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**Digital Program Insertion – Advertising Systems Interfaces
Part 10
Stream Restriction Data Model (SRDM)**

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1.0 SCOPE

This document in conjunction with the SCTE 130 Part 10 Extensible Markup Language (XML) schema document (i.e. the XSD document) defines the XML data model expressing stream restrictions.

The Stream Restriction Data Model (SRDM) expresses the features, the attributes and the restrictions for a given context. That context may refer to a piece of entertainment content, an advertising asset, a VOD session or some other quantity of media. The application of the SRDM to a given context is out of scope for this document.

This revision of the SRDM is used to specify restrictions applied against play scale (i.e. the speed and direction of a particular asset). Any other form of stream restriction is out of scope for this revision of the SRDM.

2.0 REFERENCES

2.1 Normative References

None

3.0 COMPLIANCE NOTATION

“SHALL”	This word or the adjective “REQUIRED” means that the item is an absolute requirement of this specification.
“SHALL NOT”	This phrase means that the item is an absolute prohibition of this specification.
“SHOULD”	This word or the adjective “RECOMMENDED” means that there may exist valid reasons in particular circumstances to ignore this item, but the full implications should be understood and the case carefully weighted before choosing a different course.
“SHOULD NOT”	This phrase means that there may exist valid reasons in particular circumstances when the listed behavior is acceptable or even useful, but the full implications should be understood and the case carefully weighed before implementing any behavior described with this label.
“MAY”	This word or the adjective “OPTIONAL” means that this item is truly optional. One vendor may choose to include the item because a particular marketplace requires it or because it

	enhances the product, for example; another vendor may omit the same item.
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4.0 **ABBREVIATIONS**

ADS – Ad Decision Service

CIS – Content Information Service

MSO – Multi Service Operator

NPT – Normal Play Time

POIS – Placement Opportunity Information Service

SCTE – Society of Cable and Telecommunications Engineers

SRDM – Stream Restriction Data Model

URI – Universal Resource Identifier

VOD – Video On Demand

XML – Extensible Markup Language

XSD – XML Schema Definition

5.0 **INTRODUCTION**

There are business use cases requiring media being consumed by a viewer to be controlled. A requirement to prevent a viewer from fast forwarding through an advertisement would be an example of such a use case. If such a requirement was made either as an MSO, a content provider or an advertiser business policy, there needs to be a way to describe the restriction such that it may be understood by the involved systems. For example, the restriction may be expressed as Placement Opportunity metadata from a Placement Opportunity Information Service (POIS/SCTE 130-5), or as part of PlacementResponse from an Ad Decision Service (ADS/SCTE 130-3), or as metadata served from a Content Information Service (CIS/SCTE 130-4). This appendix provides the definition of a stream restriction data model. Instances of these stream restrictions are intended to be used as part of an extension to existing schema definitions where the schemata employ an ‘Ext’ style extension mechanism. (See the Ext element herein for additional information.) This schema definition model allows for this document and

associated schema to be revised without having to revise any additional schemas that may carry this data model.

Throughout this document the following concepts are used and are useful for the reader to understand. Specific XML elements that embody these concepts are discussed later on in this document.

NPT range : The inclusive minimum and maximum permitted positions within a stream as denoted via normal play time (NPT) values.

Scale range : The inclusive minimum and maximum permitted scale values used for media play out. Scale values can be a discrete value or unbounded.

Stream restriction : An instruction which governs the permissible conditions by which media may be presented.

While there are many different ways in which a stream may be restricted, this particular version of the data model concerns itself with play scale restriction (the speed and direction of play) as it applies to periods of time within a piece of media. Play scale restrictions are expressed as ranges using an upper and lower bound rather than single scale values because of the difficulties arising when trying to map the values to semantic definitions such as fast forward, slow play, etc. For example, there may be a need to express a way to restrict all fast-forward play (any play that is in the forward direction faster than regular play speed). There are an infinite number of values that could be expressed (from 1.0 to infinity). Using an artificially high ceiling has the problem of imposing implementation limitations and using discrete values is not sufficient. If the only cases needing consideration were to restrict fast-forward, rewind, etc., then using enumerations could be one option. However, scenarios whereby a restriction is needed to disallow all fast-forward greater than twice the normal speed would mean creating additional enumerations. If the example is extrapolated to other restrictions, it becomes apparent that enumerations become inflexible and all parties using such enumerations would need to agree on the semantic definition of each value. Suffice to say, it becomes easier to express a play scale restriction as a range, so the syntax of the restriction may express a wide range of restrictions and the semantics don't impose as rigid a definition.

Scale ranges state what scale values are permitted. Each bound that makes up the range has a condition associated with it. The scale value may be tested to see if it is greater, or greater or equal to (using the values defined in the schema 'gt' and 'gteq' respectively) the lower bound, and less than, or less than or equal to (using the values defined in the schema 'lt' and 'lteq' respectively) the upper bound. Both bound tests may be set to "unbounded" indicating the boundary condition does not exist. The rationale behind this approach is to allow ranges to be specified as precise values rather than approximations.

Example scale ranges may include

Restriction	Condition
No fast forward	lowerbound=-INF, lowertest=unbounded,

	upperbound=1, uppertest=lteq
No rewind	lowerbound=0, lowertest=gteq, upperbound=INF, uppertest=unbounded
No slow play	{lowerbound=-INF, lowertest=unbounded, upperbound=0, uppertest=lt} + {lowerbound=1, lowertest=gteq, upperbound=INF, uppertest=unbounded}
Allow normal play	lowerbound=1, lowertest=gteq, upperbound=1, uppertest=lteq
Allow pause	lowerbound=0, lowertest=gteq, upperbound=0, uppertest=lteq
No fast forward > 2x	lowerbound=-INF, lowertest=unbounded, upperbound=2, uppertest=lteq
No pause	{lowerbound=-INF, lowertest=unbounded, upperbound=0, uppertest=lt} + {lowerbound=0, lowertest=gt, upperbound=INF, uppertest=unbounded}

Table 1 – Example scale ranges

This document does not specifically define the XML document locations where the Stream Restriction Data Model SRDM is carried. It is expected that SRDM instances may be used within various parts of SCTE 130 messages. For example, it may be applied to a PlacementOpportunity element in a 130-3 PlacementRequest message or it may be used with a SCTE 130-4 CIS related messages describing how a particular asset should be controlled. A particular instance of the SRDM applies to the context it is defined within.

It is considered that the SRDM may be used outside of the scope of SCTE 130 and as such does not derive any XML definitions from other SCTE 130 parts. This does mean that there is duplicative definitions with respect to the Ext element defined within SCTE 130 part 2 and the ExtType complex type defined within SCTE 130 part 10. Updates to the SCTE 130 part 2 Ext element definition shall warrant consideration for adoption by SCTE 130 part 10.

6.0 NOTATIONAL CONVENTIONS

6.1 Normative XML Schema

See [SCTE130-2] for information.

6.2 Document Conventions

This specification utilizes the same document conventions as SCTE 130 Part 2. See [SCTE130-2] for conventions and XML schema illustration nomenclature explanations. This specification utilizes XML substitution groups for additional extensibility. XML substitution groups designate elements as substitutes for other element declarations without changing the original schema documents. Within this document, substitutable elements are graphically identified using the following illustrative technique.

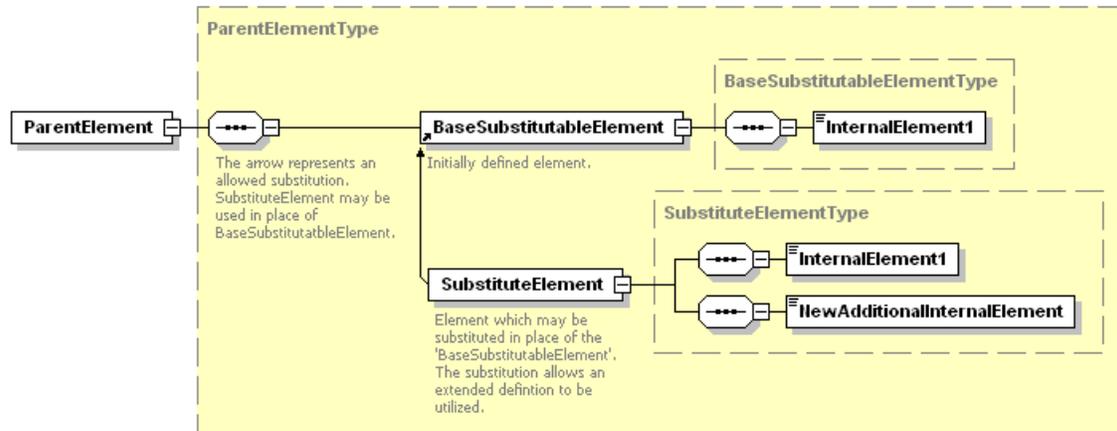


Figure 1: Substitution Group Schema Convention

In Figure 5, the element referred to as “SubstituteElement” may be used in place of the element named “BaseSubstitutableElement” provided the XML namespace declarations are included in the document as per [W3C-XSD]. The diagram’s illustrative arrow signals the reader of the possible element substitution.

7.0 PROCESSING CONVENTIONS

7.1 Unknown/Unrecognized/Unsupported XML Elements and Attributes

See [SCTE130-2] for information

8.0 XML NAMESPACES

This specification uses the ‘srdm’ prefix, as described in Table 2, for the interface associated with the specific XML namespace URI that shall be used by all implementations. Table 4 lists the prefix, the corresponding namespace, and a description of the defining specification used herein.

Prefix	Namespace	Description
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srdm	http://www.scte.org/schemas/130-10/201x/srdm	SCTE 130 Part 10 (i.e. this document).
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Table 2: XML Namespaces

9.0 XML NAMESPACE DECLARATIONS

Unless otherwise stated, all references to XML elements illustrated in this document are from the ‘srdm’ namespace. Elements from other namespaces are prefixed with the name of the external namespace, e.g. <xsd:XXXX>.

10.0 MESSAGES CONTAINING THE STREAM RESTRICTION DATA MODEL

Any SCTE 130 message interface may utilize the SRDM. The message interfaces utilizing the SRDM are outside the scope of this specification. Refer to the individual messaging specifications for additional information.

10.1 @version Attribute

This SRDM shall not have a @version attribute associated with this specification. The data model revision shall be reflected by the SRDM XML namespace specified in Section 8.0.

11.0 SRDM ELEMENT DETAILS

The SRDM introduces new elements in defining the data model composition. The new SRDM elements are listed in Table 3 and are detailed in subsequent document sections.

Element	Description
StreamRestrictionList	The element used to capture the list of stream restrictions for a given context.
StreamRestriction	Used to describe an instance of a specific set of stream restrictions for a given NPT range.
NPTRange	Used to describe a single NPT range.
ScaleRange	Used to describe a single scale range.

Table 3 - SRDM Elements

11.1 StreamRestrictionList

This element is a container for all the stream restrictions that are to be applied for a given context. It is intended that only one StreamRestrictionList instance need be instantiated for a given context. At least one StreamRestriction instance must be specified.

The XML schema diagram for this element is as follows:

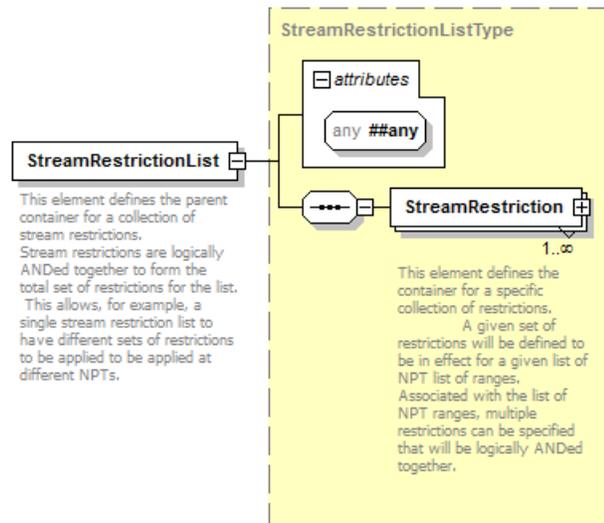


Figure 2: StreamRestrictionList Element Schema

The StreamRestrictionList element semantics are as follows:

StreamRestriction [Required] – a specific instance of a set of stream restrictions for an optional set of NPT ranges.

11.2 StreamRestriction

This element defines the container for a specific collection of restrictions that are applied to a given set of NPT ranges. Associated with the list of NPT ranges, multiple restrictions may be specified that are logically ANDed together. NPTRange is optional and if omitted, the stream restrictions shall be applied to the entire context.

The behavior of overlapping NPT ranges is not defined by this document.

The XML schema diagram for this element is as follows:

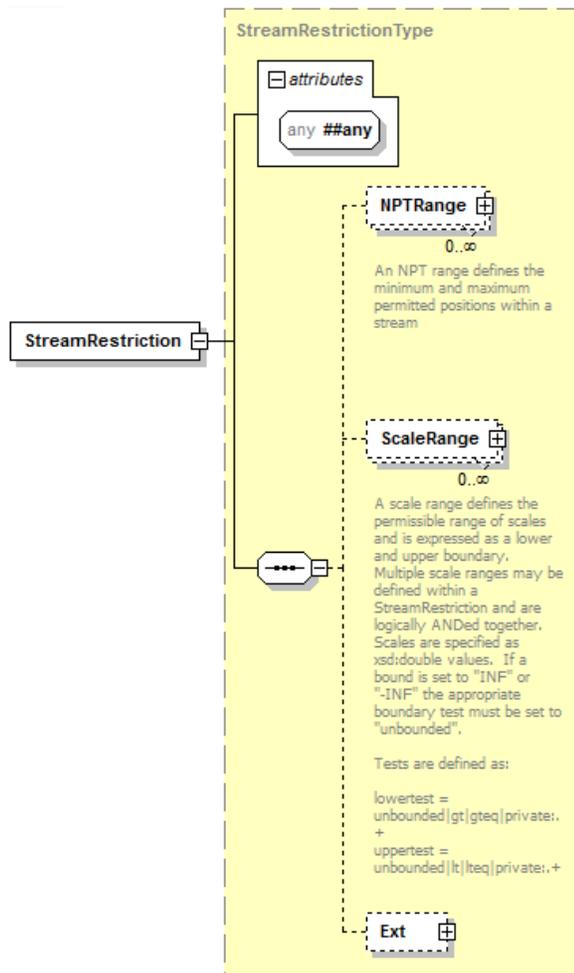


Figure 3: StreamRestriction Element Schema

The StreamRestrictionType element semantics are as follows:

NPTRange [Optional] – Zero or more NPT ranges.

ScaleRange [Optional] – Zero or more scale ranges.

core:Ext [Optional] – An optional extension point for implementation details not covered by this specification.

Stream restrictions may be created with one or more scale ranges but do not have any associated NPT range. The absence of an NPT range shall mean that the stream restriction applies to the entire media from beginning to end.

Stream restrictions may be created with one or more NPT ranges but do not have any associated scale ranges. The absence of scale range shall be permitted to allow extensions to the SRDM to be bounded by NPT ranges. Such use of the SRDM is out of the scope of this document.

Stream restrictions may be created with zero NPT ranges and zero scale ranges. The absence of both NPT ranges and scale ranges shall be permitted to allow extensions to the SRDM. Such use of the SRDM is out of the scope of this document.

11.3 NPTRange

This element is used to hold a single NPT range. Multiple NPTRanges may be specified within a single StreamRestriction element. When multiple NPTRanges are specified within a single StreamRestriction element the applicable range shall be the union of NPTRange elements. For any NPT not covered by an NPTRange instance, no stream restrictions shall apply.

The NPTRange startnpt and endnpt attributes utilize the xsd:dateTime format. The behavior of NPTRange instances based on the presence or absence of the startnpt and endnpt attributes is described in the table below:

startnpt	endnpt	Behavior
Present	Absent	The range starts from the value of the startnpt attribute and extends to infinity. An endnpt may be implicit by practical limitations of a system (e.g. session duration) . The definition of the practical end of a range without an endnpt attribute is outside of the scope of this document.
Present	Present	The range starts from the value of the startnpt attribute and extends up to but not inclusive of the value of the endnpt attribute.
Absent	Present	The range starts from an infinite point the past and extends to the value of the endnpt attribute. A startnpt may be implicit by practical limitations of a system (e.g. start of session) . The definition of the practical start of a range without a startnpt attribute is outside of the scope of this document.
Absent	Absent	When both startnpt and endnpt values are not defined this shall mean the stream restriction applies to the entire context.

Table 4 - Interpretation of NPTRange attributes

The XML schema diagram for this element is as follows:

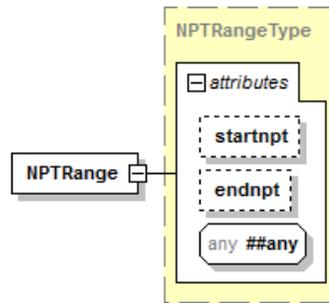


Figure 4: NPTRange Element Schema

11.4 ScaleRange

This element holds a single scale range. The scale range expresses the permissible scale ranges as defined by a lower and upper bound. Each bound shall be expressed as an xsd:double value and shall have an associated boundary test.

If a bound is set to $-\text{INF}/\text{INF}$ (meaning unbounded), the corresponding bound test must be set to “unbounded”. Otherwise, the lowestest attribute should be either “gt” or “gteq” and the uppermost attribute should either be “lt” or “lteq”. The upperbound must be greater than the lowerbound, and both the upperbound and lowerbound along with uppermost and lowestest attributes must be specified.

Bound value	Test value
upperbound = INF	uppermost = unbounded
lowerbound = -INF	lowestest = unbounded
upperbound != INF	uppermost = lt lteq
lowerbound != -INF	lowestest = gt gteq

Table 2 – Possible bound/test values for scale ranges

Scale ranges state what scale values are permitted.

The XML schema diagram for this element is as follows:

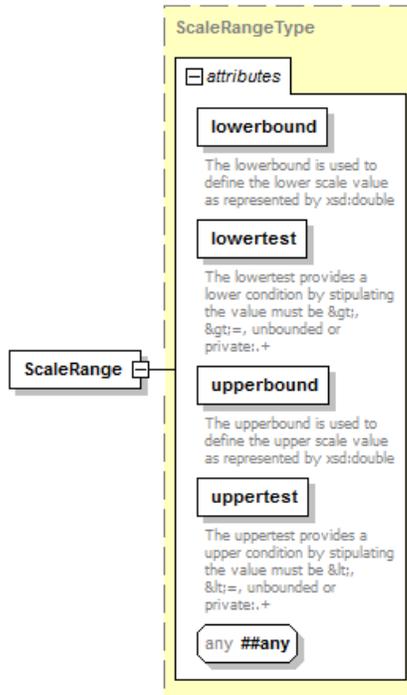


Figure 5 – ScaleRange Element Schema

APPENDIX 1. SRDM EXAMPLES (INFORMATIVE)

Disallow fast forward example

An example of an instance of the Stream Restriction Data Model that would disallow fast forward for the entire NPT range of the context.

```
<?xml version="1.0" encoding="UTF-8"?>
<StreamRestrictionList xmlns="http://www.scte.org/schema/130-10/2013/srdm"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://www.scte.org/schema/130-10/2013/srdm SCTE_130-10_2013.xsd">
  <StreamRestriction>
    <NPTRange startnpt="00:00:00.000"/>
    <ScaleRange lowerbound="-INF" upperbound="1" lowestest="unbounded"
uppertest="lteq"/>
  </StreamRestriction>
</StreamRestrictionList>
```

Disallow fast forward example with no NPT range example

An example of an instance of the Stream Restriction Data Model that would disallow fast forward for the entire NPT range of the context by virtue of specifying no NPT range.

```
<?xml version="1.0" encoding="UTF-8"?>
<StreamRestrictionList xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:noNamespaceSchemaLocation="SCTE_130-10_2013.xsd">
  <StreamRestriction>
    <ScaleRange lowerbound="-INF" upperbound="1" lowestest="unbounded"
uppertest="lteq"/>
  </StreamRestriction>
</StreamRestrictionList>
```

Multiple NPT range example

An example of an instance of the Stream Restriction Data Model that restricts play for two NPT ranges (e.g. for two static breaks within a piece of entertainment content), to any reverse play, pause, slow forward play and normal (1x) forward play.

```
<?xml version="1.0" encoding="UTF-8"?>
<StreamRestrictionList xmlns="http://www.scte.org/schema/130-10/2013/srdm"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://www.scte.org/schema/130-10/2013/srdm SCTE_130-10_2013.xsd">
  <StreamRestriction>
    <NPTRange startnpt="00:10:00.000" endnpt="00:12:59.999"/>
    <NPTRange startnpt="00:20:00.000" endnpt="00:22:59.999"/>
    <ScaleRange lowerbound="-INF" upperbound="1" lowestest="unbounded"
uppertest="lteq"/>
  </StreamRestriction>
```

```
</StreamRestrictionList>
```

Multiple stream restriction example

An instance of the Stream Restriction Data Model showing no slow play between three time periods (e.g. during entertainment content) and no fast forward during two periods (e.g. during baked in ad content).

```
<?xml version="1.0" encoding="UTF-8"?>
<StreamRestrictionList xmlns="http://www.scte.org/schema/130-10/2013/srdm"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://www.scte.org/schema/130-10/2013/srdm SCTE_130-10_2013.xsd">
  <StreamRestriction>
    <NPTRange startnpt="00:10:00.000" endnpt="00:12:59.999" />
    <NPTRange startnpt="00:20:00.000" endnpt="00:22:59.999" />
    <ScaleRange lowerbound="INF" lowertest="unbounded" upperbound="1"
uppertest="lteq" />
  </StreamRestriction>
  <StreamRestriction>
    <NPTRange endnpt="00:09:59.999" />
    <NPTRange startnpt="00:13:00.000" endnpt="00:19:59.999" />
    <NPTRange startnpt="00:23:00.00" />
    <ScaleRange lowerbound="-INF" lowertest="unbounded" upperbound="1"
uppertest="lteq" />
    <ScaleRange lowerbound="0" lowertest="gteq" upperbound="0"
uppertest="lteq" />
    <ScaleRange lowerbound="1" lowertest="gteq" upperbound="INF"
uppertest="unbounded" />
  </StreamRestriction>
</StreamRestrictionList>
```

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