
**Information technology — Coding of
multimedia and hypermedia information —**

**Part 8:
XML notation for ISO/IEC 13522-5**

*Technologies de l'information — Codage de l'information multimédia et
hypermédia —*

Partie 8: Notation XML pour l'ISO/CEI 13522-5

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Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this part of ISO/IEC 13522 may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights.

International Standard ISO/IEC 13522-8 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 29, *Coding of audio, picture, multimedia and hypermedia information*. It is based on the normative content of ISO/IEC 13522-5:1997, in constituting a new notation of MHEG-5 classes.

ISO/IEC 13522 consists of the following parts, under the general title *Information technology — Coding of multimedia and hypermedia information*:

- *Part 1: MHEG object representation — Base notation (ASN.1)*
- *Part 3: MHEG script interchange representation*
- *Part 4: MHEG registration procedures*
- *Part 5: Support for base-level interactive applications*
- *Part 6: Support for enhanced interactive applications*
- *Part 7: Interoperability and conformance testing for ISO/IEC 13522-5*
- *Part 8: XML Notation for ISO/IEC 13522-5*

Annex A forms a normative part of this part of ISO/IEC 13522. Annexes B and C are for information only.

Introduction

This part of ISO/IEC 13522 specifies a third formal notation based on XML for ISO/IEC 13522-5:1997.

At present the normative components of ISO/IEC 13522-5:1997 are unambiguously expressed in ASN.1 and EBNF textual Notation. Both of these formats are well known to most software specialists. But it is thought that the standard would attract a wider user community if a more familiar markup language was used to express the elements of the Standard. XML has been suggested as the appropriate markup language to use because a very large number of WWW authors already use HTML; and both XML and HTML have a common ancestor in SGML. Many applications or application components may be retrieved from the Internet or written by persons who know or use HTML document formats; thus an MHEG-5 engine capable of processing objects expressed in XML would appeal to a wide audience of potential users. Material stored on Intranet servers in XML format might also be easily and quickly inserted into broadcast applications. In addition it is expected that the WWW and MHEG technologies will eventually merge. Hence an XML version of MHEG-5 may be consistent with this process when it begins to take place.

In XML, a DTD (Document Type Definition) defines a verifiable syntax for a class of XML documents. This part of ISO/IEC 13522 expresses a DTD defining a notation for encoding MHEG-5 objects; this DTD is given in Annex A.

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Information technology — Coding of multimedia and hypermedia information —

Part 8:

XML notation for ISO/IEC 13522-5

1 Scope

ISO/IEC 13522-5:1997 specifies two functionally equivalent notations for MHEG-5 objects in Annexes A and B of that document. This part of ISO/IEC 13522 specifies a third functionally equivalent notation for MHEG-5 objects in XML 1.0 ("Extensible Markup Language" as recommended by World Wide Web Consortium, W3C). This specification is unambiguously expressed in the DTD contained in Annex A.

This part of ISO/IEC 13522 in no way invalidates or substitutes for any clauses of ISO/IEC 13522-5:1997.

2 Conformance

This part of ISO/IEC 13522 defines an alternative notation to those defined in Annexes A and B of ISO/IEC 13522-5:1997. Therefore, no new conformance requirements are imposed on ISO/IEC 13522-5:1997.

However the DTD specified in this part of ISO/IEC 13522-5:1997 is required to validate any MHEG-5 application written in XML.

3 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of ISO/IEC 13522. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of ISO/IEC 13522 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO/IEC 13522-5:1997, *Information technology — Coding of multimedia and hypermedia information — Part 5: Support for base-level interactive applications*.

Extensible Markup Language (XML) 1.0, W3C Recommendation, 10th-February-1998.

4 Terms and definitions

For the purposes of this part of ISO/IEC 13522, the terms and definitions given in ISO/IEC 13522-5:1997 and XML 1.0 apply.

5 Symbols and abbreviated terms

For the purposes of this part of ISO/IEC 13522, the symbols and abbreviated terms given in ISO/IEC 13522-5:1997 and XML 1.0 apply.

6 Structure

Annex A is normative and defines the notation in the form of an XML DTD. Annex B is informative and provides two examples of MHEG-5 objects encoded using this notation. Annex C is informative and provides some information on the XML DTD validation.

7 Requirements

This International Standard has been designed to satisfy the following requirements:

- Provide a functionally equivalent XML notation for MHEG-5 application description.
- Provide a basis for future migration of MHEG-5 technology to the Internet technology.

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Annex A (normative)

XML DTD for ISO/IEC 13522-5

A.1 DTD

```
<?xml version="1.0" encoding="UTF-8" ?>
```

```
<!-- MHEG-8 MHEG XML Document Type Definition -->
```

```
<!-- Root element mheg5 -->
```

```
<!ELEMENT mheg5 (application | scene)>
```

```
<!-- These are integer sub-range declarations -->
```

```
<!ENTITY % from0to255 "(0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 |
48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 | 63 | 64 |
65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 | 81 |
82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 |
99 | 100 | 101 | 102 | 103 | 104 | 105 | 106 | 107 | 108 | 109 | 110 | 111 | 112 |
113 | 114 | 115 | 116 | 117 | 118 | 119 | 120 | 121 | 122 | 123 | 124 | 125 | 126 |
127 | 128 | 129 | 130 | 131 | 132 | 133 | 134 | 135 | 136 | 137 | 138 | 139 | 140 |
141 | 142 | 143 | 144 | 145 | 146 | 147 | 148 | 149 | 150 | 151 | 152 | 153 | 154 |
155 | 156 | 157 | 158 | 159 | 160 | 161 | 162 | 163 | 164 | 165 | 166 | 167 | 168 |
169 | 170 | 171 | 172 | 173 | 174 | 175 | 176 | 177 | 178 | 179 | 180 | 181 | 182 |
183 | 184 | 185 | 186 | 187 | 188 | 189 | 190 | 191 | 192 | 193 | 194 | 195 | 196 |
197 | 198 | 199 | 200 | 201 | 202 | 203 | 204 | 205 | 206 | 207 | 208 | 209 | 210 |
211 | 212 | 213 | 214 | 215 | 216 | 217 | 218 | 219 | 220 | 221 | 222 | 223 | 224 |
225 | 226 | 227 | 228 | 229 | 230 | 231 | 232 | 233 | 234 | 235 | 236 | 237 | 238 |
239 | 240 | 241 | 242 | 243 | 244 | 245 | 246 | 247 | 248 | 249 | 250 | 251 | 252 |
253 | 254 | 255)">
```

```
<!ENTITY % from0to100 "(0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 |
48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 | 63 | 64 |
65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 | 81 |
82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 |
99 | 100)">
```

```
<!-- These elements are defined on class Root, which is abstract -->
```

```
<!-- class Root itself is not representable directly in XML notation -->
```

```
<!ENTITY % oid "objref">
```

```
<!ENTITY % root "%oid;">
```

```
<!ELEMENT objref EMPTY>
```

```
<!ATTLIST objref
```

```
    groupid CDATA #IMPLIED
```

```
    objnum CDATA #REQUIRED>
```

```

<!-- These elements are defined on class group, which is abstract -->
<!-- class group itself is not representable directly in XML notation -->

<!ELEMENT stdid EMPTY>
<!ATTLIST stdid
    jointid CDATA #FIXED "2"
    mhegstddid CDATA #FIXED "19">
<!ELEMENT stdversion EMPTY>
<!ATTLIST stdversion
    value CDATA #FIXED "1">
<!ELEMENT objectinfo EMPTY>
<!ATTLIST objectinfo
    info CDATA #REQUIRED>
<!ELEMENT onstartup (action)>
<!ELEMENT onclosedown (action)>
<!ELEMENT origgcpriority EMPTY>
<!ATTLIST origgcpriority
    value %from0to255; "127">
<!ELEMENT items (residentprg | remoteprg | interchgprg | palette | font |
    cursorshape | booleanvar | integervar | ostringvar |
    objectrefvar | contentrefvar | link | stream |
    bitmap | lineart | dynamiclineart | rectangle |
    hotspot | switchbutton | pushbutton | text |
    entryfield | hypertext | slider | tokengroup |
    listgroup)+>

<!-- This entity is used in Application and Scene classes-->

<!ENTITY % groupobjectreference "groupid CDATA #REQUIRED objnum CDATA #FIXED '0'">

<!-- Application Class -->
<!-- Directly representable in XML notation -->

<!ELEMENT application (stdid?, stdversion?, objectinfo?, onstartup?,
    onclosedown?, origgcpriority?, items?, onspawnclosedown?,
    onrestart?, defaultattributes?)>
<!ATTLIST application
    %groupobjectreference;>
<!ELEMENT onspawnclosedown (action)>
<!ELEMENT onrestart (action)>
<!-- name "defaultfont" is used in place of "font" in ASN.1 and Textual notation to
prevent XML name clash -->
<!ELEMENT defaultattributes (characterset | backgroundcolour | textchook |
    textcolour | defaultfont | fontattributes |
    interchgprgchook | streamchook | bitmapchook |
    lineartchook | buttonrefcolour | highlightrefcolour |
    sliderrefcolour)+>
<!ENTITY % colourindex "integer">
<!ENTITY % absolutecolour "octetstring">
<!ENTITY % colour "%colourindex;|%absolutecolour;">
<!ENTITY % directcfont "octetstring">
<!ENTITY % indirectcfont "objref">
<!ENTITY % fontbody "%directcfont; | %indirectcfont;">
<!ELEMENT characteraset EMPTY>
<!ATTLIST characteraset
    value CDATA #REQUIRED>
<!ELEMENT backgroundcolour (%colour;)>
<!ELEMENT textchook EMPTY>
<!ATTLIST textchook
    value CDATA #REQUIRED>

```

```

<!ELEMENT textcolour      (%colour;)>
<!ELEMENT defaultfont     (%fontbody;)>
<!ELEMENT fontattributes EMPTY>
<!ATTLIST fontattributes
    value CDATA #REQUIRED>
<!ELEMENT interchgprgchook EMPTY>
<!ATTLIST interchgprgchook
    value CDATA #REQUIRED>
<!ELEMENT streamchook EMPTY>
<!ATTLIST streamchook
    value CDATA #REQUIRED>
<!ELEMENT bitmapchook EMPTY>
<!ATTLIST bitmapchook
    value CDATA #REQUIRED>
<!ELEMENT lineartchook EMPTY>
<!ATTLIST lineartchook
    value CDATA #REQUIRED>
<!ELEMENT buttonrefcolour (%colour;)>
<!ELEMENT highlightrefcolour (%colour;)>
<!ELEMENT sliderrefcolour (%colour;)>

<!-- Scene Class - -->
<!-- Directly representable in XML notation -->

<!ELEMENT scene (stdid?, stdversion?, objectinfo?, onstartup?,
    onclosedown?, origgcpriority?, items?, inputeventreg, scenecs,
    aspectratio?, movingcursor?, nextscenes?)>
<!ATTLIST scene
    %groupobjectreference;>
<!ELEMENT inputeventreg EMPTY>
<!ATTLIST inputeventreg
    num CDATA #REQUIRED>
<!ELEMENT scenecs EMPTY>
<!ATTLIST scenecs
    xscene CDATA #REQUIRED
    yscene CDATA #REQUIRED>
<!ELEMENT aspectratio EMPTY>
<!ATTLIST aspectratio
    width CDATA #REQUIRED
    height CDATA #REQUIRED>
<!ELEMENT movingcursor EMPTY>
<!ATTLIST movingcursor
    value (true | false) "false">
<!ELEMENT nextscenes (nextscene)+>
<!ELEMENT nextscene EMPTY>
<!ATTLIST nextscene
    sceneref CDATA #REQUIRED
    sceneweight %from0to255; #REQUIRED>

<!-- These elements are defined on class Ingredient, which is abstract -->
<!-- class Ingredient itself is not representable directly in XML notation -->

<!ENTITY % includedcontent "octetstring">
<!ELEMENT origcontent (%includedcontent; | referencedcontent)>
<!ATTLIST origcontent
    chook CDATA #IMPLIED>
<!ELEMENT referencedcontent EMPTY>
<!ATTLIST referencedcontent
    contentreference CDATA #REQUIRED

```

```

        contentsize          CDATA #IMPLIED
        ccpriority           %from0to255; "127">

<!ENTITY % objectreference "groupid CDATA #IMPLIED
                           objnum CDATA #REQUIRED">

<!-- ingredient parameter entities -->

<!-- the default case -->
<!ENTITY % ingredientparameters1 "initiallyactive (true | false) 'true'
                                shared (true | false) 'false'">

<!-- used in palette, font, cursorshape, and variable classes -->
<!ENTITY % ingredientparameters2 "initiallyactive (true | false) #FIXED 'true'
                                shared (true | false) 'false'">

<!-- used in audio, video, and RTGraphics -->
<!ENTITY % ingredientparameters3 "initiallyactive (true | false) 'true'">

<!-- Link Class -->

<!ELEMENT link (linkcondition, linkeffect)>
<!ATTLIST link
        %objectreference;
        %ingredientparameters1;>
<!ELEMENT linkcondition (eventsource, eventtype, eventdata?)>
<!ELEMENT eventsource EMPTY>
<!ATTLIST eventsource
        groupid CDATA #IMPLIED
        objnum CDATA #REQUIRED>
<!ELEMENT eventtype EMPTY>
<!ATTLIST eventtype
        type (isdeleted | isrunning | isavailable | isstopped |
              userinput | anchorfired | timerfired | asynchstopped |
              interactioncompleted | tokenmovedfrom | tokenmovedto |
              streamevent | streamplaying | streamstopped |
              countertrigger | highlighton | highlightoff |
              cursorenter | cursorleave | isselected | isdeselected |
              testevent | firstitempresented | lastitempresented |
              headitems | tailitems | itemselected | itemdeselected |
              entryfieldfull | contentavailable | engineevent) #REQUIRED>
<!ELEMENT eventdata (octetstring | boolean | integer)>
<!ELEMENT linkeffect (action)>

<!-- These elements are defined on class Program, which is abstract -->
<!-- class Program itself is not representable directly in XML notation -->

<!ENTITY % prgparameters "name, initiallyavailable?">
<!ELEMENT name EMPTY>
<!ATTLIST name
        value CDATA #REQUIRED>
<!ELEMENT initiallyavailable EMPTY>
<!ATTLIST initiallyavailable
        value CDATA "true">
<!ELEMENT residentprg (%prgparameters;)>
<!ATTLIST residentprg
        %objectreference;
        %ingredientparameters1;>
<!ELEMENT remoteprg (%prgparameters;, programconnectiontag?)>

```

```

<!-- remoteprg
      %objectreference;
      %ingredientparameters1;>
<!-- programconnectiontag EMPTY>
<!-- programconnectiontag value CDATA #REQUIRED>
<!-- interchgprg (origcontent, %prgparameters;)>
<!-- interchgprg
      %objectreference;
      %ingredientparameters1;>

<!-- Palette Class -->
<!-- palette (origcontent)>
<!-- palette
      %objectreference;
      %ingredientparameters2;>

<!-- Font Class -->
<!-- font (origcontent)>
<!-- font
      %objectreference;
      %ingredientparameters2;>

<!-- CursorShape Class -->
<!-- cursorshape (origcontent)>
<!-- cursorshape
      %objectreference;
      %ingredientparameters2;>

<!-- These elements are defined on class Variable, which is abstract -->
<!-- class Variable itself is not representable directly in XML notation -->

<!-- integervalue EMPTY>
<!-- integervalue
      origvalue CDATA #REQUIRED>
<!-- booleanvalue EMPTY>
<!-- booleanvalue
      origvalue (true | false) #REQUIRED>
<!-- ostringvalue EMPTY>
<!-- ostringvalue
      origvalue CDATA #REQUIRED>
<!-- objectrefvalue EMPTY>
<!-- objectrefvalue
      groupid CDATA #IMPLIED
      objnum CDATA #REQUIRED>
<!-- contentrefvalue EMPTY>
<!-- contentrefvalue
      origvalue CDATA #REQUIRED>

<!-- subclasses of variable -->

<!-- booleanvar (booleanvalue)>
<!-- booleanvar
      %objectreference;
      %ingredientparameters2;>
<!-- integervar (integervalue)>
<!-- integervar
      %objectreference;

```

```

        %ingredientparameters2;>
<!ELEMENT ostringvar (ostringvalue)>
<!ATTLIST ostringvar
        %objectreference;
        %ingredientparameters2;>
<!ELEMENT objectrefvar (objectrefvalue)>
<!ATTLIST objectrefvar
        %objectreference;
        %ingredientparameters2;>
<!ELEMENT contentrefvar (contentrefvalue)>
<!ATTLIST contentrefvar
        %objectreference;
        %ingredientparameters2;>

<!-- Presentable Class is not directly representable in XML-->

<!-- TokenManager Class -->

<!ENTITY % tokenmanager "movementtable?">
<!ELEMENT movementtable (movement)+>
<!ENTITY % targetelement "integer">
<!ELEMENT movement (%targetelement;)+>

<!-- TokenGroup Class -->

<!ELEMENT tokengroup (%tokenmanager;, tokengroupitems,
        notokenActionslots?)>
<!ATTLIST tokengroup
        %objectreference;
        %ingredientparameters1;>
<!ELEMENT tokengroupitems (tokengroupitem)+>
<!ENTITY % avisible "objref">
<!ELEMENT tokengroupitem (%avisible;, actionslots?)>
<!ENTITY % actionslot "action | null">
<!ELEMENT actionslots (%actionslot;)+>
<!ELEMENT null EMPTY>
<!ELEMENT notokenActionslots (%actionslot;)+>

<!-- ListGroup Class -->
<!ELEMENT listgroup (%tokenmanager;, tokengroupitems,
        notokenActionslots?, positions, wraparound?,
        multipleselection?)>
<!ATTLIST listgroup
        %objectreference;
        %ingredientparameters1;>
<!ENTITY % position "xyposition">
<!ELEMENT positions (%position;)+>
<!ELEMENT wraparound EMPTY>
<!ATTLIST wraparound
        value CDATA "false">
<!ELEMENT multipleselection EMPTY>
<!ATTLIST multipleselection
        value CDATA "false">

<!-- Two varieties of class Visible, depending on whether subclasses -->
<!-- have content or not-->

<!ENTITY % visiblewithcontent "origcontent, origboxsize,
        origposition?, origpaletteref?">
<!ENTITY % visiblewithoutcontent "origboxsize,
        origposition?, origpaletteref?">

```

```

<!ELEMENT origboxsize EMPTY>
<!ATTLIST origboxsize
    xlength CDATA #REQUIRED
    ylength CDATA #REQUIRED>
<!ELEMENT origposition EMPTY>
<!ATTLIST origposition
    xpos CDATA "0"
    ypos CDATA "0">
<!ELEMENT origpaletteref EMPTY>
<!ATTLIST origpaletteref
    groupid CDATA #IMPLIED
    objnum CDATA #REQUIRED>

<!-- Bitmap Class -->
<!ELEMENT bitmap (%visiblewithcontent;, tiling?, origtransparency?)>
<!ATTLIST bitmap
    %objectreference;
    %ingredientparameters1;>
<!ELEMENT tiling EMPTY>
<!ATTLIST tiling
    value CDATA "false">
<!ELEMENT origtransparency EMPTY>
<!ATTLIST origtransparency
    value %from0to100; "0">

<!-- Entity used by class Lineart and some subclasses-->
<!ENTITY % lineartbody "origlinewidth?, origlinestyle?,
    origreflinecolour?, origreffillcolour?">

<!-- LineArt Class -->
<!ELEMENT lineart (%visiblewithcontent;;, bbox?, %lineartbody;)>
<!ATTLIST lineart
    %objectreference;
    %ingredientparameters1;>
<!ELEMENT bbox EMPTY>
<!ATTLIST bbox
    value (true | false) "true">
<!ELEMENT origlinewidth EMPTY>
<!ATTLIST origlinewidth
    value CDATA "1">
<!ELEMENT origlinestyle EMPTY>
<!ATTLIST origlinestyle
    type (solid | dashed | dotted) "solid">
<!ELEMENT origreflinecolour (%colour;)>
<!ELEMENT origreffillcolour (%colour;)>

<!-- Rectangle Class -->
<!ELEMENT rectangle (%visiblewithoutcontent;;, %lineartbody;)>
<!ATTLIST rectangle
    %objectreference;
    %ingredientparameters1;>

<!-- DynamicLineArt Class -->
<!ELEMENT dynamiclineart (%visiblewithoutcontent;;, bbox?, %lineartbody;)>
<!ATTLIST dynamiclineart
    %objectreference;
    %ingredientparameters1;>

```

```

<!-- Entity used by Text Class and subclasses Entryfield and Hypertext -->

<!ENTITY % textbody "%visiblewithcontent;; originalfont?, fontattributes?,
    textcolour?, backgroundcolour?, characterset?,
    hjustification?, vjustification?, lineorientation?,
    startcorner?, textwrapping?">

<!-- Text Class -->

<!ELEMENT text (%textbody;)>
<!ATTLIST text
    %objectreference;
    %ingredientparameters1;>
<!ELEMENT originalfont (%fontbody;)>
<!ELEMENT hjustification EMPTY>
<!ATTLIST hjustification
    type (start | end | centre | justified) "start">
<!ELEMENT vjustification EMPTY>
<!ATTLIST vjustification
    type (start | end | centre | justified) "start">
<!ELEMENT lineorientation EMPTY>
<!ATTLIST lineorientation
    type (vertical | horizontal) "horizontal">
<!ELEMENT startcorner EMPTY>
<!ATTLIST startcorner
    type (upper-left | upper-right | lower-left | lower-right) "upper-left">
<!ELEMENT textwrapping EMPTY>
<!ATTLIST textwrapping
    value (true | false) "false">

<!-- Stream Class -->
<!ELEMENT stream (origcontent, multiplex, storage?, looping?)>
<!ATTLIST stream
    %objectreference;
    %ingredientparameters1;>
<!ELEMENT multiplex (audio | video | rtgraphics)+>
<!ELEMENT storage EMPTY>
<!ATTLIST storage
    type (memory | stream) "stream">
<!ELEMENT looping EMPTY>
<!ATTLIST looping
    value CDATA "1">

<!-- Audio Class -->
<!ELEMENT audio (componenttag, origvolume?)>
<!ATTLIST audio
    %objectreference;
    %ingredientparameters3;>
<!ELEMENT componenttag EMPTY>
<!ATTLIST componenttag
    value CDATA #REQUIRED>
<!ELEMENT origvolume EMPTY>
<!ATTLIST origvolume
    value CDATA "0">

<!-- Video Class -->
<!ELEMENT video (origboxsize, origposition?, componenttag, termination?)>
<!ATTLIST video

```

```

        %objectreference;
        %ingredientparameters3;>
<!ELEMENT termination EMPTY>
<!ATTLIST termination
    type (freeze | disappear) "disappear">

<!-- RTGraphics Class -->
<!ELEMENT rtgraphics (origboxsize, origposition?, origpaletteref?, componenttag,
termination?)>
<!ATTLIST rtgraphics
    %objectreference;
    %ingredientparameters3;>

<!-- Interactable Class -->
<!ENTITY % interactible "engineersp?, highlightrefcolour?">
<!ELEMENT engineersp EMPTY>
<!ATTLIST engineersp
    value (true | false) "true">

<!-- Slider Class -->
<!ELEMENT slider (%visiblewithoutcontent;, %interactable;, orientation, maxvalue,
    minvalue?, initialvalue?, initialportion?, stepsize?,
    sliderstyle?, sliderrefcolour?)>
<!ATTLIST slider
    %objectreference;
    %ingredientparameters1;>
<!ELEMENT orientation EMPTY>
<!ATTLIST orientation
    type (left | right | up | down) #REQUIRED>
<!ELEMENT maxvalue EMPTY>
<!ATTLIST maxvalue
    value CDATA #REQUIRED>
<!ELEMENT minvalue EMPTY>
<!ATTLIST minvalue
    value CDATA "1">
<!ELEMENT initialvalue EMPTY>
<!ATTLIST initialvalue
    value CDATA #REQUIRED>
<!ELEMENT initialportion EMPTY>
<!ATTLIST initialportion
    value CDATA #REQUIRED>
<!ELEMENT stepsize EMPTY>
<!ATTLIST stepsize
    value CDATA "1">
<!ELEMENT sliderstyle EMPTY>
<!ATTLIST sliderstyle
    type (normal | thermometer | proportional) "normal">

<!-- EntryField Class -->
<!ELEMENT entryfield (%textbody;, %interactable;, inputtype?,
    charlist?, obscuredinput?, maxlength?)>
<!ATTLIST entryfield
    %objectreference;
    %ingredientparameters1;>
<!ELEMENT inputtype EMPTY>
<!ATTLIST inputtype
    type (alpha | numeric | any | listed) "any">
<!ELEMENT charlist EMPTY>
<!ATTLIST charlist
    value CDATA #REQUIRED>
<!ELEMENT obscuredinput EMPTY>

```

```

<!ATTLIST obscuredinput
    value CDATA "false">
<!ELEMENT maxlength EMPTY>
<!ATTLIST maxlength
    value CDATA "0">

<!-- HyperText Class -->
<!ELEMENT hypertext (%textbody;, %interactable;)>
<!ATTLIST hypertext
    %objectreference;
    %ingredientparameters1;>

<!-- Button Class -->
<!ENTITY % button "%visiblewithoutcontent;, %interactable;, buttonrefcolour?">

<!-- Hotspot Class -->
<!ELEMENT hotspot (%button;)>
<!ATTLIST hotspot
    %objectreference;
    %ingredientparameters1;>

<!-- PushButton Class -->
<!ENTITY % pushbuttonbody "%button;, origlabel?, characterset?">
<!ELEMENT pushbutton (%pushbuttonbody;)>
<!ATTLIST pushbutton
    %objectreference;
    %ingredientparameters1;>
<!ELEMENT origlabel EMPTY>
<!ATTLIST origlabel
    value CDATA #REQUIRED>

<!-- SwitchButton Class -->
<!ELEMENT switchbutton (%pushbuttonbody;, buttonstyle)>
<!ATTLIST switchbutton
    %objectreference;
    %ingredientparameters1;>
<!ELEMENT buttonstyle EMPTY>
<!ATTLIST buttonstyle
    type (pushbutton | radiobutton | checkbox) #REQUIRED>

<!-- Common Data Types -->
<!ENTITY % directref "objref">
<!ENTITY % genericobjectreference "%directref;|indirectref">
<!ENTITY % contentref "octetstring">
<!ENTITY % genericcontentreference "%contentref;|indirectref">
<!ENTITY % genericinteger "integer | indirectref">
<!ENTITY % genericboolean "boolean | indirectref">
<!ENTITY % genericoctetstring "octetstring | indirectref">
<!ENTITY % address "%genericoctetstring;">
<!ENTITY % answer "objref">
<!ENTITY % appendvalue "%genericoctetstring;">
<!ENTITY % arcangle "%genericinteger;">
<!ENTITY % availabilitystatusvar "objref">
<!ENTITY % callsucceeded "objref">
<!ENTITY % cellindex "%genericinteger;">
<!ENTITY % clonerefvar "objref">
<!ENTITY % comparisonvalue "newgenericinteger|newgenericboolean|
    newgenericoctetstring|newgenericobjectreference|
    newgenericcontentreference">
<!ELEMENT connectiontag (%genericinteger;)>
<!ENTITY % denominator "%genericinteger;">

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<!ENTITY % ellipseheight "%genericinteger;">
<!ENTITY % ellipsewidth "%genericinteger;">
<!ENTITY % emulatedeventdata "newgenericinteger|newgenericboolean|
                                newgenericoctetstring">
<!ENTITY % emulatedeventsourcesource "%genericobjectreference;">
<!ENTITY % entriypointvar "objref">
<!ENTITY % forksucceeded "objref">
<!ENTITY % feature "%genericoctetstring;">
<!ENTITY % fillcolourvar "objref">
<!ENTITY % firstitemvar "objref">
<!ENTITY % highlightstatusvar "objref">
<!ENTITY % index "%genericinteger;">
<!ENTITY % infilename "%genericoctetstring;">
<!ENTITY % interactionstatusvar "objref">
<!ENTITY % itemindex "%genericinteger;">
<!ENTITY % itemrefvar "objref">
<!ENTITY % itemstatusvar "objref">
<!ENTITY % itemstoscroll "%genericinteger;">
<!ENTITY % labelvar "objref">
<!ENTITY % lastanchorfiredvar "objref">
<!ENTITY % linecolourvar "objref">
<!ENTITY % linestylevar "objref">
<!ENTITY % linewidthvar "objref">
<!ENTITY % movementidentifier "%genericinteger;">
<!ENTITY % nbofsteps "%genericinteger;">
<!ENTITY % newcachepriority "%genericinteger;">
<!ENTITY % newcolour "newcolourindex|newabsolutecolour">
<!ENTITY % newincludedcontent "%genericoctetstring;">
<!ENTITY % newcontent "%newincludedcontent; newreferencedcontent">
<!ENTITY % newcounterendposition "%genericinteger;">
<!ENTITY % newcounterposition "%genericinteger;">
<!ENTITY % newcountervalue "%genericinteger;">
<!ENTITY % newcursorshape "%genericobjectreference;">
<!ENTITY % newentrypoint "%genericinteger;">
<!ENTITY % newfirstitem "%genericinteger;">
<!ENTITY % newfontname "newgenericoctetstring">
<!ENTITY % newfontreference "newgenericobjectreference">
<!ENTITY % newfont "%newfontname; | %newfontreference;">
<!ENTITY % newhighlightstatus "%genericboolean;">
<!ENTITY % newinteractionstatus "%genericboolean;">
<!ENTITY % newlabel "%genericoctetstring;">
<!ENTITY % newlinestyle "%genericinteger;">
<!ENTITY % newlinewidth "%genericinteger;">
<!ENTITY % newoverwritemode "%genericboolean;">
<!ENTITY % newpaletteref "%genericobjectreference;">
<!ENTITY % newportion "%genericinteger;">
<!ENTITY % newslidervalue "%genericinteger;">
<!ENTITY % numerator "%genericinteger;">
<!ENTITY % rational "(%numerator;), (%denominator;)">
<!ENTITY % newspeed "%rational;">
<!ENTITY % newtransparency "%genericinteger;">
<!ENTITY % newvariablevalue "newgenericinteger|newgenericboolean|
                                newgenericoctetstring|newgenericobjectreference|
                                newgenericcontentreference">
<!ENTITY % newvolume "%genericinteger;">
<!ENTITY % new "%genericinteger;">
<!ENTITY % newxposition "%genericinteger;">
<!ENTITY % newyposition "%genericinteger;">
<!ENTITY % opensucceeded "objref">
<!ENTITY % operator "%genericinteger;">
<!ENTITY % outfilename "%genericoctetstring;">

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<!ENTITY % overwritemodevar "objref">
<!ENTITY % parameter "newgenericinteger|newgenericboolean|
                        newgenericoctetstring|newgenericobjectreference|
                        newgenericcontentreference">
<!ENTITY % portionvar "objref">
<!ENTITY % protocol "%genericoctetstring;">
<!ENTITY % readsucceeded "objref">
<!ENTITY % referencevisible "%genericobjectreference;">
<!ENTITY % runningstatusvar "objref">
<!ENTITY % selectionstatusvar "objref">
<!ENTITY % sizevar "objref">
<!ENTITY % slidervaluevar "objref">
<!ENTITY % startangle "%genericinteger;">
<!ENTITY % storesucceeded "objref">
<!ENTITY % target "%genericobjectreference;">
<!ENTITY % textcontentvar "objref">
<!ENTITY % textdatavar "objref">

<!ENTITY % timerid "%genericinteger;">

<!ENTITY % timervalue "%genericinteger;">
<!ENTITY % tokenpositionvar "objref">
<!ENTITY % transitioneffect "%genericinteger;">
<!ENTITY % triggeridentifier "%genericinteger;">
<!ENTITY % value "%genericinteger;">
<!ENTITY % visiblereference "%genericobjectreference;">
<!ENTITY % volumevar "objref">
<!ENTITY % x "%genericinteger;">
<!ENTITY % x1 "%genericinteger;">
<!ENTITY % x2 "%genericinteger;">
<!ENTITY % xboxsizevar "objref">
<!ENTITY % xcursor "%genericinteger;">
<!ENTITY % xnewboxsize "%genericinteger;">
<!ENTITY % xout "objref">
<!ENTITY % xpositionvar "objref">
<!ENTITY % xscale "%genericinteger;">
<!ENTITY % y "%genericinteger;">
<!ENTITY % y1 "%genericinteger;">
<!ENTITY % y2 "%genericinteger;">
<!ENTITY % yboxsizevar "objref">
<!ENTITY % ycursor "%genericinteger;">
<!ENTITY % ynewboxsize "%genericinteger;">
<!ENTITY % yout "objref">
<!ENTITY % ypositionvar "objref">
<!ENTITY % yscale "%genericinteger;">

<!-- Action Class -->
<!ELEMENT action (
  activate | add | additem | append | bringtofront |
  call | callactionslot | clear | clone | closeconnection |
  deactivate | delitem | deselect | deselectitem | divide |
  drawarc | drawline | drawoval | drawpolygon | drawpolyline |
  drawrectangle | drawsector | fork | getavailabilitystatus |
  getboxsize | getcellitem | getcursorposition | getenginesupport |
  getentrypoint | getfillcolour | getfirstitem | gethighlightstatus |
  getinteractionstatus | getitemstatus | getlabel | getlastanchorfired |
  getlinecolour | getlinestyle | getlinewidth | getlistitem |
  getlistsizes | getoverwrite | getportion | getposition |
  getrunningstatus | getselectionstatus | getslidervalue |
  gettextcontent | gettextdata | gettokenposition | getvolume |
  launch | lockscreen | modulo | move | moveto | multiply |

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openconnection | preload | putbefore | putbehind | quit |
readpersistent | run | scalebitmap | scalevideo | scrollitems |
select | selectitem | sendevent | sendtoback | setboxsize |
setcachepriority | setcounterendposition | setcounterposition |
setcountertrigger | setcursorposition | setcursorshape | setdata |
setentrypoint | setfillcolour | setfirstitem | setfontref |
sethighlightstatus | setinteractionstatus | setlabel | setlinecolour |
setlinestyle | setlinewidth | setoverwritemode | setpaletteref |
setportion | setposition | setslidervalue | setspeed | settimer |
settransparency | setvariable | setvolume | spawn | step | stop |
storepersistent | subtract | testvariable | toggle | toggleitem |
transitionto | unload | unlockscreen )+>

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<!-- Elementary Action -->
<!ELEMENT activate (%target;)>
<!ELEMENT add ((%target;), (%value;))>
<!ELEMENT additem ((%target;), (%itemindex;), (%visibleref;))>
<!ELEMENT append ((%target;), (%appendvalue;))>
<!ELEMENT bringtofront (%target;)>
<!ELEMENT call ((%target;), (%callsucceeded;), (parameters?))>
<!ELEMENT callactionslot ((%target;), (%index;))>
<!ELEMENT clear (%target;)>
<!ELEMENT clone ((%target;), (%clonerefvar;))>
<!ELEMENT closeconnection ((%target;), (connectiontag;))>
<!ELEMENT deactivate (%target;)>
<!ELEMENT delitem ((%target;), (%visibleref;))>
<!ELEMENT deselect (%target;)>
<!ELEMENT deselectitem ((%target;), (%itemindex;))>
<!ELEMENT divide ((%target;), (%value;))>
<!ELEMENT drawarc ((%target;), (%x;), (%y;), (%ellipsewidth;),
(%ellipseheight;), (%startangle;), (%arcangle;))>
<!ELEMENT drawline ((%target;), (%x1;), (%y1;), (%x2;), (%y2;))>
<!ELEMENT drawoval ((%target;), (%x;), (%y;), (%ellipsewidth;),
(%ellipseheight;))>
<!ELEMENT drawpolygon ((%target;), (pointlist;))>
<!ELEMENT drawpolyline ((%target;), (pointlist;))>
<!ELEMENT drawrectangle ((%target;), (%x1;), (%y1;), (%x2;), (%y2;))>
<!ELEMENT drawsector ((%target;), (%x;), (%y;), (%ellipsewidth;),
(%ellipseheight;), (%startangle;), (%arcangle;))>
<!ELEMENT fork ((%target;), (%forksucceeded;), (parameters?))>
<!ELEMENT getavailabilitystatus ((%target;), (%availabilitystatusvar;))>
<!ELEMENT getboxsize ((%target;), (%xboxsizevar;), (%yboxsizevar;))>
<!ELEMENT getcellitem ((%target;), (%cellindex;), (%itemrefvar;))>
<!ELEMENT getcursorposition ((%target;), (%xout;), (%yout;))>
<!ELEMENT getenginesupport ((%target;), (%feature;), (%answer;))>
<!ELEMENT getentrypoint ((%target;), (%entrypointvar;))>
<!ELEMENT getfillcolour ((%target;), (%fillcolourvar;))>
<!ELEMENT getfirstitem ((%target;), (%firstitemvar;))>
<!ELEMENT gethighlightstatus ((%target;), (%highlightstatusvar;))>
<!ELEMENT getinteractionstatus ((%target;), (%interactionstatusvar;))>
<!ELEMENT getitemstatus ((%target;), (%itemindex;), (%itemstatusvar;))>
<!ELEMENT getlabel ((%target;), (%labelvar;))>
<!ELEMENT getlastanchorfired ((%target;), (%lastanchorfiredvar;))>
<!ELEMENT getlinecolour ((%target;), (%linecolourvar;))>
<!ELEMENT getlinestyle ((%target;), (%linestylevar;))>
<!ELEMENT getlinewidth ((%target;), (%linewidthvar;))>
<!ELEMENT getlistitem ((%target;), (%itemindex;), (%itemrefvar;))>
<!ELEMENT getlistsize ((%target;), (%sizevar;))>
<!ELEMENT getoverwritemode ((%target;), (%overwritemodevar;))>
<!ELEMENT getportion ((%target;), (%portionvar;))>
<!ELEMENT getposition ((%target;), (%xpositionvar;), (%ypositionvar;))>

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<!ELEMENT getrunningstatus ((%target;), (%runningstatusvar;))>
<!ELEMENT getselectionstatus ((%target;), (%selectionstatusvar;))>
<!ELEMENT getslidervalue ((%target;), (%slidervaluevar;))>
<!ELEMENT gettextcontent ((%target;), (%textcontentvar;))>
<!ELEMENT gettextdata ((%target;), (%textdatavar;))>
<!ELEMENT gettokenposition ((%target;), (%tokenpositionvar;))>
<!ELEMENT getvolume ((%target;), (%volumevar;))>
<!ELEMENT launch (%target;)>
<!ELEMENT lockscreen (%target;)>
<!ELEMENT modulo ((%target;), (%value;))>
<!ELEMENT move ((%target;), (%movementidentifier;))>
<!ELEMENT moveto ((%target;), (%index;))>

<!ELEMENT multiply ((%target;), (%value;))>
<!ELEMENT openconnection ((%target;), (%opensucceeded;),
                           (%protocol;), (%address;), connectiontag)>
<!ELEMENT preload (%target;)>
<!ELEMENT putbefore ((%target;), (%referencevisible;))>
<!ELEMENT putbehind ((%target;), (%referencevisible;))>
<!ELEMENT quit (%target;)>
<!ELEMENT readpersistent ((%target;), (%readsucceeded;),
                           outvariables, (%infilename;))>
<!ELEMENT run (%target;)>
<!ELEMENT scalebitmap ((%target;), (%xscale;), (%yscale;))>
<!ELEMENT scalevideo ((%target;), (%xscale;), (%yscale;))>
<!ELEMENT scrollitems ((%target;), (%itemstoscroll;))>
<!ELEMENT select (%target;)>
<!ELEMENT selectitem ((%target;), (%itemindex;))>
<!ELEMENT sendevent ((%target;), (%emulatedeventsource;),
                     emulatedeventtype, (%emulatedeventdata;?))>
<!ELEMENT sendtoback (%target;)>
<!ELEMENT setboxsize ((%target;), (%xnewboxsize;), (%ynewboxsize;))>
<!ELEMENT setcachepriority ((%target;), (%newcachepriority;))>
<!ELEMENT setcounterendposition ((%target;), (%newcounterendposition;))>
<!ELEMENT setcounterposition ((%target;), (%newcounterposition;))>
<!ELEMENT setcountertrigger ((%target;), (%triggeridentifier;),
                             (%newcountervalue;?))>
<!ELEMENT setcursorposition ((%target;), (%xcursor;), (%ycursor;))>
<!ELEMENT setcursorshape ((%target;), (%newcursorshape;?))>
<!ELEMENT setdata ((%target;), (%newcontent;?))>
<!ELEMENT setentrypoint ((%target;), (%newentrypoint;))>
<!ELEMENT setfillcolour ((%target;), (%newcolour;))>
<!ELEMENT setfirstitem ((%target;), (%newfirstitem;))>
<!ELEMENT setfontref ((%target;), (%newfont;))>
<!ELEMENT sethighlightstatus ((%target;), (%newhighlightstatus;))>
<!ELEMENT setinteractionstatus ((%target;), (%newinteractionstatus;))>
<!ELEMENT setlabel ((%target;), (%newlabel;))>
<!ELEMENT setlinecolour ((%target;), (%newcolour;))>
<!ELEMENT setlinestyle ((%target;), (%newlinestyle;))>
<!ELEMENT setlinewidth ((%target;), (%newlinewidth;))>
<!ELEMENT setoverwritemode ((%target;), (%newoverwritemode;))>
<!ELEMENT setpaletteref ((%target;), (%newpaletteref;))>
<!ELEMENT setportion ((%target;), (%newportion;))>
<!ELEMENT setposition ((%target;), (%newxposition;), (%newyposition;))>
<!ELEMENT setslidervalue ((%target;), (%newslidervalue;))>
<!ELEMENT setspeed ((%target;), (%newspeed;))>
<!ELEMENT settimer ((%target;), (%timerid;), (%timervalue;)?,
                    absolutetime?)>
<!ELEMENT settransparency ((%target;), (%newtransparency;))>
<!ELEMENT setvariable ((%target;), (%newvariablevalue;))>
<!ELEMENT setvolume ((%target;), (%newvolume;))>

```