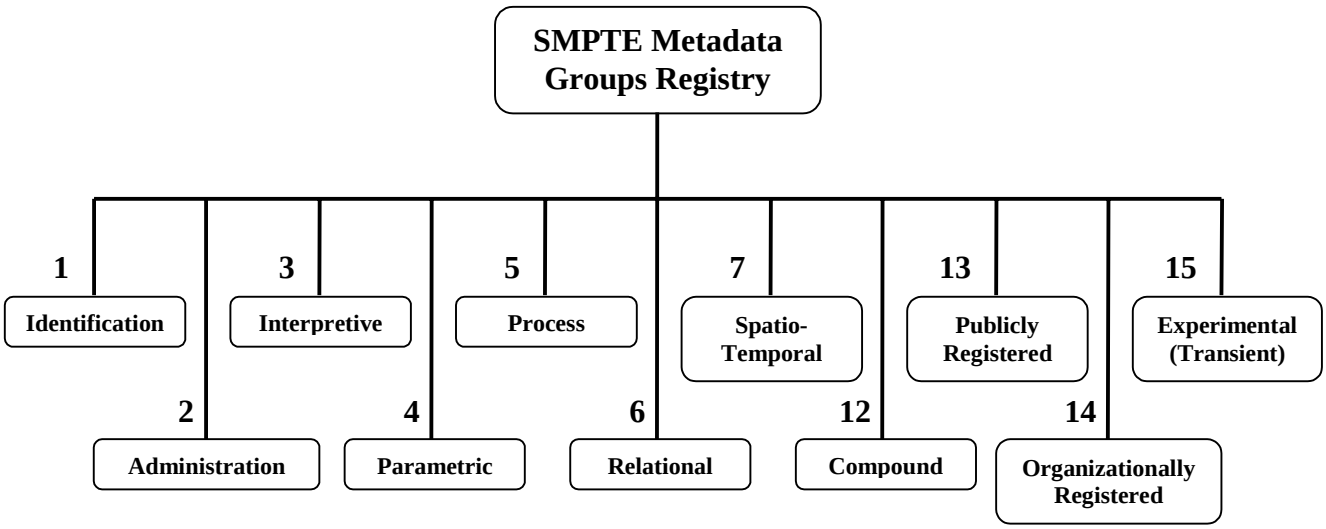

Figure 1 – Metadata groups class structure

3.2.1 Class 1: Identification and Location

Metadata Groups in this class shall primarily carry identifying information (IDs) that describes the essence of the overall bit stream or file. A critical part of Class 1 metadata is unambiguous identification of the essence using a single, recognized number or label such as the SMPTE Unique Material Identifier (SMPTE 330M). Information in this Class shall include global and local identifiers as well as identifying information about the metadata elements themselves (so-called “meta-metadata”). Examples of sub-class titles in this Class are:

- Globally unique identifiers
- ISO identifiers
- Object identifiers
- Device identifiers
- Unique IPR identifiers
- Local locators
- Titles

3.2.2 Class 2: Administration

Metadata groups in this class shall primarily carry administrative or business data that describes information about the essence or metadata that is relevant to its application. Information on authorized use, restrictions on use, and encryption are in this metadata class. Cost information and information needed to protect intellectual property or to protect ownership shall also be contained in class 2. Examples of sub-class titles in this class are:

- Supplier
- Rights
- Financial information
- Security
- Publication outlet
- Participating parties
- Broadcast and repeat statistics

3.2.3 Class 3: Interpretive

Metadata groups in this class shall primarily carry information which is normally considered either a subjective or a human-generated description of the essence or a computational result from machine examination of the essence. Interpretive information shall consist of, but not be limited to, textual terms (e.g.; keywords, narrative summary, titles, genre categories, scripts, etc.), or computational metrics (e.g.; color histograms, texture maps, object shapes, facial features, etc.). Information in class 3 shall be principally used for indexing, cataloging, administering, searching, and retrieving the content of essence. Examples of sub-class titles in this class are:

- Fundamental (such as ISO language code, length, and time systems)
- Descriptive (human-assigned)
- Categorization
- Assessments
- Descriptors (machine-assigned or computed)

3.2.4 Class 4: Parametric

Metadata groups in this class shall primarily carry information that describes the technical characteristics of the camera, sensor, or system that originates the essence or metadata. Information about the technical characteristics of the essence or metadata is also provided, including, but not limited to, its creation parameters and the configuration of the originating system. Examples of sub-class titles in this class are:

- Video essence encoding characteristics
- Audio essence encoding characteristics
- Data essence encoding characteristics
- Metadata encoding characteristics
- Audio test parameters
- Film pulldown characteristics
- Fundamental sequencing and scanning
- MPEG coding characteristics
- Time code characteristics

3.2.5 Class 5: Process

Metadata groups in this class shall primarily carry information that describes how the essence was processed or otherwise changed or enhanced after its origination. This class shall include, but not be limited to, many of the parameters in an edit decision list. Additional information in class 5 shall be an audit trail (heritage) of all changes to the original content over time. Also included shall be a record of compression/decompression steps and any changes in storage media or format. Examples of sub-class titles in this class are:

- Process indicators
- Manipulation
- Downstream processing history
- Enhancement or modification
- Audio processor settings (device-specific)
- Editing information

3.2.6 Class 6: Relational

Metadata groups in this class shall primarily carry information that describes relationships between objects in the content or between any combination of essence, objects and metadata. Examples of sub-class titles in this class are:

- Generic relationships
- Relatives
- Essence-to-essence relationship

- Metadata-to-essence relationship
- Metadata-to-metadata relationship
- Object-to-object relationship
- Metadata-to-object relationship
- Related production material
- Numerical sequence
- Relationship structures

3.2.7 Class 7: Spatio-temporal

Metadata groups in this class shall primarily carry information about aspects of the content or the originating camera, sensor, or system relating to time, place, or space. Geo-spatial information in class 7 shall be any information that defines the positions or places (either absolute or relative) of objects, scenes, individuals, or any other component of the essence. Temporal elements such as dates, time codes, synchronization marks, temporal keywords, and motion (vector) parameters shall also be part of class 7 metadata. Examples of sub-class titles in this class are:

- Position and space vectors
- Absolute position
- Image positional information
- Rate and direction of positional change
- Abstract locations
- Angular specifications
- Distance measurements
- Operational date and time information
- Absolute date and time
- Relative durations
- Rights date and time
- Setting date and time (characterized time period)
- Delay
- Latency

3.2.8 Class 12: Compound

Metadata groups in this class shall carry individual elements of metadata drawn from more than one metadata dictionary classes, or elements which are themselves metadata groups, or a combination.

3.2.9 Class 13: Organizationally registered for public use

Metadata groups in this class shall be defined and registered by a specific user organization or individual and are therefore reserved and managed separately from the other classes (1-7 and 12) of metadata groups. The definition may allow or require these groups to carry standard metadata from classes 1-7, or publicly registered metadata (class 13), or a combination.

Information about publicly registered metadata groups shall appear in the appropriate sections of the published metadata groups registry. Class 13 metadata groups shall be managed by the SMPTE Registration Authority and their approval shall be consistent with SMPTE 359M.

3.2.10 Class 14: Organizationally registered as private

Metadata groups in this class shall be defined and registered by a specific user organization or individual and are therefore reserved and managed separately from the other classes (1-7 and 12) of metadata groups. The definition may allow or require these groups to carry standard metadata from classes 1-7, or publicly registered metadata (class 13), or organizationally registered metadata (class 14), or a combination.

Information about organizationally registered metadata shall not be made public but the metadata tags shall be publicly identified in the metadata dictionary contents and shall be reserved for use by the

registered organization. Class 14 metadata shall be managed by the SMPTE Registration Authority and its approval shall be consistent with SMPTE 359M.

3.2.11 Class 15: Experimental

Metadata groups in this class shall carry information whose definition and use does not need to conform to the definitions in the metadata dictionary. Class 15 metadata is intended for use in multimedia research or other limited access, experimental environments where experimentation with new metadata elements and applications does not depend on strict conformance to approved standards and which remain within a test or laboratory environment.

3.3 Universal labels for metadata groups

The metadata groups registry shall define the format of the 8-byte group designator (the second 8 bytes of the 16-byte UL) as shown in table 1. “Organization” is used below to mean the organization, company, institution, or person requesting the assignment of a metadata universal set designator.

Table 1 – Group designator format

Byte	Description	Contents (see note below)
9	Base groups (classes)	0x00 – Not used 0x01 – Identifier and locator group 0x02 – Administrative group 0x03– Interpretive group 0x04 – Parametric group 0x05 – Process and processing group 0x06 – Relational group 0x07 – Spatio-temporal group 0x0C – Compound group (contains properties from different base classes) 0x0D – Organizationally registered for public use group (359M type 3 approval) 0x0E – Organizationally registered for private use group (359M type 4 approval) 0x0F – Experimental use group (transient validity) 0x10-0xFF – Reserved
When byte 9 is anything other than 0x0D or 0X0E:		
10-16	Group ID	Assigned by SMPTE-RA, BER OID-encoded
When byte 9 is 0x0D or 0X0E:		
10	Organization major ID	Sequentially assigned by SMPTE-RA
11	Organization minor ID (Class within the organization)	Assigned by the organization, registered by SMPTE-RA
12	Organization version ID	0x01 – Default 0x02-0x7F – Assigned by the organization as required
13-16	Organization group ID	0x00-0xFF – Assigned and defined by the organization.

Note – Contents of bytes 9-12 require SMPTE 359M type 2 approval unless otherwise stated.

The metadata groups registry shall contain one entry for each registered group.

The entry shall apply only to those values of the registry designator (UL byte 6) which are specified within the entry. Each group designator may be used for universal, global, or local sets, and for fixed and variable packs as specified. The same group designator may not be used with different registry designators to identify different groups.

3.4 Metadata groups registry entry structure and format

The metadata group registry shall contain the information listed in table 2 for each registered metadata group.

Table 2 – Metadata groups registry format

Registry item No.	Description	Format	Purpose
1	UL header and designator	UL key bytes 1-7	Identifies the syntax and version control for the metadata group
1a	Registry version at introduction	UL key byte 8	The version number of the registry in which this group first appeared
2	Group designator	UL key bytes 9-16	Identifies the metadata group
3	Group name	Text	English language name of the group
4	Group description	Text	Narrative description of the group, its contents, and its application.
5	Parent	UL (16 bytes)	UL of the parent group from which this group inherits all mandatory and optional item (if any)
6	Allowed syntax	Vector of bytes	Lists the values of UL byte 6 (set or pack syntaxes) which are allowed for this group
7	Mandatory contents	Vector of records	Listing of all the metadata elements and/or groups required in every instance of the defined group, in the order required for pack syntax.
7a	Mandatory item	UL (16 bytes)	Identifier of item in the SMPTE registry
7b	Local tag	4 bytes	Tag to be used in local set syntax
7c	Limit length	4 bytes	Fixed length in fixed pack syntax
8	Optional contents	Batch of records	Listing of any metadata elements and/or groups allowed in particular instances of the defined group (but not for pack syntax)
8a	Optional item	UL (16 bytes)	Identifier of item in the SMPTE registry
8b	Local tag	4 bytes	Tag to be used in local set syntax
8c	Limit length	4 bytes	Fixed length in fixed pack syntax
9	Defining document	Text	A reference to the published document which defines this group in detail

The metadata dictionary shall consist of the following fields for each metadata element:

UL header and designator

This entry records the first 7 bytes of the SMPTE Universal label: 0x06 0e 2b 34 02 00 01.

– Byte 5 will always be 02 (groups)

– Byte 6 is always shown as 00 in this entry. One of the actual values specified in the allowed syntax entry (detailed below)shall be substituted to create the actual UL designator.

– Byte 7 increments from 01 (the only value defined at the present time).

Registry version at introduction

This entry records the version number of the registry which first recorded the registration of the group designator, and is equal to byte 8 of the SMPTE UL.

Group designator

This has eight fields represent the eight octets or bytes of the group designator. These uniquely identify the specific metadata group in the registry.

Group name

This entry is the English language name for the element represented numerically by the group designator.

Group definition

This entry is the detailed and unambiguous English language definition of what is represented by the group designator.

Parent

This entry lists the UL of the parent group from which this group inherits all mandatory and optional item, if any. Another term for the parent group is superclass. If there is no parent group, this entry shall be null.

The effect of specifying a parent group is that the child group inherits all mandatory and optional contents of the parent group, as specified for the parent group, including the limit lengths and local tags and any parents of the parent. In ordered (pack) syntax, mandatory properties of parent groups shall be placed before those of the child.

The allowed syntax of the parent group is not inherited.

Allowed syntax

This entry lists those values of byte 6 of the UL (universal, global, local set, fixed and variable pack) which are valid for this group designator

Mandatory contents

This vector of records details the elements of the group which must be present in every instance of the group. The records appear in the order in which the elements must appear when pack syntax is used.

Optional contents

This heap of records details the elements of the group which may be present in some instance of the group (except in pack syntax, when optional no such elements may be present). The records are un-ordered.

(Mandatory and optional) Item (UL)

This entry identifies an element of the group

(Mandatory and optional) Local tag

This entry specifies the local tag which shall be used in local set syntax (the value of this entry is truncated to the tag width for the particular syntax)

(Mandatory and optional) Limit length

This entry specifies the element length which shall be used in fixed pack syntax

Defining document

In cases where the group designator is comprehensively defined in another standard or other document, this entry references that standard or the authoritative source of the information. The defining document shall be normative and therefore publically available. The only exception shall be for metadata groups in class 14 (organizationally registered as private) for which the document may or may not be identified.

3.5 Metadata groups registry structure maintenance

The principles for maintenance and administration of the metadata groups registry structure are defined in the following sections.

3.5.1 Registry version information

The following information shall be provided by the SMPTE Registration Authority with each update to the metadata groups registry structure and contents:

Standard name:	Metadata dictionary structure standard
Standard designator:	One-byte unsigned integer in the range of 1 to 127
Version number:	One-byte unsigned integer in the range of 1 to 127
Effective date:	TBD
Database format:	Text
Summary of changes:	Text
Database administrator:	Text with URL or e-mail
Contact information:	Text with URL or e-mail

3.5.2 Groups registry management and compatibility requirements

To ensure the reliable, correct, interpretation of legacy material in the future, changes to the metadata groups registry shall be additions only and deletions or changes to entries (other than purely editorial) are not permitted. This addition process shall be speedily carried out and documented in accordance with SMPTE 359M by the SMPTE Registration Authority. It shall occur immediately on request from the appropriate SMPTE technical committee and shall be administered and scrutinized with a light but formal touch to ensure minimal delay in the availability for use of a newly required registered tag. The version number of the dictionary shall be incremented each and every time an addition (or group of additions) is made since this is critical to ensuring the operational compatibility of metadata decoders. The incrementing of the version number shall not prevent use of unaffected tags, structure, or contents by a decoder that conforms to the prior version.

It is inevitable given the above addition process that eventually the registry will become cluttered with legacy entries to the point where the responsible SMPTE technical committee determines it has reached the limit of its usefulness. At this stage, or when other changes to the registry, to an existing approved registry structure or to relationships between metadata classes that prevent backward compatibility are necessary, a new registry consisting of both registry structure standard and registry contents shall be created and the structure and contents of the new Registry made readily accessible on-line by the SMPTE Registration Authority to allow upgrades to decoders. The superceded standard shall then undergo no further revision unless essential under the SMPTE five year rule.

3.5.3 Registry availability

The registry shall be available in electronic form in a defined electronic publishing format, such as XML with an accompanying document type definition.

The latest version of the registry shall be made available on the SMPTE Web site in a non-editable format (PDF or equivalent). It is preferred that a minimum of the two immediate previous versions be also available in a clearly indicated archive.

Annex A (normative)
Glossary of terms

A.1 batch of: Multiple instances of the items specified, in no particular order.

A.2 content: The program content will consist of the sum total of the essence (video, audio, data, etc.) and the metadata.

A.3 data element: An individual unit of data or metadata.

A.4 data element definition: The detailed and unambiguous definition of what is represented by the key and element name.

A.5 data element name: The English language name for the element represented numerically by the data element tag.

A.6 data element tag: The 8-byte tag that uniquely identifies the data element in the metadata dictionary.

A.7 essence: Identified by the SMPTE/EBU Task Force for Harmonized Standards for the Exchange of Program Material as Bitstreams (TFHS) as the digital representation of video, audio, and/or data information. Essence can therefore also be graphics, telemetry, photographs, or other information.

A.8 label: A 16-byte key that explicitly identifies a pre-defined value or group of values.

A.9 metadata: Generally referred to as data about data or data describing other data. More specifically, information that is considered ancillary to or otherwise directly complementary to the essence. Any information that a content provider considers useful or of value when associated with the essence being provided.

A.10 metadata class: The broad category of metadata that forms the first level of hierarchy for all registered metadata.

A.11 metadata registry: The standard database of approved, registered data element tags and their definitions.

A.12 metadata element: A broad term for a unit of metadata.

A.13 metadata tag: The 8-byte tag that uniquely identifies the data element in the metadata dictionary.

A.14 type: Information about the representation of the metadata or data value. A document is under development which defines the type for each element in more detail.

A.15 value: The instance of information described by the metadata tag. Equivalent to *Description* in the terminology of MPEG-7.

A.16 vector of: An ordered one-dimensional array of the items specified.

Annex B (informative)
Example

This example shows the groups registry entry for a hypothetical group named Altitude Datum, containing a time offset and an altitude, with an optional accuracy and an optional absolute event time.

Registry item No.	Description	Format	Value and purpose
1	UL header and designator	UL key bytes 1-5 and 7	06 0e 2b 34 02 00 01 Identifies the syntax and version control for the metadata group
1a	Registry version at introduction	UL key byte 8	01 The version number of the registry in which this group first appeared
2	Group designator	UL key bytes 9-16	07 01 00 00 00 00 00 00 In class 7, since all elements are in class 7; Identifies the metadata group
3	Group name	Text	Altitude datum English language name of the group
4	Group description	Text	Altitude and time plus optional reference Narrative description of the group, its contents, and its application
5	Parent	UL	Null UL of the parent group from which this group inherits all mandatory and optional item (if any)
6	Allowed syntax	Vector of bytes	(4 items) 01 03 13 05 Universal Sets Local Sets (1 byte tag, BER length) Local Sets (2 byte tag, BER length) Fixed Pack Lists the values of UL byte 6 (set or pack syntaxes) which are allowed for this group
7	Mandatory contents	Vector of records	(2 items) Listing of all the metadata elements and/or groups required in every instance of the defined group, in the order required for pack syntax
7.1a	UL key	16 bytes	06.0E.2B.34.01.01.01.02 07.02.01.03.03.03.00.00 Identifier of item in the SMPTE registry
7.1b	Local tag	4 bytes	0001 Tag to be used in local set syntax
7.1c	Limit length	4 bytes	0008 Fixed length in fixed pack syntax
7.2a	UL key	16 bytes	06.0E.2B.34.01.01.01.01 07.01.02.01.02.02.00.00 Identifier of item in the SMPTE registry
7.2b	Local tag	4 bytes	0002 Tag to be used in local set syntax
7.2c	Limit length	4 bytes	0004 Fixed length in fixed pack syntax
8	Optional contents	Heap of records	(2 items) Listing of any metadata elements and/or groups allowed in particular instances of the defined group (but not for pack syntax)
8.1a	UL key	16 bytes	06.0E.2B.34.01.01.01.01 07.02.01.02.07.01.00.00 Identifier of item in the SMPTE registry
8.1b	Local tag	4 bytes	0003 Tag to be used in local set syntax
8.1c	Limit length	4 bytes	32 Fixed length (or omitted)
8.2a	UL key	16 bytes	06.0E.2B.34.01.01.01.01 07.01.02.01.01.01.00.00 Identifier of item in the SMPTE registry
8.2b	Local tag	4 bytes	0004 Tag to be used in local set syntax
8.2c	Limit length	4 bytes	4 Fixed length (or omitted)
9	Defining document	Text	SMPTE xxxM Annex B A reference to the published document which defines this group in detail

Note that the groups registry does not duplicate any information in the mandatory and optional contents fields which is properly contained in the registry that defines the target element, and which can be obtained by a lookup operation.

For reference, the items referenced above were obtained from RP 210, as follows:

06.0E.2B.34.01.01.01.02	07.02.01.03.03.03.00.00	Event start
06.0E.2B.34.01.01.01.01	07.01.02.01.02.02.00.00	Device altitude
06.0E.2B.34.01.01.01.01	07.01.02.01.01.01.00.00	Local datum absolute position accuracy
06.0E.2B.34.01.01.01.01	07.02.01.02.07.01.00.00	Event start data and time – UTC

Annex C (informative)
Bibliography

SMPTE 335M-2001, Television — Metadata Dictionary Structure

SMPTE RP 210, Metadata Dictionary Registry of Metadata Element Descriptions