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An XML Schema for the CLUE data model
draft-ietf-clue-data-model-schema-03

Abstract

This document provides an XML schema file for the definition of CLUE data model types.

Status of This Memo

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1. Introduction

This document provides an XML schema file for the definition of CLUE data model types.

The schema is based on information contained in [I-D.ietf-clue-framework]. It encodes information and constraints defined in the aforementioned document in order to provide a formal representation of the concepts therein presented. The schema definition is intended to be modified according to changes applied to the above mentioned CLUE document.

The document actually represents a proposal aiming at the definition of a coherent structure for all the information associated with the description of a telepresence scenario.

2. Terminology

This document refers to the same terminology used in [I-D.ietf-clue-framework]. We briefly recall herein some of the main terms exploited in the document.

Audio Capture: Media Capture for audio. Denoted as ACn in the example cases in this document.

Camera-Left and Right: For Media Captures, camera-left and cameraright are from the point of view of a person observing the rendered media. They are the opposite of Stage-Left and Stage-Right.

Capture: Same as Media Capture.

Capture Device: A device that converts audio and video input into an electrical signal, in most cases to be fed into a media encoder.

Capture Encoding: A specific encoding of a Media Capture, to be sent by a Media Provider to a Media Consumer via RTP.

Capture Scene: An abstraction grouping semantically-coupled Media Captures available at the Media Provider’s side, representing a precise portion of the local scene that can be transmitted remotely. Capture Scene MAY correspond to a part of the telepresence room or MAY focus only on the presentation media. A Capture Scene is characterized by a set of attributes and by a set of Capture Scene Entries.

Capture Scene Entry: A list of Media Captures of the same media type that constitute a possible representation of a Capture Scene. Media Capture belonging to the same Capture Scene Entry can be sent simultaneously by the Media Provider.

CLUE Participant: An entity able to use the CLUE protocol within a telepresence session. It can be an Endpoint or a MCU able to use the CLUE protocol.

Consumer: Same as Media Consumer.

Encoding or Individual Encoding: The representation of an encoding technology. In the CLUE datamodel, for each encoding it is provided a set of parameters representing the encoding constraints, like for example the maximum bandwidth of the Media Provider the encoding can consume. s

Encoding Group: The representation of a group of encodings. For each group, it is provided a set of parameters representing the constraints to be applied to the group as a whole. An example is the maximum bandwidth that can be consumed when using the contained encodings together simultaneously.

Endpoint The logical point of final termination through receiving, decoding and rendering, and/or initiation through capturing, encoding, and sending of media streams. An endpoint consists of one or more physical devices which source and sink media streams, and exactly one SIP Conferencing Framework Participant (which, in turn, includes exactly one SIP User Agent). Endpoints can be anything from multiscreen/multicamera room controllers to handheld devices.

MCU: Multipoint Control Unit (MCU) - a device that connects two or more endpoints together into one single multimedia conference. An MCU may include a Mixer.

Media: Any data that, after suitable encoding, can be conveyed over RTP, including audio, video or timed text.

Media Capture: A "Media Capture", or simply "Capture", is a source of Media of a single type (i.e., audio or video or text).

Media Stream: The term "Media Stream", or simply "Stream", is used as a synonymous of Capture Encoding.

Media Provider: A CLUE participant (i.e., an Endpoint or a MCU) able to send Media Streams.

Media Consumer: A CLUE participant (i.e., an Endpoint or a MCU) able to receive Media Streams.

Scene: Same as Capture Scene.

Scene Entry: Same as Capture Scene Entry.

Stream: Same of Media Stream.

Multiple Content Capture: A Capture that can contain different Media Captures of the same media type. It is denoted as MCC in this document. In the Stream resulting from the MCC, the Stream coming from the encoding of the composing Media Captures can appear simultaneously, if the MCC is the result of a mixing operation, or can appear alternatively over the time, according to a certain switching policy.

Plane of Interest: The spatial plane containing the most relevant subject matter.

Provider: Same as Media Provider.

Render:

Simultaneous Transmission Set: a set of Media Captures that can be transmitted simultaneously from a Media Provider.

Single Media Capture: A Capture representing the Media coming from a single-source Capture Device.

Spatial Information: Data about the spatial position of a Capture Device that generate a Single Media Capture within the context of a Capture Scene representing a phisical portion of a Telepresence Room.

Stream Characteristics: The union of the features used to describe a Stream in the CLUE environment and in the SIP-SDP environment

Video Capture: A Media Capture for video.

3. XML Schema

This section contains the proposed CLUE data model schema definition.

The element and attribute definitions are formal representation of the concepts needed to describe the capabilities of a media provider and the current streams it is transmitting within a telepresence session.

The main groups of information are:

<mediaCaptures>: the list of media captures available (Section 4)

<encodings>: the list of individual encodings (Section 5)

<encodingGroups>: the list of encodings groups (Section 6)

<captureScenes>: the list of capture scenes (Section 7)

<simultaneousSets>: the list of simultaneous transmission sets(Section 8)

<captureEncodings>: the list of instantiated capture encodings (Section 9)

All of the above refers to concepts that have been introduced in [I-D.ietf-clue-framework] and further detailed in the following of this document.

```
<?xml version="1.0" encoding="UTF-8" ?>
<xs:schema
   targetNamespace="urn:ietf:params:xml:ns:clue-info"
   xmlns:tns="urn:ietf:params:xml:ns:clue-info"
   xmlns:xs="http://www.w3.org/2001/XMLSchema"
   xmlns="urn:ietf:params:xml:ns:clue-info"
   elementFormDefault="qualified"
   attributeFormDefault="unqualified">

<!-- ELEMENT DEFINITIONS -->
<xs:element name="mediaCaptures" type="mediaCapturesType"/>
<xs:element name="encodings" type="encodingsType"/>
<xs:element name="encodingGroups" type="encodingGroupsType"/>
<xs:element name="captureScenes" type="captureScenesType"/>
<xs:element name="simultaneousSets" type="simultaneousSetsType"/>
<xs:element name="captureEncodings" type="captureEncodingsType"/>


<!-- MEDIA CAPTURES TYPE -->
<!-- envelope of media captures -->
<xs:complexType name="mediaCapturesType">
 <xs:sequence>
   <xs:element name="mediaCapture" type="mediaCaptureType"
   maxOccurs="unbounded"/>
 </xs:sequence>
</xs:complexType>


<!-- DESCRIPTION element -->
<xs:element name="description">
 <xs:complexType>
  <xs:simpleContent>
   <xs:extension base="xs:string">
     <xs:attribute name="lang" type="xs:language"/>
   </xs:extension>
  </xs:simpleContent>
 </xs:complexType>
</xs:element>

<!-- MEDIA CAPTURE TYPE -->
<xs:complexType name="mediaCaptureType" abstract="true">
  <xs:sequence>
    <!-- mandatory fields -->
    <xs:element name="capturedMedia" type="xs:string"/>
    <xs:element name="captureSceneIDREF" type="xs:IDREF"/>
    <xs:element name="encGroupIDREF" type="xs:IDREF"/>
    <xs:choice>
      <xs:sequence>
        <xs:element name="spatialInformation"
                    type="tns:spatialInformationType"/>
      </xs:sequence>
      <xs:element name="nonSpatiallyDefinable" type="xs:boolean" fixed="true"/>
    </xs:choice>
    <!-- for handling multi-content captures: -->
    <xs:choice>
      <xs:sequence>
        <xs:element name="synchronizationID" type="xs:ID" minOccurs="0"/>
        <xs:element name="contentCaptureIDs" type="captureIDListType"
        minOccurs="0"/>
        <xs:element name="composed" type="xs:boolean" minOccurs="0"/>
        <xs:element name="switching" type="xs:boolean" minOccurs="0"/>
        <xs:element name="policy" type="xs:string" minOccurs="0"/>
        <xs:element name="maxCaptures" type="xs:unsignedInt" minOccurs="0"/>
      </xs:sequence>
      <xs:element name="single" type="xs:boolean" fixed="true"/>
    </xs:choice>
    <!-- optional fields -->
    <xs:element ref="description" minOccurs="0" maxOccurs="unbounded"/>
    <xs:element name="priority" type="xs:unsignedInt" minOccurs="0"/>
    <xs:element name="lang" type="xs:language" minOccurs="0"/>
    <xs:element name="mobility" type="mobilityType" minOccurs="0"/>
    <xs:element name="presentation" type="presentationType" minOccurs="0"/>
    <xs:element name="view" type="viewType" minOccurs="0"/>
    <xs:element name="maxCaptureEncodings" type="xs:unsignedInt"
    minOccurs="0"/>
    <xs:element name="relatedTo" type="xs:IDREF" minOccurs="0"/>
    <xs:any namespace="##other" processContents="lax" minOccurs="0"
    maxOccurs="unbounded"/>
  </xs:sequence>
  <xs:attribute name="captureID" type="xs:ID" use="required"/>
  <xs:anyAttribute namespace="##other" processContents="lax"/>
</xs:complexType>

<!-- VIEW TYPE -->
<xs:simpleType name="viewType">
 <xs:restriction base="xs:string">
  <xs:enumeration value="room"/>
  <xs:enumeration value="table"/>
  <xs:enumeration value="lectern"/>
  <xs:enumeration value="individual"/>
  <xs:enumeration value="audience"/>
 </xs:restriction>
</xs:simpleType>

<!-- PRESENTATION TYPE -->
<xs:simpleType name="presentationType">
 <xs:restriction base="xs:string">
  <xs:enumeration value="slides"/>
  <xs:enumeration value="image"/>
  <xs:enumeration value=""/>
 </xs:restriction>
</xs:simpleType>

<!-- SPATIAL INFORMATION TYPE -->
<xs:complexType name="spatialInformationType">
 <xs:sequence>
  <xs:element name="capturePoint" type="capturePointType"/>
  <xs:element name="captureArea" type="captureAreaType"
  minOccurs="0"/>
  <xs:any namespace="##other" processContents="lax" minOccurs="0"
  maxOccurs="unbounded"/>
 </xs:sequence>
 <xs:anyAttribute namespace="##other" processContents="lax"/>
</xs:complexType>

<!-- MOBILITY TYPE -->
<xs:simpleType name="mobilityType">
 <xs:restriction base="xs:string">
  <xs:enumeration value="static"/>
  <xs:enumeration value="dynamic"/>
  <xs:enumeration value="highly-dynamic"/>
 </xs:restriction>
</xs:simpleType>

<!-- TEXT CAPTURE TYPE -->
<xs:complexType name="textCaptureType">
 <xs:complexContent>
  <xs:extension base="tns:mediaCaptureType">
  </xs:extension>
 </xs:complexContent>
</xs:complexType>


<!-- AUDIO CAPTURE TYPE -->
<xs:complexType name="audioCaptureType">
 <xs:complexContent>
  <xs:extension base="tns:mediaCaptureType">
   <xs:sequence>
    <xs:element name="audioChannelFormat" type="audioChannelFormatType"
    minOccurs="0"/>
   </xs:sequence>
  </xs:extension>
 </xs:complexContent>
</xs:complexType>


<!-- AUDIO CHANNEL FORMAT TYPE -->
<xs:simpleType name="audioChannelFormatType">
 <xs:restriction base="xs:string">
  <xs:enumeration value="mono"/>
  <xs:enumeration value="stereo"/>
 </xs:restriction>
</xs:simpleType>

<!-- VIDEO CAPTURE TYPE -->
<xs:complexType name="videoCaptureType">
 <xs:complexContent>
  <xs:extension base="tns:mediaCaptureType">
   <xs:sequence>
    <xs:element ref="embeddedText" minOccurs="0"/>
   </xs:sequence>
  </xs:extension>
 </xs:complexContent>
</xs:complexType>

<!-- EMBEDDED TEXT ELEMENT -->
<xs:element name="embeddedText">
```

```
 <xs:complexType>
  <xs:simpleContent>
   <xs:extension base="xs:boolean">
    <xs:attribute name="lang" type="xs:language"/>
   </xs:extension>
  </xs:simpleContent>
 </xs:complexType>
</xs:element>

<!-- CAPTURE SCENES TYPE -->
<!-- envelope of capture scenes -->
<xs:complexType name="captureScenesType">
 <xs:sequence>
  <xs:element name="captureScene" type="captureSceneType"
  maxOccurs="unbounded"/>
 </xs:sequence>
</xs:complexType>

<!-- CAPTURE SCENE TYPE -->
<xs:complexType name="captureSceneType">
 <xs:sequence>
  <xs:element ref="description" minOccurs="0" maxOccurs="unbounded"/>
  <xs:element name="sceneEntries" type="sceneEntriesType"/>
  <xs:any namespace="##other" processContents="lax" minOccurs="0"
  maxOccurs="unbounded"/>
 </xs:sequence>
 <xs:attribute name="sceneID" type="xs:ID" use="required"/>
 <xs:attribute name="scale" type="scaleType" use="required"/>
 <xs:anyAttribute namespace="##other" processContents="lax"/>
</xs:complexType>

<!-- SCALE TYPE -->
<xs:simpleType name="scaleType">
 <xs:restriction base="xs:string">
  <xs:enumeration value="millimeters"/>
  <xs:enumeration value="unknown"/>
  <xs:enumeration value="noscale"/>
 </xs:restriction>
</xs:simpleType>

<!-- CAPTURE AREA TYPE -->
<xs:complexType name="captureAreaType">
 <xs:sequence>
  <xs:element name="bottomLeft" type="pointType"/>
  <xs:element name="bottomRight" type="pointType"/>
  <xs:element name="topLeft" type="pointType"/>
  <xs:element name="topRight" type="pointType"/>
 </xs:sequence>
```

```
</xs:complexType>

<!-- POINT TYPE -->
<xs:complexType name="pointType">
 <xs:sequence>
  <xs:element name="x" type="xs:decimal"/>
  <xs:element name="y" type="xs:decimal"/>
  <xs:element name="z" type="xs:decimal"/>
 </xs:sequence>
</xs:complexType>

<!-- CAPTURE POINT TYPE -->
<xs:complexType name="capturePointType">
 <xs:complexContent>
  <xs:extension base="pointType">
   <xs:sequence>
    <xs:element name="lineOfCapturePoint" type="tns:pointType"
    minOccurs="0"/>
   </xs:sequence>
   <xs:attribute name="pointID" type="xs:ID"/>
  </xs:extension>
 </xs:complexContent>
</xs:complexType>


<!-- SCENE ENTRIES TYPE -->
<!-- envelope of scene entries of a capture scene -->
<xs:complexType name="sceneEntriesType">
 <xs:sequence>
  <xs:element name="sceneEntry" type="sceneEntryType"
  maxOccurs="unbounded"/>
 </xs:sequence>
</xs:complexType>

<!-- SCENE ENTRY TYPE -->
<xs:complexType name="sceneEntryType">
 <xs:sequence>
  <xs:element ref="description" minOccurs="0" maxOccurs="unbounded"/>
  <xs:element name="mediaCaptureIDs" type="captureIDListType"/>
 </xs:sequence>
 <xs:attribute name="sceneEntryID" type="xs:ID" use="required"/>
 <xs:attribute name="mediaType" type="xs:string" use="required"/>
</xs:complexType>


<!-- CAPTURE ID LIST TYPE -->
<xs:complexType name="captureIDListType">
 <xs:sequence>
```

```
  <xs:element name="captureIDREF" type="xs:IDREF"
  maxOccurs="unbounded"/>
 </xs:sequence>
</xs:complexType>

<!-- ENCODINGS TYPE -->
<xs:complexType name="encodingsType">
 <xs:sequence>
  <xs:element name="encoding" type="encodingType"
  maxOccurs="unbounded"/>
 </xs:sequence>
</xs:complexType>

<!-- ENCODING TYPE -->
<xs:complexType name="encodingType" abstract="true">
 <xs:sequence>
  <xs:element name="encodingName" type="xs:string"/>
  <xs:element name="maxBandwidth" type="xs:unsignedInt"/>
  <xs:any namespace="##other" processContents="lax" minOccurs="0"
  maxOccurs="unbounded"/>
 </xs:sequence>
 <xs:attribute name="encodingID" type="xs:ID" use="required"/>
 <xs:anyAttribute namespace="##any" processContents="lax"/>
</xs:complexType>

<!-- AUDIO ENCODING TYPE -->
<xs:complexType name="audioEncodingType">
 <xs:complexContent>
  <xs:extension base="tns:encodingType">
   <xs:sequence>
    <xs:element name="encodedMedia" type="xs:string" fixed="audio"
    minOccurs="0"/>
   </xs:sequence>
  </xs:extension>
 </xs:complexContent>
</xs:complexType>

<!-- VIDEO ENCODING TYPE -->
<xs:complexType name="videoEncodingType">
 <xs:complexContent>
  <xs:extension base="tns:encodingType">
   <xs:sequence>
    <xs:element name="encodedMedia" type="xs:string" fixed="video"
    minOccurs="0"/>
   </xs:sequence>
  </xs:extension>
 </xs:complexContent>
</xs:complexType>
```

```
<!-- ENCODING GROUPS TYPE -->
<xs:complexType name="encodingGroupsType">
 <xs:sequence>
  <xs:element name="encodingGroup" type="tns:encodingGroupType"
  maxOccurs="unbounded"/>
 </xs:sequence>
</xs:complexType>

<!-- ENCODING GROUP TYPE -->
<xs:complexType name="encodingGroupType">
 <xs:sequence>
  <xs:element name="maxGroupBandwidth" type="xs:unsignedInt"/>
  <xs:element name="encodingIDList" type="encodingIDListType"/>
  <xs:any namespace="##other" processContents="lax" minOccurs="0"
  maxOccurs="unbounded"/>
 </xs:sequence>
 <xs:attribute name="encodingGroupID" type="xs:ID" use="required"/>
 <xs:anyAttribute namespace="##any" processContents="lax"/>
</xs:complexType>

<!-- ENCODING ID LIST TYPE -->
<xs:complexType name="encodingIDListType">
 <xs:sequence>
  <xs:element name="encIDREF" type="xs:IDREF" maxOccurs="unbounded"/>
 </xs:sequence>
</xs:complexType>

<!-- SIMULTANEOUS SETS TYPE -->
<xs:complexType name="simultaneousSetsType">
 <xs:sequence>
  <xs:element name="simultaneousSet" type="simultaneousSetType"
  maxOccurs="unbounded"/>
 </xs:sequence>
</xs:complexType>

<!-- SIMULTANEOUS SET TYPE -->
<xs:complexType name="simultaneousSetType">
 <xs:sequence>
   <xs:element name="captureIDREF" type="xs:IDREF"
   minOccurs="0" maxOccurs="unbounded"/>
   <xs:element name="sceneEntryIDREF" type="xs:IDREF"
   minOccurs="0" maxOccurs="unbounded"/>
 </xs:sequence>
 <xs:attribute name="setID" type="xs:ID" use="required"/>
</xs:complexType>

<!-- CAPTURE ENCODINGS TYPE -->
<xs:complexType name="captureEncodingsType">
```

```
 <xs:sequence>
  <xs:element name="captureEncoding" type="captureEncodingType"
  maxOccurs="unbounded"/>
 </xs:sequence>
</xs:complexType>


<!-- CAPTURE ENCODING TYPE -->
<xs:complexType name="captureEncodingType">
 <xs:sequence>
  <xs:element name="mediaCaptureID" type="xs:string"/>
  <xs:element name="encodingID" type="xs:string"/>
 </xs:sequence>
 <xs:attribute name="ID" type="xs:ID"/>
</xs:complexType>

<!-- CLUE INFO ELEMENT -->
<!-- the <clueInfo> envelope can be seen
     as the ancestor of an <advertisement> envelope -->
<xs:element name="clueInfo" type="clueInfoType"/>

<!-- CLUE INFO TYPE -->
<xs:complexType name="clueInfoType">
  <xs:sequence>
   <xs:element ref="mediaCaptures"/>
   <xs:element ref="encodings"/>
   <xs:element ref="encodingGroups"/>
   <xs:element ref="captureScenes"/>
   <xs:element ref="simultaneousSets" minOccurs="0"/>
   <xs:any namespace="##other" processContents="lax" minOccurs="0"
   maxOccurs="unbounded"/>
  </xs:sequence>
  <xs:attribute name="clueInfoID" type="xs:ID" use="required"/>
  <xs:anyAttribute namespace="##other" processContents="lax"/>
</xs:complexType>

</xs:schema>
```

Following sections describe the XML schema in more detail.

4. <mediaCaptures>

<mediaCaptures> represents the list of one ore more media captures available on the media provider’s side. Each media capture is represented by a <mediaCapture> element (Section 10).

5. <encodings>

<encodings> represents the list of individual encodings available on the media provider’s side. Each individual encoding is represented by an <encoding> element (Section 16).

6. <encodingGroups>

<encodingGroups> represents the list of the encoding groups organized on the media provider’s side. Each encoding group is represented by a <encodingGroup> element (Section 19).

7. <captureScenes>

<captureScenes> represents the list of the capture scenes organized on the media provider’s side. Each capture scene is represented by a <captureScene> element. (Section 14).

8. <simultaneousSets>

<simultaneousSets> contains the simultaneous sets indicated by the media provider. Each simultaneous set is represented by a <simultaneousSet> element. (Section 20).

9. <captureEncodings>

<captureEncodings> is a list of capture encodings. It can represents the list of the desired capture encodings indicated by the media consumer or the list of instantiated captures on the provider’s side. Each capture encoding is represented by a <captureEncoding> element. (Section 21).

10. <mediaCapture>

According to the CLUE framework, a media capture is the fundamental representation of a media flow that is available on the provider’s side. Media captures are characterized with a set of features that are independent from the specific type of medium, and with a set of feature that are media-specific. We design the media capture type as an abstract type, providing all the features that can be common to all media types. Media-specific captures, such as video captures, audio captures and others, are specialization of that media capture type, as in a typical generalization-specialization hierarchy.

The following is the XML Schema definition of the media capture type:

```
<!-- MEDIA CAPTURE TYPE -->
<xs:complexType name="mediaCaptureType" abstract="true">
  <xs:sequence>
    <!-- mandatory fields -->
    <xs:element name="capturedMedia" type="xs:string"/>
    <xs:element name="captureSceneIDREF" type="xs:IDREF"/>
    <xs:element name="encGroupIDREF" type="xs:IDREF"/>
    <xs:choice>
      <xs:sequence>
        <xs:element name="spatialInformation"
                    type="tns:spatialInformationType"/>
      </xs:sequence>
      <xs:element name="nonSpatiallyDefinable" type="xs:boolean" fixed="true"/>
    </xs:choice>
    <!-- for handling multi-content captures: -->
    <xs:choice>
      <xs:sequence>
        <xs:element name="synchronizationID" type="xs:ID" minOccurs="0"/>
        <xs:element name="contentCaptureIDs" type="captureIDListType"
        minOccurs="0"/>
        <xs:element name="composed" type="xs:boolean" minOccurs="0"/>
        <xs:element name="switching" type="xs:boolean" minOccurs="0"/>
        <xs:element name="policy" type="xs:string" minOccurs="0"/>
        <xs:element name="maxCaptures" type="xs:unsignedInt" minOccurs="0"/>
      </xs:sequence>
      <xs:element name="single" type="xs:boolean" fixed="true"/>
    </xs:choice>
    <!-- optional fields -->
    <xs:element ref="description" minOccurs="0" maxOccurs="unbounded"/>
    <xs:element name="priority" type="xs:unsignedInt" minOccurs="0"/>
    <xs:element name="lang" type="xs:language" minOccurs="0"/>
    <xs:element name="mobility" type="mobilityType" minOccurs="0"/>
    <xs:element name="presentation" type="presentationType" minOccurs="0"/>
    <xs:element name="view" type="viewType" minOccurs="0"/>
    <xs:element name="maxCaptureEncodings" type="xs:unsignedInt"
    minOccurs="0"/>
    <xs:element name="relatedTo" type="xs:IDREF" minOccurs="0"/>
    <xs:any namespace="##other" processContents="lax" minOccurs="0"
    maxOccurs="unbounded"/>
  </xs:sequence>
  <xs:attribute name="captureID" type="xs:ID" use="required"/>
  <xs:anyAttribute namespace="##other" processContents="lax"/>
</xs:complexType>
```

10.1. <capturedMedia>

<capturedMedia> is a mandatory field specifying the media type of the capture ("audio", "video", "text",...).

10.2. <captureSceneIDREF>

<captureSceneIDREF> is a mandatory field containing the identifier of the capture scene the media capture belongs to. Indeed, each media capture must be associated with one and only one capture scene. When a media capture is spatially definable, some spatial information is provided along with it in the form of point coordinates (see Section 10.4). Such coordinates refers to the space of coordinates defined for the capture scene containing the capture.

10.3. <encGroupIDREF>

<encGroupIDREF> is a mandatory field containing the identifier of the encoding group the media capture is associated with.

10.4. <spatialInformation>

Media captures are divided into two categories: non spatially definable captures and spatially definable captures.

Non spatially definable captures are those that do not capture parts of the telepresence room. Capture of this case are for example those related to registrations, text captures, DVDs, registered presentation, or external streams, that are played in the telepresence room and transmitted to remote sites.

Spatially definable captures are those that capture part of the telepresence room. The captured part of the telepresence room is described by means of the <spatialInformation> element.

This is the definition of the spatial information type:

```
<!-- SPATIAL INFORMATION TYPE -->
<xs:complexType name="spatialInformationType">
 <xs:sequence>
  <xs:element name="capturePoint" type="capturePointType"/>
  <xs:element name="captureArea" type="captureAreaType"
  minOccurs="0"/>
  <xs:any namespace="##other" processContents="lax"
  minOccurs="0" maxOccurs="unbounded"/>
 </xs:sequence>
 <xs:anyAttribute namespace="##other"
 processContents="lax"/>
</xs:complexType>
```

The <capturePoint> contains the coordinates of the capture device that is taking the capture, as well as, optionally, the pointing direction (see Section 10.4.1). It is a mandatory field when the media capture is spatially definable, independently from the media type.

The <captureArea> is an optional field containing four points defining the captured area represented by the capture (see Section 10.4.2).

10.4.1. <capturePoint>

The <capturePoint> element is used to represent the position and the line of capture of a capture device. The XML Schema definition of the <capturePoint> element type is the following:

```
   <!-- CAPTURE POINT TYPE -->
   <xs:complexType name="capturePointType">
    <xs:complexContent>
     <xs:extension base="pointType">
      <xs:sequence>
       <xs:element name="lineOfCapturePoint"
       type="tns:pointType"
       minOccurs="0"/>
      </xs:sequence>
      <xs:attribute name="pointID" type="xs:ID"/>
     </xs:extension>
    </xs:complexContent>
   </xs:complexType>

   <!-- POINT TYPE -->
   <xs:complexType name="pointType">
    <xs:sequence>
     <xs:element name="x" type="xs:decimal"/>
     <xs:element name="y" type="xs:decimal"/>
     <xs:element name="z" type="xs:decimal"/>
    </xs:sequence>
   </xs:complexType>
```

The point type contains three spatial coordinates ("x","y","z") representing a point in the space associated with a certain capture scene.

The capture point type extends the point type, i.e., it is represented by three coordinates identifying the position of the capture device, but can add further information. Such further information is conveyed by the <lineOfCapturePoint>, which is another point-type element representing the "point on line of capture", that gives the pointing direction of the capture device.

If the point of capture is not specified, it means the consumer should not assume anything about the spatial location of the capturing device.

The coordinates of the point on line of capture MUST NOT be identical to the capture point coordinates. If the point on line of capture is not specified, no assumptions are made about the axis of the capturing device.

10.4.2. <captureArea>

<captureArea> is an optional element that can be contained within the spatial information associated with a media capture. It represents

the spatial area captured by the media capture.

The XML representation of that area is provided through a set of four point-type element, <bottomLeft>, <bottomRight>, <topLeft>, and <topRight>, as it can be seen from the following definition:

```
<!-- CAPTURE AREA TYPE -->
<xs:complexType name="captureAreaType">
 <xs:sequence>
  <xs:element name="bottomLeft" type="pointType"/>
  <xs:element name="bottomRight" type="pointType"/>
  <xs:element name="topLeft" type="pointType"/>
  <xs:element name="topRight" type="pointType"/>
 </xs:sequence>
</xs:complexType>
```

<bottomLeft>, <bottomRight>, <topLeft>, and <topRight> should be co-planar.

By comparing the capture area of different media captures within the same capture scene, a consumer can determine the spatial relationships between them and render them correctly. If the area of capture is not specified, it means the Media Capture is not spatially related to any other media capture.

10.5. <nonSpatiallyDefinable>

When media captures are non spatially definable, they are marked with the boolean <nonSpatiallyDefinable> element set to "true".

10.6. <contentCaptureIDs>

A media capture can be alternatively a single media capture or a multiple content capture. A multiple content capture is made by different captures that can be arranged spatially (by a mixing operation), or temporally (by a switching operation), or that can result from the orchestration of both the techniques. If a media capture is a MCC, then it must show in its XML data model representation the <contentCaptureIDs>. It is the identifiers list of the media captures that can be part of the content of the multiple content capture.

[containedCaptureIDs or contentIDs or contentCaptureIDs?]

10.7. <synchronizationID>

<synchronizationID> is an optional element for multiple content captures that contains a numeric identifier. Multiple content captures marked with the same identifier in the <synchronizationID> contain at each time captures coming from the same room endpoint.

10.8. <composed>

<composed> is an optional boolean element that can be used only for multiple content captures. It indicates wheter or not a multiple content capture is a mix (audio) or a composition (video) of streams. This attribute is useful for a media consumer for example to avoid nesting a composed video capture into another composed capture or rendering.

[edt’s note: proposal - discussion needed]

10.9. <switching>

<switching> is an optional boolean element that can be used only for multiple content captures. It indicates wheter or not a multiple content capture switches over the time.

[edt’s note: proposal - discussion needed]

10.10. <policy>

<policy> is an optional element that can be used only for multiple content captures. It indicates the criteria applied to build the multiple content capture using the media captures referenced in <contentCaptureIDs>. Such element can assume a list of pre-defined values ([todo]).

10.11. <maxCaptures>

<maxCaptures> is an optional element that can be used only for multiple content captures. It indicates the maximum number of media captures that can be represented in the multiple content capture at a time.

10.12. <single>

<single> is a mandatory boolean element that must be used for single-content captures. Its value is fixed and set to "true". Such element indicates the capture that is being described is not a multiple content capture.

[edt’s note: proposal - discussion needed]

10.13. <description>

<description> is used to provide optionally human-readable textual information. It is used to describe media captures, capture scenes and capture scene entries. A media capture can be described by using multiple <description> elements, each one providing information in a different language. Indeed, the <description> element definition is the following:

```
<!-- DESCRIPTION element -->
<xs:element name="description">
 <xs:complexType>
  <xs:simpleContent>
   <xs:extension base="xs:string">
     <xs:attribute name="lang" type="xs:language"/>
   </xs:extension>
  </xs:simpleContent>
 </xs:complexType>
</xs:element>
```

As it can be seen, <description> is a string element with an attribute ("lang") indicating the language used in the textual description.

10.14. <priority>

<priority> is an optional unsigned integer field indicating the importance of a media capture according to the media provider’s perspective. It can be used on the receiver’s side to automatically identify the most "important" contribution available from the media provider. The higher the importance, the lower the contained value. When media captures are marked with a "0" priority value, it means that they are "not subject to priority".

10.15. <lang>

<lang> is an optional element containing the language used in the capture, if any.

10.16. <mobility>

<mobility> is an optional element indicating whether or not the capture device originating the capture may move during the

telepresence session. That optional element can assume one of the three following values: static, dynamic or highly dynamic, defined as in [I-D.ietf-clue-framework].

10.17. <maxCaptureEncodings>

The optional <maxCaptureEncodings> contains an unsigned integer indicating the maximum number of capture encodings that can be simultaneously active for the media capture. If absent, this parameter defaults to 1. The minimum value for this attribute is 1. The number of simultaneous capture encodings is also limited by the restrictions of the encoding group the media capture refers to my means of the <encGroupIDREF> element.

10.18. <relatedTo>

The optional <relatedTo> element contains the value of the ID attribute of the media capture it refers to. The media capture marked with a <relatedTo> element can be for example the translation of a main media capture in a different language.

10.19. captureID attribute

The "captureID" attribute is a mandatory field containing the identifier of the media capture.

11. Audio captures

Audio captures inherit all the features of a generic media capture and present further audio-specific characteristics. The XML Schema definition of the audio capture type is reported below:

```
<!-- AUDIO CAPTURE TYPE -->
<xs:complexType name="audioCaptureType">
 <xs:complexContent>
  <xs:extension base="tns:mediaCaptureType">
   <xs:sequence>
    <xs:element name="audioChannelFormat" type="audioChannelFormatType"
    minOccurs="0"/>
   </xs:sequence>
  </xs:extension>
 </xs:complexContent>
</xs:complexType>
```

Audio-specific information about the audio capture is contained in

<audioChannelFormat> (Section 11.1).

11.1. <audioChannelFormat>

The optional <audioChannelFormat> element is a field with enumerated values ("mono" and "stereo") which describes the method of encoding used for audio. A value of "mono" means the audio capture has one channel. A value of "stereo" means the audio capture has two audio channels, left and right. A single stereo capture is different from two mono captures that have a left-right spatial relationship. A stereo capture maps to a single RTP stream, while each mono audio capture maps to a separate RTP stream.

The XML Schema definition of the <audioChannelFormat> element type is provided below:

```
<!-- AUDIO CHANNEL FORMAT TYPE -->
<xs:simpleType name="audioChannelFormatType">
 <xs:restriction base="xs:string">
  <xs:enumeration value="mono"/>
  <xs:enumeration value="stereo"/>
 </xs:restriction>
</xs:simpleType>
```

12. Video captures

Video captures, similarly to audio captures, extend the information of a generic media capture with video-specific features, such as <embeddedText> (Section 12.1).

The XML Schema representation of the video capture type is provided in the following:

```
<!-- VIDEO CAPTURE TYPE -->
<xs:complexType name="videoCaptureType">
 <xs:complexContent>
  <xs:extension base="tns:mediaCaptureType">
   <xs:sequence>
    <xs:element ref="embeddedText" minOccurs="0"/>
   </xs:sequence>
  </xs:extension>
 </xs:complexContent>
</xs:complexType>
```

12.1. <embeddedText>

The <embeddedText> element is a boolean element indicating that there is text embedded in the video capture. The language used in such embedded textual description is reported in <embeddedText> "lang" attribute.

The XML Schema definition of the <embeddedText> element is:

```
<!-- EMBEDDED TEXT ELEMENT -->
<xs:element name="embeddedText">
 <xs:complexType>
  <xs:simpleContent>
   <xs:extension base="xs:boolean">
    <xs:attribute name="lang" type="xs:language"/>
   </xs:extension>
  </xs:simpleContent>
 </xs:complexType>

</xs:element>
```

13. Text captures

Also text captures can be described by extending the generic media capture information, similarly to audio captures and video captures.

The XML Schema representation of the text capture type is currently lacking text-specific information, as it can be seen by looking at the definition below:

```
<!-- TEXT CAPTURE TYPE -->
<xs:complexType name="textCaptureType">
 <xs:complexContent>
  <xs:extension base="tns:mediaCaptureType">
  </xs:extension>
 </xs:complexContent>
</xs:complexType>
```

14. <captureScene>

A media provider organizes the available capture in capture scenes in order to help the receiver both in the rendering and in the selection of the group of captures. Capture scenes are made of capture scene entries, that are set of media captures of the same media type. Each capture scene entry represents an alternative to represent completely a capture scene for a fixed media type.

The XML Schema representation of a <captureScene> element is the following:

```
<!-- CAPTURE SCENE TYPE -->
<xs:complexType name="captureSceneType">
 <xs:sequence>
  <xs:element ref="description" minOccurs="0" maxOccurs="unbounded"/>
  <xs:element name="sceneEntries" type="sceneEntriesType"/>
  <xs:any namespace="##other" processContents="lax" minOccurs="0"
  maxOccurs="unbounded"/>
 </xs:sequence>
 <xs:attribute name="sceneID" type="xs:ID" use="required"/>
 <xs:attribute name="scale" type="scaleType" use="required"/>
 <xs:anyAttribute namespace="##other" processContents="lax"/>
</xs:complexType>
```

The <captureScene> element can contain zero or more textual <description> elements, defined as in Section 10.13. Besides <description>, there the <sceneEntries> element (Section 14.1), which is the list of the capture scene entries.

14.1. <sceneEntries>

The <sceneEntries> element is a mandatory field of a capture scene containing the list of scene entries. Each scene entry is represented by a <sceneEntry> element (Section 15).

```
<!-- SCENE ENTRIES TYPE -->
<!-- envelope of scene entries of a capture scene -->
<xs:complexType name="sceneEntriesType">
 <xs:sequence>
  <xs:element name="sceneEntry" type="sceneEntryType"
  maxOccurs="unbounded"/>
 </xs:sequence>
```

```
   </xs:complexType>
```

14.2. sceneID attribute

The sceneID attribute is a mandatory attribute containing the identifier of the capture scene.

14.3. scale attribute

The scale attribute is a mandatory attribute that specifies the scale of the coordinates provided in the spatial information of the media capture belonging to the considered capture scene. The scale attribute can assume three different values:

"millimeters" - the scale is in millimeters. Systems which know their physical dimensions (for example professionally installed telepresence room systems) should always provide those real-world measurements.

"unknown" - the scale is not necessarily millimeters, but the scale is the same for every media capture in the capture scene. Systems which don’t know specific physical dimensions but still know relative distances should select "unknown" in the scale attribute of the capture scene to be described.

"noscale" - there is no a common physical scale among the media captures of the capture scene. That means the scale could be different for each media capture.

```
   <!-- SCALE TYPE -->
   <xs:simpleType name="scaleType">
    <xs:restriction base="xs:string">
     <xs:enumeration value="millimeters"/>
     <xs:enumeration value="unknown"/>
     <xs:enumeration value="noscale"/>
    </xs:restriction>
   </xs:simpleType>
```

15. <sceneEntry>

A <sceneEntry> element represents a capture scene entry, which contains a set of media capture of the same media type describing a capture scene.

A <sceneEntry> element is characterized as follows.

```
<!-- SCENE ENTRY TYPE -->
<xs:complexType name="sceneEntryType">
 <xs:sequence>
  <xs:element ref="description" minOccurs="0" maxOccurs="unbounded"/>
  <xs:element name="mediaCaptureIDs" type="captureIDListType"/>
 </xs:sequence>
 <xs:attribute name="sceneEntryID" type="xs:ID" use="required"/>
 <xs:attribute name="mediaType" type="xs:string" use="required"/>
</xs:complexType>
```

One or more optional <description> elements provide human-readable information about what the scene entry contains. <description> is defined as already seen in Section 10.13.

The remaining child elements are described in the following subsections.

15.1. <mediaCaptureIDs>

The <mediaCaptureIDs> is the list of the identifiers of the media captures included in the scene entry. It is an element of the captureIDListType type, which is defined as a sequence of <captureIDREF> each one containing the identifier of a media capture listed within the <mediaCaptures> element:

```
<!-- CAPTURE ID LIST TYPE -->
<xs:complexType name="captureIDListType">
 <xs:sequence>
  <xs:element name="captureIDREF" type="xs:IDREF"
  maxOccurs="unbounded"/>
 </xs:sequence>
</xs:complexType>
```

15.2. sceneEntryID attribute

The sceneEntryID attribute is a mandatory attribute containing the identifier of the capture scene entry represented by the <sceneEntry> element.

15.3. mediaType attribute

The mediaType attribute contains the media type of the media captures included in the scene entry.

16. <encoding>

The <encoding> element represents an individual encoding, i.e., a way to encode a media capture. Individual encodings can be characterized with features that are independent from the specific type of medium, and with features that are media-specific. We design the individual encoding type as an abstract type, providing all the features that can be common to all media types. Media-specific individual encodings, such as video encodings, audio encodings and others, are specialization of that type, as in a typical generalization-specialization hierarchy.

```
<!-- ENCODING TYPE -->
<xs:complexType name="encodingType" abstract="true">
 <xs:sequence>
  <xs:element name="encodingName" type="xs:string"/>
  <xs:element name="maxBandwidth" type="xs:integer"/>
  <xs:any namespace="##other" processContents="lax" minOccurs="0"
  maxOccurs="unbounded"/>
 </xs:sequence>
 <xs:attribute name="encodingID" type="xs:ID" use="required"/>
 <xs:anyAttribute namespace="##any" processContents="lax"/>
</xs:complexType>
```

16.1. <encodingName>

<encodingName> is a mandatory field containing the name of the encoding (e.g., G711, H264, ...).

16.2. <maxBandwidth>

<maxBandwidth> represent the maximum bitrate the media provider can instantiate for that encoding.

16.3. encodingID attribute

The encodingID attribute is a mandatory attribute containing the identifier of the individual encoding.

17. Audio encodings

Audio encodings inherit all the features of a generic individual encoding and can present further audio-specific encoding characteristics. The XML Schema definition of the audio encoding type is reported below:

```
<!-- AUDIO ENCODING TYPE -->
<xs:complexType name="audioEncodingType">
 <xs:complexContent>
  <xs:extension base="tns:encodingType">
   <xs:sequence>
    <xs:element name="encodedMedia" type="xs:string" fixed="audio"
    minOccurs="0"/>
   </xs:sequence>
  </xs:extension>
 </xs:complexContent>
</xs:complexType>
```

Up to now the only audio-specific information is the <encodedMedia> element containing the media type of the media captures that can be encoded with the considered individual encoding. In the case of audio encoding, that element is forced to "audio".

18. Video encodings

Similarly to audio encodings, video encodings can extend the information of a generic individual encoding with video-specific encoding features.

The <encodedMedia> element contains the media type of the media captures that can be encoded with the considered individual encoding. In the case of video encoding, that element is forced to "video".

```
<!-- VIDEO ENCODING TYPE -->
<xs:complexType name="videoEncodingType">
 <xs:complexContent>
  <xs:extension base="tns:encodingType">
   <xs:sequence>
    <xs:element name="encodedMedia" type="xs:string" fixed="video"
    minOccurs="0"/>
   </xs:sequence>
  </xs:extension>
```

```
    </xs:complexContent>
   </xs:complexType>
```

19. <encodingGroup>

The <encodingGroup> element represents an encoding group, which is a set of one or more individual encodings, and parameters that apply to the group as a whole. The definition of the <encodingGroup> element is the following:

```
   <!-- ENCODING GROUP TYPE -->
   <xs:complexType name="encodingGroupType">
    <xs:sequence>
     <xs:element name="maxGroupBandwidth" type="xs:integer"/>
     <xs:element name="encodingIDList" type="encodingIDListType"/>
     <xs:any namespace="##other" processContents="lax" minOccurs="0"
     maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:attribute name="encodingGroupID" type="xs:ID" use="required"/>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
   </xs:complexType>
```

In the following, the contained elements are further described.

19.1. <maxGroupBandwidth>

<maxGroupBandwidth> is an optional field containing the maximum bitrate supported for all the individual encodings included in the encoding group.

19.2. <encodingIDList>

<maxGroupBandwidth> is the list of the individual encoding grouped together. Each individual encoding is represented through its identifier contained within an <encIDREF> element.

```
   <!-- ENCODING ID LIST TYPE -->
   <xs:complexType name="encodingIDListType">
    <xs:sequence>
     <xs:element name="encIDREF" type="xs:IDREF" maxOccurs="unbounded"/>
    </xs:sequence>
   </xs:complexType>
```

19.3. encodingGroupID attribute

The encodingGroupID attribute contains the identifier of the encoding group.

20. <simultaneousSet>

<simultaneousSet> represents a simultaneous set, i.e. a list of capture of the same type that cab be transmitted at the same time by a media provider. There are different simultaneous transmission sets for each media type.

```
<!-- SIMULTANEOUS SET TYPE -->
<xs:complexType name="simultaneousSetType">
 <xs:sequence>
   <xs:element name="captureIDREF" type="xs:IDREF"
   minOccurs="0" maxOccurs="unbounded"/>
   <xs:element name="sceneEntryIDREF" type="xs:IDREF"
   minOccurs="0" maxOccurs="unbounded"/>
 </xs:sequence>
</xs:complexType>
```

[edt note: need to be checked]

20.1. <captureIDREF>

<captureIDREF> contains the identifier of the media capture that belongs to the simultanous set.

20.2. <sceneEntryIDREF>

<captureIDREF> contains the identifier of the scene entry containing a group of capture that are able to be sent simultaneously with the other capture of the simultaneous set.

21. <captureEncoding>

A <captureEncoding> is given from the association of a media capture and an individual encoding, to form a capture stream as defined in [I-D.ietf-clue-framework]. A media consumer expresses for each capture encoding its preferences about the capture parameters (such as the desired switching policy) and the encoding parameters (such as the bandwidth). A possible solution to model such entity is provided in the following.

```
   <!-- CAPTURE ENCODING TYPE -->
   <xs:complexType name="captureEncodingType">
    <xs:sequence>
     <xs:element name="mediaCaptureID" type="xs:string"/>
     <xs:element name="encodingID" type="xs:string"/>
     <xs:element name="captureParameters" type="captureParametersType"
                 minOccurs="0"/>
     <xs:element name="encodingParameters" type="encodingParametersType"
                 minOccurs="0"/>
    </xs:sequence>
    <xs:attribute name="ID" type="xs:ID"/>
   </xs:complexType>

   <!-- CAPTURE PARAMETERS TYPE -->
   <xs:complexType name="captureParametersType">
    <xs:sequence>
           <xs:element name="switchingOption" type="xs:string"/>
           <xs:any namespace="##other" processContents="lax" minOccurs="0"
      maxOccurs="unbounded"/>
    </xs:sequence>
   </xs:complexType>

   <!-- ENCODING PARAMETERS TYPE -->
   <xs:complexType name="captureParametersType">
    <xs:sequence>
           <xs:element name="bandwidth" type="xs:unsignedInt"/>
           <xs:any namespace="##other" processContents="lax" minOccurs="0"
      maxOccurs="unbounded"/>
    </xs:sequence>
   </xs:complexType>
```

21.1. <mediaCaptureID>

<mediaCaptureID> contains the identifier of the media capture that has been encoded to form the capture encoding.

21.2. <encodingID>

<encodingID> contains the identifier of the applied individual encoding.

22. <clueInfo>

The <clueInfo> element has been left within the XML Schema for the sake of convenience when representing a prototype of ADVERTISEMENT message (see the example section).

```
<!-- CLUE INFO ELEMENT -->
<!-- the <clueInfo> envelope can be seen
     as the ancestor of an <advertisement> envelope -->
<xs:element name="clueInfo" type="clueInfoType"/>

<!-- CLUE INFO TYPE -->
<xs:complexType name="clueInfoType">
  <xs:sequence>
   <xs:element ref="mediaCaptures"/>
   <xs:element ref="encodings"/>
   <xs:element ref="encodingGroups"/>
   <xs:element ref="captureScenes"/>
   <xs:element ref="simultaneousSets"/>
   <xs:any namespace="##other" processContents="lax" minOccurs="0"
   maxOccurs="unbounded"/>
  </xs:sequence>
  <xs:attribute name="clueInfoID" type="xs:ID" use="required"/>
  <xs:anyAttribute namespace="##other" processContents="lax"/>
</xs:complexType>
```

23. Sample XML file

The following XML document represents a schema compliant example of a CLUE telepresence scenario.

In the considered scenario, there are 5 video captures:

VC0: the video from the left camera

VC1: the video from the central camera

VC2: the video from the right camera

VC3: the overall view of the telepresence room taken from the central camera

VC4: the video associated with the slide stream

There are 2 audio captures:

AC0: the overall room audio taken from the central camera

AC1: the audio associated with the slide stream presentation

The captures are organized into two capture scenes:

CS1: this scene contains captures associated with the participants that are in the telepresence room.

CS2: this scene contains captures associated with the slide presentation, which is a pre-registered presentation played within the context of the telepresence session.

Within the capture scene CS1, there are three scene entries available:

CS1_SE1: this entry contains the partipants’ video captures taken from the three cameras (VC0, VC1, VC2).

CS1_SE2: this entry contains the zoomed-out view of the overall telepresence room (VC3)

CS1_SE3: this entry contains the overall telepresence room audio (AC0)

On the other hand, capture scene CS2 presents two scene entries:

CS2_SE1: this entry contains the presentation audio stream (AC1)

CS2_SE2: this entry contains the presentation video stream (VC4)

There are two encoding groups:

EG0 This encoding groups involves video encodings ENC0, ENC1, ENC2. All of them are identical video encodings that can consume up to 128K bps. The total amount of available bandwidth for EG0 is 384Kbps. That means that only three video capture encodings can be issued at a time.

EG1 This encoding groups involves audio encodings ENC3, ENC4. Both of them have a maximum bandwidth of 64Kbps. The EG1 maximum bandwidth is 128Kbps. That means that only two audio captures can be issued at a time.

As to the simultaneous sets, only VC1 and VC3 cannot be transmitted simultaneously since they are captured by the same device. i.e. the central camera (VC3 is a zoomed-out view while VC1 is a focused view of the front participants). The simultaneous sets would then be the following:

SS1 made by VC0, VC1, VC2, VC4

```
   SS2  made by VC0, VC3, VC2, VC4

   SS3  made by AC0 and AC1
```

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<clueInfo xmlns="urn:ietf:params:xml:ns:clue-info" clueInfoID="NapoliRoom">
    <mediaCaptures>
        <mediaCapture xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
        xsi:type="videoCaptureType" captureID="vc0">
            <capturedMedia>video</capturedMedia>
            <captureSceneIDREF>CS1</captureSceneIDREF>
            <encGroupIDREF>EG0</encGroupIDREF>
            <spatialInformation>
                <capturePoint>
                    <x>1.0</x>
                    <y>1.0</y>
                    <z>1.0</z>
                    <lineOfCapturePoint>
                        <x>1.0</x>
                        <y>0.0</y>
                        <z>1.0</z>
                    </lineOfCapturePoint>
                </capturePoint>
            </spatialInformation>
            <single>true</single>
            <description lang="en">left-most participants video</description>
            <lang>Italian</lang>
            <mobility>static</mobility>
            <view>individual</view>
        </mediaCapture>
        <mediaCapture xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
        xsi:type="videoCaptureType" captureID="vc1">
            <capturedMedia>video</capturedMedia>
            <captureSceneIDREF>CS1</captureSceneIDREF>
            <encGroupIDREF>EG0</encGroupIDREF>
            <spatialInformation>
                <capturePoint>
                    <x>0.0</x>
                    <y>1.0</y>
                    <z>1.0</z>
                    <lineOfCapturePoint>
                        <x>0.0</x>
                        <y>0.0</y>
                        <z>1.0</z>
                    </lineOfCapturePoint>
                </capturePoint>
            </spatialInformation>
            <single>true</single>
            <description lang="en">central participants video</description>
            <lang>Italian</lang>
            <mobility>static</mobility>
            <view>individual</view>
        </mediaCapture>
        <mediaCapture xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
        xsi:type="videoCaptureType" captureID="vc2">
            <capturedMedia>video</capturedMedia>
            <captureSceneIDREF>CS1</captureSceneIDREF>
            <encGroupIDREF>EG0</encGroupIDREF>
            <spatialInformation>
                <capturePoint>
                    <x>-1.0</x>
                    <y>1.0</y>
                    <z>1.0</z>
                    <lineOfCapturePoint>
                        <x>-1.0</x>
                        <y>0.0</y>
                        <z>1.0</z>
                    </lineOfCapturePoint>
                </capturePoint>
            </spatialInformation>
            <single>true</single>
            <description lang="en">right-most participants video</description>
            <lang>Italian</lang>
            <mobility>static</mobility>
            <view>individual</view>
        </mediaCapture>
        <mediaCapture xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
        xsi:type="videoCaptureType" captureID="vc3">
            <capturedMedia>video</capturedMedia>
            <captureSceneIDREF>CS1</captureSceneIDREF>
            <encGroupIDREF>EG0</encGroupIDREF>
            <spatialInformation>
                <capturePoint>
                    <x>0.0</x>
                    <y>1.0</y>
                    <z>1.0</z>
                    <lineOfCapturePoint>
                        <x>0.0</x>
                        <y>0.0</y>
                        <z>1.0</z>
                    </lineOfCapturePoint>
                </capturePoint>
            </spatialInformation>
            <single>true</single>
            <description lang="en">overall room video</description>
            <lang>Italian</lang>
            <mobility>static</mobility>
            <view>room</view>
        </mediaCapture>
        <mediaCapture xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
        xsi:type="videoCaptureType" captureID="vc4">
            <capturedMedia>video</capturedMedia>
            <captureSceneIDREF>cs2</captureSceneIDREF>
            <encGroupIDREF>EG0</encGroupIDREF>
            <nonSpatiallyDefinable>true</nonSpatiallyDefinable>
            <single>true</single>
            <description lang="en">slides video</description>
            <lang>Italian</lang>
            <presentation>slides</presentation>
        </mediaCapture>
        <mediaCapture xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
        xsi:type="audioCaptureType" captureID="ac0">
            <capturedMedia>audio</capturedMedia>
            <captureSceneIDREF>CS1</captureSceneIDREF>
            <encGroupIDREF>EG1</encGroupIDREF>
            <spatialInformation>
                <capturePoint>
                    <x>0.0</x>
                    <y>1.0</y>
                    <z>1.0</z>
                    <lineOfCapturePoint>
                        <x>0.0</x>
                        <y>0.0</y>
                        <z>1.0</z>
                    </lineOfCapturePoint>
                </capturePoint>
            </spatialInformation>
            <single>true</single>
            <description lang="en">room audio</description>
            <lang>Italian</lang>
            <mobility>static</mobility>
            <view>room</view>
            <audioChannelFormat>stereo</audioChannelFormat>
        </mediaCapture>
        <mediaCapture xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
        xsi:type="audioCaptureType" captureID="ac1">
            <capturedMedia>audio</capturedMedia>
            <captureSceneIDREF>cs2</captureSceneIDREF>
            <encGroupIDREF>EG1</encGroupIDREF>
            <nonSpatiallyDefinable>true</nonSpatiallyDefinable>
            <single>true</single>
            <description lang="en">slide presentation audio</description>
            <lang>Italian</lang>
            <presentation>slides</presentation>
            <audioChannelFormat>mono</audioChannelFormat>
        </mediaCapture>
    </mediaCaptures>
    <encodings>
        <encoding xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
        xsi:type="videoEncodingType" encodingID="ENC0">
            <encodingName>vp8</encodingName>
            <maxBandwidth>128000</maxBandwidth>
            <encodedMedia>video</encodedMedia>
        </encoding>
        <encoding xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
        xsi:type="videoEncodingType" encodingID="ENC1">
            <encodingName>vp8</encodingName>
            <maxBandwidth>128000</maxBandwidth>
            <encodedMedia>video</encodedMedia>
        </encoding>
        <encoding xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
        xsi:type="videoEncodingType" encodingID="ENC2">
            <encodingName>vp8</encodingName>
            <maxBandwidth>128000</maxBandwidth>
            <encodedMedia>video</encodedMedia>
        </encoding>
        <encoding xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
        xsi:type="audioEncodingType" encodingID="ENC3">
            <encodingName>g711</encodingName>
            <maxBandwidth>64000</maxBandwidth>
            <encodedMedia>audio</encodedMedia>
        </encoding>
        <encoding xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
        xsi:type="audioEncodingType" encodingID="ENC4">
            <encodingName>g711</encodingName>
            <maxBandwidth>32000</maxBandwidth>
            <encodedMedia>audio</encodedMedia>
        </encoding>
    </encodings>
    <encodingGroups>
        <encodingGroup encodingGroupID="EG0">
            <maxGroupBandwidth>0</maxGroupBandwidth>
            <encodingIDList>
                <encIDREF>ENC0</encIDREF>
                <encIDREF>ENC1</encIDREF>
                <encIDREF>ENC2</encIDREF>
            </encodingIDList>
        </encodingGroup>
        <encodingGroup encodingGroupID="EG1">
            <maxGroupBandwidth>0</maxGroupBandwidth>
            <encodingIDList>
                <encIDREF>ENC3</encIDREF>
                <encIDREF>ENC4</encIDREF>
            </encodingIDList>
        </encodingGroup>
    </encodingGroups>
    <captureScenes>
        <captureScene scale="unknown" sceneID="CS1">
            <description lang="en">main scene</description>
            <sceneEntries>
                <sceneEntry mediaType="audio" sceneEntryID="CS1_SE3">
                    <description lang="en">overall room audio</description>
                    <mediaCaptureIDs>
                        <captureIDREF>ac0</captureIDREF>
                    </mediaCaptureIDs>
                </sceneEntry>
                <sceneEntry mediaType="video" sceneEntryID="CS1_SE2">
                    <description lang="en">overall room video</description>
                    <mediaCaptureIDs>
                        <captureIDREF>vc3</captureIDREF>
                    </mediaCaptureIDs>
                </sceneEntry>
                <sceneEntry mediaType="video" sceneEntryID="CS1_SE1">
                    <description lang="en">participants video</description>
                    <mediaCaptureIDs>
                        <captureIDREF>vc0</captureIDREF>
                        <captureIDREF>vc1</captureIDREF>
                        <captureIDREF>vc2</captureIDREF>
                    </mediaCaptureIDs>
                </sceneEntry>
            </sceneEntries>
        </captureScene>
        <captureScene scale="noscale" sceneID="cs2">
            <description lang="en">presentation scene</description>
            <sceneEntries>
                <sceneEntry mediaType="audio" sceneEntryID="CS2_SE2">
                    <mediaCaptureIDs>
                        <captureIDREF>ac1</captureIDREF>
                    </mediaCaptureIDs>
                </sceneEntry>
                <sceneEntry mediaType="video" sceneEntryID="CS2_SE1">
                    <mediaCaptureIDs>
                        <captureIDREF>vc4</captureIDREF>
                    </mediaCaptureIDs>
                </sceneEntry>
            </sceneEntries>
        </captureScene>
    </captureScenes>
    <simultaneousSets>
        <simultaneousSet setID="ss1">
            <captureIDREF>vc0</captureIDREF>
            <captureIDREF>vc3</captureIDREF>
            <captureIDREF>vc2</captureIDREF>
            <captureIDREF>vc4</captureIDREF>
        </simultaneousSet>
        <simultaneousSet setID="ss2">
            <captureIDREF>vc0</captureIDREF>
            <captureIDREF>vc1</captureIDREF>
            <captureIDREF>vc2</captureIDREF>
            <captureIDREF>vc4</captureIDREF>
        </simultaneousSet>
        <simultaneousSet setID="ss3">
            <captureIDREF>ac0</captureIDREF>
            <captureIDREF>ac1</captureIDREF>
        </simultaneousSet>
    </simultaneousSets>
</clueInfo>
```

24. MCC example

In this example, the endpoint is equipped with three cameras capturing three individual captures (VC1, VC2, VC3). The central one is able to capture a zoomed-out view of the room (VC4). Moreover, the MP is able to advertise a composed MCC (MCC5) made by a big picture representing the current speaker (MCC0) and two picture-in-picture boxes representing the previous speakers (the previous one -MCC1- and the oldest one - MCC2-).

A possible description for that scenario could be the following:

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<clueInfo xmlns="urn:ietf:params:xml:ns:clue-info" clueInfoID="NapoliRoom">
    <mediaCaptures>
        <mediaCapture xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
        xsi:type="videoCaptureType" captureID="VC1">
            <capturedMedia>video</capturedMedia>
            <captureSceneIDREF>CS1</captureSceneIDREF>
            <encGroupIDREF>EG0</encGroupIDREF>
            <spatialInformation>
                <capturePoint>
```

```
                    <x>0.5</x>
                    <y>1.0</y>
                    <z>0.5</z>
                    <lineOfCapturePoint>
                        <x>0.5</x>
                        <y>0.0</y>
                        <z>0.5</z>
                    </lineOfCapturePoint>
                </capturePoint>
                <captureArea>
                    <bottomLeft>
                        <x>0.0</x>
                        <y>3.0</y>
                        <z>0.0</z>
                    </bottomLeft>
                    <bottomRight>
                        <x>1.0</x>
                        <y>3.0</y>
                        <z>0.0</z>
                    </bottomRight>
                    <topLeft>
                        <x>0.0</x>
                        <y>3.0</y>
                        <z>3.0</z>
                    </topLeft>
                    <topRight>
                        <x>1.0</x>
                        <y>3.0</y>
                        <z>3.0</z>
                    </topRight>
                </captureArea>
            </spatialInformation>
            <single>true</single>
            <description lang="en">left-most participants video</description>
            <lang>Italian</lang>
            <mobility>static</mobility>
            <view>individual</view>
        </mediaCapture>
        <mediaCapture xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
        xsi:type="videoCaptureType" captureID="vc2">
            <capturedMedia>video</capturedMedia>
            <captureSceneIDREF>CS1</captureSceneIDREF>
            <encGroupIDREF>EG0</encGroupIDREF>
            <spatialInformation>
                <capturePoint>
                    <x>0.0</x>
                    <y>1.0</y>
                    <z>1.0</z>
                    <lineOfCapturePoint>
                        <x>0.0</x>
                        <y>0.0</y>
                        <z>1.0</z>
                    </lineOfCapturePoint>
                </capturePoint>
            </spatialInformation>
            <single>true</single>
            <description lang="en">central participants video</description>
            <lang>Italian</lang>
            <mobility>static</mobility>
            <view>individual</view>
        </mediaCapture>
        <mediaCapture xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
        xsi:type="videoCaptureType" captureID="vc3">
            <capturedMedia>video</capturedMedia>
            <captureSceneIDREF>CS1</captureSceneIDREF>
            <encGroupIDREF>EG0</encGroupIDREF>
            <spatialInformation>
                <capturePoint>
                    <x>0.5</x>
                    <y>1.0</y>
                    <z>0.5</z>
                    <lineOfCapturePoint>
                        <x>0.5</x>
                        <y>0.0</y>
                        <z>0.5</z>
                    </lineOfCapturePoint>
                </capturePoint>
                <captureArea>
                    <bottomLeft>
                        <x>0.0</x>
                        <y>3.0</y>
                        <z>0.0</z>
                    </bottomLeft>
                    <bottomRight>
                        <x>1.0</x>
                        <y>3.0</y>
                        <z>0.0</z>
                    </bottomRight>
                    <topLeft>
                        <x>0.0</x>
                        <y>3.0</y>
                        <z>3.0</z>
                    </topLeft>
                    <topRight>
                        <x>1.0</x>
                        <y>3.0</y>
                        <z>3.0</z>
                    </topRight>
                </captureArea>
            </spatialInformation>
            <single>true</single>
            <description lang="en">right-most participants video</description>
            <lang>Italian</lang>
            <mobility>static</mobility>
            <view>individual</view>
        </mediaCapture>
        <mediaCapture xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
        xsi:type="videoCaptureType" captureID="vc4">
            <capturedMedia>video</capturedMedia>
            <captureSceneIDREF>CS1</captureSceneIDREF>
            <encGroupIDREF>EG0</encGroupIDREF>
            <spatialInformation>
                <capturePoint>
                    <x>0.5</x>
                    <y>1.0</y>
                    <z>0.5</z>
                    <lineOfCapturePoint>
                        <x>0.5</x>
                        <y>0.0</y>
                        <z>0.5</z>
                    </lineOfCapturePoint>
                </capturePoint>
                <captureArea>
                    <bottomLeft>
                        <x>0.0</x>
                        <y>3.0</y>
                        <z>0.0</z>
                    </bottomLeft>
                    <bottomRight>
                        <x>1.0</x>
                        <y>3.0</y>
                        <z>0.0</z>
                    </bottomRight>
                    <topLeft>
                        <x>0.0</x>
                        <y>3.0</y>
                        <z>3.0</z>
                    </topLeft>
                    <topRight>
                        <x>1.0</x>
                        <y>3.0</y>
                        <z>3.0</z>
                    </topRight>
                </captureArea>
            </spatialInformation>
            <single>true</single>
            <description lang="en">table view video</description>
            <lang>Italian</lang>
            <mobility>static</mobility>
            <view>table</view>
        </mediaCapture>
        <mediaCapture xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
        xsi:type="videoCaptureType" captureID="mcc0">
            <capturedMedia>video</capturedMedia>
            <captureSceneIDREF>CS1</captureSceneIDREF>
            <encGroupIDREF>EG0</encGroupIDREF>
            <nonSpatiallyDefinable>true</nonSpatiallyDefinable>
            <contentCaptureIDs>
                <captureIDREF>VC1</captureIDREF>
                <captureIDREF>vc2</captureIDREF>
                <captureIDREF>vc3</captureIDREF>
            </contentCaptureIDs>
            <composed>false</composed>
            <switching>true</switching>
            <policy>SoundLevel:0</policy>
            <maxCaptures>1</maxCaptures>
            <description lang="en">video of the current
            loudest speaker</description>
            <lang>Italian</lang>
            <mobility>static</mobility>
            <view>individual</view>
        </mediaCapture>
        <mediaCapture xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
        xsi:type="videoCaptureType" captureID="mcc1">
            <capturedMedia>video</capturedMedia>
            <captureSceneIDREF>CS1</captureSceneIDREF>
            <encGroupIDREF>EG0</encGroupIDREF>
            <nonSpatiallyDefinable>true</nonSpatiallyDefinable>
            <contentCaptureIDs>
                <captureIDREF>VC1</captureIDREF>
                <captureIDREF>vc2</captureIDREF>
                <captureIDREF>vc3</captureIDREF>
            </contentCaptureIDs>
            <composed>false</composed>
            <switching>true</switching>
            <policy>SoundLevel:1</policy>
            <maxCaptures>1</maxCaptures>
            <description lang="en">video of the previous loudest speaker</descri
ption>
            <lang>Italian</lang>
            <mobility>static</mobility>
            <view>individual</view>
        </mediaCapture>
        <mediaCapture xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
        xsi:type="videoCaptureType" captureID="mcc2">
            <capturedMedia>video</capturedMedia>
            <captureSceneIDREF>CS1</captureSceneIDREF>
            <encGroupIDREF>EG0</encGroupIDREF>
            <nonSpatiallyDefinable>true</nonSpatiallyDefinable>
            <contentCaptureIDs>
                <captureIDREF>VC1</captureIDREF>
                <captureIDREF>vc2</captureIDREF>
                <captureIDREF>vc3</captureIDREF>
            </contentCaptureIDs>
            <composed>false</composed>
            <switching>true</switching>
            <policy>SoundLevel:2</policy>
            <maxCaptures>1</maxCaptures>
            <description lang="en">video of the oldest loudest speaker</descript
ion>
            <lang>Italian</lang>
            <mobility>static</mobility>
            <view>individual</view>
        </mediaCapture>
        <mediaCapture xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
        xsi:type="videoCaptureType" captureID="mcc5">
            <capturedMedia>video</capturedMedia>
            <captureSceneIDREF>CS1</captureSceneIDREF>
            <encGroupIDREF>EG0</encGroupIDREF>
            <nonSpatiallyDefinable>true</nonSpatiallyDefinable>
            <contentCaptureIDs>
                <captureIDREF>mcc0</captureIDREF>
                <captureIDREF>mcc1</captureIDREF>
                <captureIDREF>mcc2</captureIDREF>
            </contentCaptureIDs>
            <composed>true</composed>
            <switching>true</switching>
            <policy>SoundLevel</policy>
            <maxCaptures>1</maxCaptures>
            <description lang="en">big video of the current loudest speaker
            + PiPs of previous speakers</description>
            <lang>Italian</lang>
            <mobility>static</mobility>
            <view>individual</view>
        </mediaCapture>
    </mediaCaptures>
    <encodings>
        <encoding xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
        xsi:type="videoEncodingType" encodingID="ENC0">
            <encodingName>vp8</encodingName>
            <maxBandwidth>128000</maxBandwidth>
            <encodedMedia>video</encodedMedia>
        </encoding>
        <encoding xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
        xsi:type="videoEncodingType" encodingID="ENC1">
            <encodingName>vp8</encodingName>
            <maxBandwidth>128000</maxBandwidth>
            <encodedMedia>video</encodedMedia>
        </encoding>
        <encoding xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
        xsi:type="videoEncodingType" encodingID="ENC2">
            <encodingName>vp8</encodingName>
            <maxBandwidth>128000</maxBandwidth>
            <encodedMedia>video</encodedMedia>
        </encoding>
    </encodings>
    <encodingGroups>
        <encodingGroup encodingGroupID="EG0">
            <maxGroupBandwidth>384000</maxGroupBandwidth>
            <encodingIDList>
                <encIDREF>ENC0</encIDREF>
                <encIDREF>ENC1</encIDREF>
                <encIDREF>ENC2</encIDREF>
            </encodingIDList>
        </encodingGroup>
    </encodingGroups>
    <captureScenes>
        <captureScene scale="unknown" sceneID="CS1">
            <description lang="en">main scene</description>
            <sceneEntries>
                <sceneEntry mediaType="video" sceneEntryID="CS1_SE1">
                    <description lang="en">participants video</description>
                    <mediaCaptureIDs>
                        <captureIDREF>VC1</captureIDREF>
                        <captureIDREF>vc2</captureIDREF>
                        <captureIDREF>vc3</captureIDREF>
                    </mediaCaptureIDs>
                </sceneEntry>
                <sceneEntry mediaType="video" sceneEntryID="CS1_SE2">
                    <description lang="en">overall room video</description>
                    <mediaCaptureIDs>
                        <captureIDREF>vc4</captureIDREF>
                    </mediaCaptureIDs>
                </sceneEntry>
                <sceneEntry mediaType="video" sceneEntryID="CS1_SE3">
                    <description lang="en">multi-content captures</description>
                    <mediaCaptureIDs>
                        <captureIDREF>mcc0</captureIDREF>
                        <captureIDREF>mcc1</captureIDREF>
                        <captureIDREF>mcc2</captureIDREF>
                    </mediaCaptureIDs>
                </sceneEntry>
                <sceneEntry mediaType="video" sceneEntryID="CS1_SE4">
                    <description lang="en">composed capture</description>
                    <mediaCaptureIDs>
                        <captureIDREF>mcc5</captureIDREF>
                    </mediaCaptureIDs>
                </sceneEntry>
            </sceneEntries>
        </captureScene>
    </captureScenes>
    <simultaneousSets>
        <simultaneousSet setID="ss1">
            <captureIDREF>VC1</captureIDREF>
            <captureIDREF>vc2</captureIDREF>
            <captureIDREF>vc3</captureIDREF>
            <sceneEntryIDREF>CS1_SE3</sceneEntryIDREF>
            <sceneEntryIDREF>CS1_SE4</sceneEntryIDREF>
        </simultaneousSet>
        <simultaneousSet setID="ss2">
            <captureIDREF>VC1</captureIDREF>
            <captureIDREF>vc4</captureIDREF>
            <captureIDREF>vc3</captureIDREF>
            <sceneEntryIDREF>CS1_SE3</sceneEntryIDREF>
            <sceneEntryIDREF>CS1_SE4</sceneEntryIDREF>
        </simultaneousSet>
    </simultaneousSets>
</clueInfo>
```

25. Diff with draft-ietf-clue-data-model-schema-01 version

Terminology has been added.

Switching policies has been removed from capture scene entry attributes list.

multiple content captures can now be modeled by using the schema. Related attributes (composed, switching, maxCaptures, captureIDs) have been added in the definition of the media capture type.

H26X encoding type has been removed.

maxGroupPps (max pixels per second for encoding groups) removed

Presentation attribute for media captures has been added.

View attribute for media captures has been added.

26. Diff with draft-ietf-clue-data-model-schema-02 version

captureParameters and encodingParameters have been removed from the captureEncodingType

data model example has been updated and validated according to the new schema. Further description of the represented scenario have been provided.

A multiple content capture example has been added.

Obsolete comments and references have been removed.

27. Informative References

[I-D.ietf-clue-framework] Duckworth, M., Pepperell, A., and S. Wenger, "Framework for Telepresence Multi-Streams", draft-ietf-clue-framework-13 (work in progress), December 2013.

[RFC4796] Hautakorpi, J. and G. Camarillo, "The Session Description Protocol (SDP) Content Attribute", RFC 4796, February 2007.

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