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Technical Specification

Digital Audio Broadcasting (DAB); XML Specification for DAB Electronic Programme Guide (EPG)

European Broadcasting Union



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DAB
Digital Audio Broadcasting



Reference

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Foreword

This Technical Specification (TS) has been produced by Joint Technical Committee (JTC) Broadcast of the European Broadcasting Union (EBU), Comité Européen de Normalisation ELECTrotechnique (CENELEC) and the European Telecommunications Standards Institute (ETSI).

NOTE: The EBU/ETSI JTC Broadcast was established in 1990 to co-ordinate the drafting of standards in the specific field of broadcasting and related fields. Since 1995 the JTC Broadcast became a tripartite body by including in the Memorandum of Understanding also CENELEC, which is responsible for the standardization of radio and television receivers. The EBU is a professional association of broadcasting organizations whose work includes the co-ordination of its members' activities in the technical, legal, programme-making and programme-exchange domains. The EBU has active members in about 60 countries in the European broadcasting area; its headquarters is in Geneva.

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The Eureka Project 147 was established in 1987, with funding from the European Commission, to develop a system for the broadcasting of audio and data to fixed, portable or mobile receivers. Their work resulted in the publication of European Standard, EN 300 401 [18], for DAB (see note) which now has worldwide acceptance. The members of the Eureka Project 147 are drawn from broadcasting organizations and telecommunication providers together with companies from the professional and consumer electronics industry.

NOTE: DAB is a registered trademark owned by one of the Eureka Project 147 partners.

1 Scope

The present document defines the XML schema data model for an Electronic Programme Guide (EPG) for Eureka-147 Digital Audio Broadcasting (DAB) [18]. Within the present document the term "DAB" is used to refer to the Eureka-147 Digital Audio Broadcasting standard. It is envisaged that this data format could be used both for transmitting schedule data to EPG applications on receivers and as the basis for exchanging information between broadcasters, network operators and content providers.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication and/or edition number or version number) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies.

Referenced documents which are not found to be publicly available in the expected location might be found at <http://docbox.etsi.org/Reference>.

- [1] TV-Anytime Forum: "TV-Anytime Specification Series: S4 on: Content Referencing".
- [2] ISO 8601: "Data elements and interchange formats - Information interchange - Representation of dates and times".
- [3] IETF RFC 2396: "Uniform Resource Identifiers (URI): Generic Syntax".
- [4] WAP Forum: "Wireless Application Protocol; Wireless Markup Language Specification".
- [5] W3C: "Extensible Markup Language (XML) 1.0 (Second Edition)".
- [6] IETF RFC 2045: "Multipurpose Internet Mail Extensions (MIME) Part One: Format of Internet Message Bodies".
- [7] IETF RFC 1766: "Tags for the Identification of Languages".
- [8] PNG Development Group "PNG (Portable Network Graphics) Specification, Version 1.1".
- [9] IETF RFC 2806: "URLs for Telephone Calls".
- [10] IETF RFC 3191: "Minimal GSTN address format in Internet Mail".
- [11] IETF RFC 2368: "The mailto URL scheme".
- [12] WAP Forum: "Wireless Application Protocol; Wireless Application Environment Specification Version 1.1".
- [13] ISO 3166-1: "Codes for the representation of names of countries and their subdivisions - Part 1: Country codes".
- [14] IETF RFC 2046: "Multipurpose Internet Mail Extensions (MIME) Part Two: Media Types".
- [15] IETF RFC 2048: "Multipurpose Internet Mail Extensions (MIME) Part Four: Registration Procedures".
- [16] ISO/IEC 11172-3 (1993): "Information technology - Coding of moving pictures and associated audio for digital storage media at up to about 1,5 Mbit/s - Part 3: Audio".

- [17] ISO/IEC 13818-3 (1998): "Information technology - Generic coding of moving pictures and associated audio information - Part 3: Audio".
- [18] ETSI EN 300 401 (V1.3.2): "Radio Broadcasting Systems; Digital Audio Broadcasting (DAB) to mobile, portable and fixed receivers".
- [19] ISO 10646-1: "Information technology - Universal Multiple-Octet Coded Character Set (UCS) - Part 1: Architecture and Basic Multilingual Plane".
- [20] ISO 8859-2: "Information technology - 8-bit single-byte coded graphic character sets - Part 2: Latin alphabet No. 2".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply:

Conditional Access (CA): mechanism by which the user access to service components can be restricted

data service: service which comprises a non-audio primary service component and optionally secondary service components

ensemble: transmitted signal, comprising a set of regularly and closely-spaced orthogonal carriers

NOTE: The ensemble is the entity that is received and processed. In general, it contains audio and data services.

Ensemble Identifier (EId): unique 16-bit code, allocated to an ensemble and intended to allow unambiguous worldwide identification of that ensemble

Extended Programme Associated Data (X-PAD): extended part of the PAD carried towards the end of the DAB audio frame, immediately before the Scale Factor Cyclic Redundancy Check (CRC). Its length is variable

Programme Associated Data (PAD): information that is related to the audio data in terms of contents and synchronization

NOTE: The PAD field is located at the end of the DAB audio frame.

secondary service component: In the case where a service contains more than the primary service component, the additional service components are secondary service components.

service: In the present document the term "service" is used to refer to a "radio station" such as BBC Radio 4 or Oneword. In strict DAB terms this is actually a service component of a service.

service component: part of a service which carries either audio (including PAD) or data

NOTE: The service components of a given service are linked together by the Multiplex Configuration Information. Each service component is carried either in a sub-channel or in the Fast Information Data Channel.

Service Identifier (SId): 16- or 32-bit code used to identify a particular service

3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

CA	Conditional Access
CRID	Content Reference ID
DAB	Digital Audio Broadcasting
DNS	Domain Name Server
DRM	Digital Radio Mondiale

EId	Ensemble Identifier
EPG	Electronic Programme Guide
IANA	Internet Assigned Numbers Authority
ISO	International Organization for Standardization
MIME	Multipurpose Internet Mail Extensions
MOT	Multimedia Object Transfer
PAD	Programme Associated Data
PNG	Portable Network Graphics
SCIdS	Service Component Identifier within the Service
SDARS	Satellite Digital Audio Radios
SI	Service Information
SId	Service Identifier
SMS	Short Messaging Service
UATy	User Application Type
URI	Uniform Resource Identifier
URL	Uniform Resource Location
UTC	Co-ordinated Universal Time
WAP	Wireless Access Protocol
WBMP	Wireless Bitmap
WWW	World Wide Web
XML	Extensible Markup Language
X-PAD	eXtended Programme Associated Data

4 Introduction

It is intended that the EPG will be used to provide programme listings information for both audio and data services and as a mechanism for the user to select services, programmes and related content. A key requirement is that the EPG must work on a range of receivers with differing display capabilities, resources and back-channel capabilities. To achieve this a flexible structure has been defined, as shown in figure 1. The EPG data is broken down into service information (ensembles and services) and programme information (schedules, programmes, groups and events). Additionally programmes and events can be linked together into groups (e.g. for grouping programmes together into serials or series).

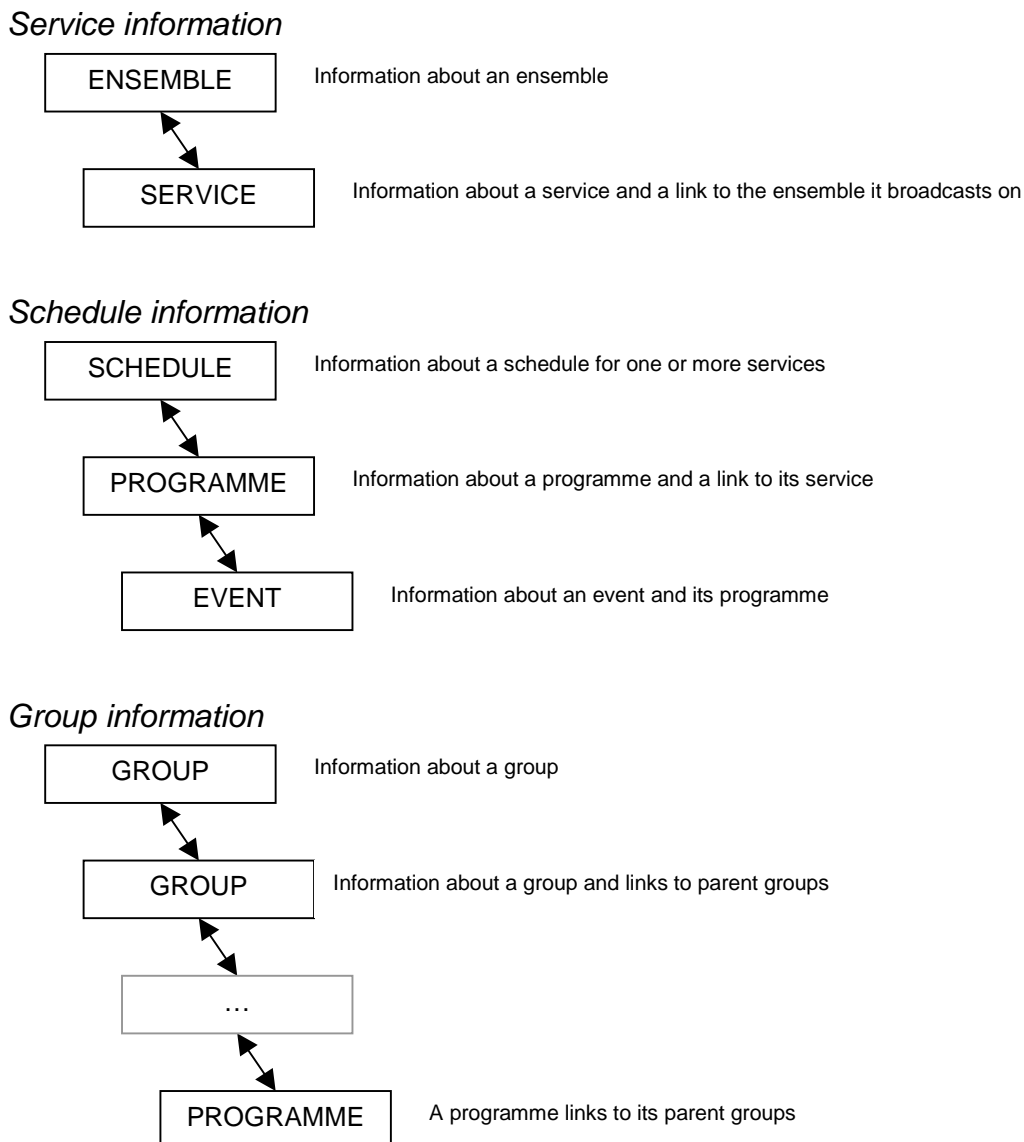


Figure 1

4.1 Document structure

The EPG specification is split into 3 schemas:

- Common data types - epgDataTypes_10.xsd.
- Schedules - epgSchedule_10.xsd.
- Service information - epgSI_10.xsd.

The present document is therefore also split into three clauses with the schemas in annexes at the end of the document. Each clause defines and describes each of the entities, elements and attributes in the respective schema.

NOTE: Some of the examples use the representation "..." to indicate possible child elements, this is not valid XML.

4.2 XML information

4.2.1 Why XML?

Standards: XML is a well-established standard for describing structured information.

Future expandability and backwards-compatibility: An appropriately designed XML application can be expanded in the future without breaking any previous systems. This is particularly important in this case where we are trying to develop a specification that will be used in a large number of applications, some of which are unknown at this point in time.

Use of existing tools: Many applications and APIs already exist for manipulating XML and these would be useful in creating/editing content and writing robust software utilizing EPG documents.

4.2.2 Character encoding

The ISO 10646 character set using UTF-8 character encoding must be used in all DAB EPG XML documents where applicable. The ISO 10646 character set contains all characters of the DAB character sets (three EBU Latin-based sets, ISO 8859-2 [20] and ISO 10646-1 [19] using UTF-8).

4.3 Examples

To give an idea of what can be done with this XML definition some simple and complex examples are shown in clauses 4.3.1 to 4.3.3.

4.3.1 Schedule

Schedule information describes a schedule and its programmes on one or more services for a defined time period. Programmes can also include programme events.

```
<?xml version="1.0" encoding="UTF-8"?>
<epg xmlns:epg="http://www.worlddab.org/schemas/epg"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://www.worlddab.org/schemas/epg epgSchedule_10.xsd" system="DAB">

  <schedule version="1" creationTime="2001-02-28T00:00:00" originator="BBC">
    <scope startTime="2001-03-01T00:00:00" stopTime="2001-03-02T18:00:00">
      <serviceScope id="e1.c221.0"/>
      <serviceScope id="e1.ce15.c224.0"/>
    </scope>

    <!-- Comprehensive example -->
    <programme id="crid://www.bbc.co.uk;dab/BC81123456"
      version="1"
      recommendation="yes"
      bitrate="160">
      <epg:mediumName xml:lang="en">Gilles Peterson</epg:mediumName>
      <epg:longName xml:lang="en">Gilles Peterson: Worldwide</epg:longName>
      <epg:location>
        <epg:time time="2001-03-01T00:00:00"
          duration="PT2H"
          actualTime="2001-03-01T00:00:03"
          actualDuration="PT1H55M"/>
        <epg:bearer id="e1.ce15.c221.0" trigger="c2213ac1"/>
      </epg:location>
      <epg:mediaDescription>
        <epg:shortDescription xml:lang="en">Worldwide: Global beats.</epg:shortDescription>
      </epg:mediaDescription>
      <epg:mediaDescription>
```

```

    <epg:longDescription xml:lang="en">Worldwide: Music from the back room of Club Radio
    1, with chilled global beats.</epg:longDescription>
</epg:mediaDescription>
<epg:mediaDescription>
    <epg:multimedia mimeType="image/png" url="dab://e1.ce15.c229.0/images/r1logo.png"/>
</epg:mediaDescription>
<epg:genre>pty15</epg:genre>
<epg:parentalRating minimumAge="12" country="UK"/>
<epg:keywords xml:lang="en">music,dance,hip-hop,jazz,soul</epg:keywords>
<epg:memberOf id="crid://www.bbc.co.uk;dab/Worldwide_Series" index="206"/>
<epg:link url="http://www.bbc.co.uk/radio1/urban/peterson_tracklistings_archive.shtml"
    mimeType="text/shtml"
    xml:lang="en"
    description="Track listing"
    expiryTime="2002-01-01T00:00:00"/>
<epg:link url="mailto:gilles.peterson@bbc.co.uk"/>

<epg:programmeEvent id="crid://www.bbc.co.uk;dab/BC81123456a" recommendation="yes">
    <epg:shortName xml:lang="en">Herbert</epg:shortName>
    <epg:mediumName xml:lang="en">Herbert Live</epg:mediumName>
    <epg:longName xml:lang="en">Live session from Herbert</epg:longName>
    <epg:location>
        <epg:time time="2001-03-01T00:45:00" duration="PT15M"/>
    </epg:location>
    <epg:mediaDescription>
        <epg:shortDescription xml:lang="en">Live session from Herbert, recorded at Cargo
        on 24/2/01</epg:shortDescription>
    </epg:mediaDescription>
    </epg:programmeEvent>
</programme>

<!-- Minimum example -->
<programme>
    <epg:mediumName xml:lang="en">PM Magazine</epg:mediumName>
    <epg:location>
        <epg:time time="2001-03-02T17:00:00" duration="PT1H"/>
    </epg:location>
</programme>
</schedule>
</epg>

```

4.3.2 Group information

Group information allows programmes to be put into groups. These may be series, serials or just general themes. A hierarchical approach also allows groups to belong to other groups.

NOTE: This example defines the group that is pointed to by the first programme in the previous example. This group also belongs to another group, 'Radio1_Series' that is not defined here.

```

<?xml version="1.0" encoding="UTF-8"?>
<epg xmlns:epg="http://www.worlddab.org/schemas/epg"
    xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
    xsi:schemaLocation="http://www.worlddab.org/schemas/epg epgSchedule_10.xsd" system="DAB">

    <programmeGroups version="1" creationTime="2001-02-28T00:00:00" originator="BBC">
        <programmeGroup id="crid://www.bbc.co.uk;dab/Worldwide_Series"
            version="1"
            type="show"
            numOfItems="206">
            <epg:mediumName xml:lang="en">Gilles Peterson</epg:mediumName>
            <epg:longName xml:lang="en">Gilles Peterson: Worldwide</epg:longName>
            <mediaDescription>
                <epg:shortDescription xml:lang="en">Worldwide: Global beats.</epg:shortDescription>
            </mediaDescription>
            <mediaDescription>
                <epg:longDescription xml:lang="en">Worldwide: Music from the back room of Club Radio
                1.</epg:longDescription>
            </mediaDescription>
            <genre>pty15</genre>
            <memberOf id="crid://www.bbc.co.uk;dab/Radio1_Series"/>
        </programmeGroup>
    </programmeGroups>
</epg>

```

4.3.3 Service information

Service information includes the structure of and information about the multiplex and its associated services.

```
<?xml version="1.0" encoding="UTF-8"?>
<serviceInformation xmlns:epg="http://www.worlddab.org/schemas/epg"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://www.worlddab.org/schemas/epg epgSI_10.xsd"
  version="1"
  creationTime="2001-02-28T00:00:00"
  originator="BBC"
  serviceProvider="BBC"
  system="DAB">

  <!-- Comprehensive example -->
  <ensemble id="e1.ce15">
    <epg:shortName xml:lang="en">BBC</epg:shortName>
    <epg:mediumName xml:lang="en">BBC National</epg:mediumName>
    <frequency type="primary" kHz="225648"/>
    <mediaDescription>
      <epg:shortDescription xml:lang="en">Digital Radio from the BBC</epg:shortDescription>
    </mediaDescription>
    <mediaDescription>
      <epg:multimedia mimeType="image/png" url="dab://e1.ce15.c229.0/images/bbclogo.png"/>
    </mediaDescription>
    <mediaDescription>
      <epg:multimedia mimeType="image/png"
        url="http://www.bbc.co.uk/radio/bbclogo_large.png"/>
    </mediaDescription>
    <parentalRating minimumAge="0" country="UK"/>
    <CA type="none"/>
    <keywords xml:lang="en">Radio1, Radio2, Radio3, Radio4, Radio5, Live</keywords>
    <link url="http://www.bbc.co.uk/radio/"
      mimeType="text/html"
      description="BBC Radio homepage"/>

    <service format="audio" bitrate="160" version="1">
      <serviceID id="e1.ce15.c221.0" type="primary"/>
      <epg:shortName xml:lang="en">Radio 1</epg:shortName>
      <epg:mediumName xml:lang="en">BBC Radio 1</epg:mediumName>
      <mediaDescription>
        <epg:shortDescription xml:lang="en">Rock and pop music from the
          BBC.</epg:shortDescription>
      </mediaDescription>
      <mediaDescription>
        <epg:multimedia mimeType="image/png" url="dab://e1.ce15.c229.0/images/r1logo.png"/>
      </mediaDescription>
      <genre>pty10</genre>
      <epgLanguage xml:lang="en"/>
      <parentalRating minimumAge="0" country="UK"/>
      <keywords xml:lang="en"> music, pop, rock, dance, hip-hop, soul </keywords>
      <link url="http://www.bbc.co.uk/radio1/" mimeType="text/html" xml:lang="en"/>
    </service>
  </ensemble>

  <!-- Minimum example -->
  <ensemble id="e1.ce15">
    <epg:shortName xml:lang="en">BBC</epg:shortName>
    <epg:mediumName xml:lang="en">BBC National</epg:mediumName>
    <service>
      <serviceID id="e1.ce15.c221.0"/>
      <epg:shortName xml:lang="en">Radio 1</epg:shortName>
      <epg:mediumName xml:lang="en">BBC Radio 1</epg:mediumName>
    </service>
    <service>
      <serviceID id="e1.ce15.c222.0"/>
      <epg:shortName xml:lang="en">BBCR2 </epg:shortName>
      <epg:mediumName xml:lang="en">BBC Radio 2</epg:mediumName>
    </service>
    <service>
      <serviceID id="e1.ce15.c223.0"/>
      <epg:shortName xml:lang="en">BBCR3</epg:shortName>
      <epg:mediumName xml:lang="en">BBC Radio 3</epg:mediumName>
    </service>
    <service>
      <serviceID id="e1.ce15.c224.0"/>
    </service>
  </ensemble>

```

```

    <epg:shortName xml:lang="en">BCCR4</epg:shortName>
    <epg:mediumName xml:lang="en">BBC Radio 4</epg:mediumName>
  </service>
  <service>
    <serviceID id="e1.ce15.c225.0"/>
    <epg:shortName xml:lang="en">BBC5L</epg:shortName>
    <epg:mediumName xml:lang="en">BBC Radio Five Live</epg:mediumName>
  </service>
</ensemble>
</serviceInformation>

```

5 Common data types

This clause describes common data types (simple and complex types) that are used throughout this XML specification.

5.1 Text

Any text sections in attributes or elements should be careful to avoid using any of the reserved XML characters:

- & < > " '

These characters should be encoded using the predefined entity references (& < > " ') or enclosed in a CDATA section (e.g. <![CDATA[Some text including an &]]>).

5.2 Schema simple types

5.2.1 basicDurationType

```

<!-- ##### -->
<!-- Definition of basicDurationType -->
<!-- ##### -->
<xs:simpleType name="basicDurationType">
  <xs:restriction base="xs:string">
    <xs:whiteSpace value="collapse"/>
    <xs:pattern value="\-?P(\d+D)?(T(\d+H)?(\d+M)?(\d+S)?(\d+N)?(\d{2}f)?)(\d+F)?((\+|\+)\d{2}:\d{2}Z)?" />
  </xs:restriction>
</xs:simpleType>

```

See durationType in clause 5.2.6.

5.2.2 basicTimePointType

```

<!-- ##### -->
<!-- Definition of basicTimePointType -->
<!-- ##### -->
<xs:simpleType name="basicTimePointType">
  <xs:restriction base="xs:string">
    <xs:whiteSpace value="collapse"/>
    <xs:pattern value="\-?(\d+(\-\d{2})(\-\d{2})?)?)?(T\d{2}(:\d{2}(:\d{2}(\:\d+(\.\d{2})?)?)?)?(F\d+)?((\+|\+)\d{2}:\d{2})|Z)?" />
  </xs:restriction>
</xs:simpleType>

```

See timePointType in clause 5.2.15.

5.2.3 broadcastType

```
<!-- ##### -->
<!-- Definition of broadcastType-->
<!-- ##### -->
<xs:simpleType name="broadcastType">
  <xs:restriction base="xs:NMTOKEN">
    <xs:enumeration value="on-air"/>
    <xs:enumeration value="off-air"/>
  </xs:restriction>
</xs:simpleType>
```

This indicates, for the duration of this programme or event, whether the parent service is being broadcast (i.e. 'on-air') or not (i.e. 'off-air'). At times when a service is not being broadcast the broadcaster can use this facility to include 'dummy' EPG entries that promote the service.

5.2.4 CRIDType

```
<!-- ##### -->
<!-- Definition of CRIDType -->
<!-- ##### -->
<simpleType name="CRIDType">
  <restriction base="xs:anyURI">
    <whiteSpace value="collapse"/>
    <pattern value="(c|C)(r|R)(i|I)(d|D)://.*"/>
  </restriction>
</simpleType>
```

A unique identifier for a programme, programme event or programme group in the format of a Content Reference ID as defined in the TV-Anytime specification [1]. This CRID (Content Reference ID) should be in the form of *crid://<authority>/<data>*. Where <authority> is a registered Internet domain name that the CRID author has permission to use. This domain name can be followed by an optional path (beginning with a ';' character) to allow multiple authorities to use the same DNS name (<DNS name><name_extension>), for example, www.bbc.co.uk;dab. The <authority> string is case insensitive. <data> is a free format string (URI compliant and case insensitive) that is meaningful to the given authority and should uniquely identify the content within that authority.

E.g.

```
crid://www.bbc.co.uk;dab/BC811200000256129
crid://broadcaster.co.uk/foobar
```

5.2.5 dabIDType

```
<!-- ##### -->
<!-- Definition of dabIDType-->
<!-- ##### -->
<xs:simpleType name="dabIDType">
  <xs:restriction base="xs:string">
    <xs:whiteSpace value="collapse"/>
    <xs:pattern value="[0-9a-fA-F]{1,2}\.([0-9a-fA-F]{1,4}\.)*[0-9a-fA-F]{1,8}\.[0-9a-fA-F]{1}" />
  </xs:restriction>
</xs:simpleType>
```

This is used to identify elements of the DAB ensemble. It should be a string of the form; <ECC>.<EId>.<Sid>.<SCIDs> in hex (see note). The Eureka-147 ensemble identifier (<EId>) is optional. This allows identical services (given identical service IDs) in different ensembles to be addressed.

NOTE: ECC = Extended Country Code, EId = Ensemble ID, Sid = Service ID, SCIDs = Service component ID within Service.

E.g.

```
e1.ce15.c221.0
e1.c224.0
```

5.2.6 durationType

```
<!-- ##### -->
<!-- Definition of durationType -->
<!-- ##### -->
<xs:simpleType name="durationType">
  <xs:restriction base="basicDurationType">
    <xs:whiteSpace value="collapse"/>
    <xs:pattern value="\-?P(\d+D)?(T(\d+H)?(\d+M)?(\d+S)?(\d+N)?)?(\d+F)?((\+|\+)\d{2}:\d{2}Z)?"/>
  </xs:restriction>
</xs:simpleType>
```

Duration is based on the ISO 8601 extended format [2]: PnYnMnDTnHnMnS, where "nY" represents the number of years, "nM" the number of months, "nD" the number of days, "T" is the date/time separator, "nH" the number of hours, "nM" the number of minutes and "nS" the number of seconds. The values of the Year, Month, Day, Hour, Minutes and Seconds components are not restricted but allow an arbitrary integer. Reduced precision and truncated representations of this format are allowed provided they conform to the following:

The lowest order items may be omitted. If omitted their value is assumed to be zero.

If the number of years, months, days, hours, minutes or seconds in any expression equals zero, the number and its corresponding designator may be omitted. However, at least one number and its designator must be present.

The designator "T" shall be absent if all of the time items (i.e. hours/minutes/seconds) are absent. The designator "P" must always be present.

E.g.

```
P1DT2H
PT2H30M
PT15M
```

5.2.7 ensembleIDType

```
<!-- ##### -->
<!-- Definition of ensembleIDType -->
<!-- ##### -->
<xs:simpleType name="ensembleIDType">
  <xs:restriction base="xs:string">
    <xs:whiteSpace value="collapse"/>
    <xs:pattern value="[0-9a-fA-F]{1,2}\.[0-9a-fA-F]{1,4}"/>
  </xs:restriction>
</xs:simpleType>
```

This is a string in the form <ECC.EId> in hex representing the Ensemble Identifier as defined in Eureka-147.

E.g.

```
e1.ce15
```

5.2.8 genreType

```

<!-- ##### -->
<!-- Definition of genreType -->
<!-- ##### -->
<xs:simpleType name="genreType">
  <xs:restriction base="xs:string">
    <xs:whiteSpace value="collapse"/>
    <xs:enumeration value="pty00"/>
    <xs:enumeration value="pty01"/>
    <xs:enumeration value="pty02"/>
    <xs:enumeration value="pty03"/>
    <xs:enumeration value="pty04"/>
    <xs:enumeration value="pty05"/>
    <xs:enumeration value="pty06"/>
    <xs:enumeration value="pty07"/>
    <xs:enumeration value="pty08"/>
    <xs:enumeration value="pty09"/>
    <xs:enumeration value="pty10"/>
    <xs:enumeration value="pty11"/>
    <xs:enumeration value="pty12"/>
    <xs:enumeration value="pty13"/>
    <xs:enumeration value="pty14"/>
    <xs:enumeration value="pty15"/>
    <xs:enumeration value="pty16"/>
    <xs:enumeration value="pty17"/>
    <xs:enumeration value="pty18"/>
    <xs:enumeration value="pty19"/>
    <xs:enumeration value="pty20"/>
    <xs:enumeration value="pty21"/>
    <xs:enumeration value="pty22"/>
    <xs:enumeration value="pty23"/>
    <xs:enumeration value="pty24"/>
    <xs:enumeration value="pty25"/>
    <xs:enumeration value="pty26"/>
    <xs:enumeration value="pty27"/>
    <xs:enumeration value="pty28"/>
    <xs:enumeration value="pty29"/>
  </xs:restriction>
</xs:simpleType>

```

This indicates the genre of a programme or service, audio or data. The genre is the DAB Programme Type (Pty) code and its use is restricted to the values shown above.

E.g.

pty15

5.2.9 mimeType

```

<!-- ##### -->
<!-- Definition of mimeType (Multipurpose Internet Mail Extension) -->
<!-- ##### -->
<xs:simpleType name="mimeType">
  <xs:restriction base="xs:string">
    <xs:whiteSpace value="collapse"/>
    <xs:pattern value="([!-\.\0-~]{1,}/[!-\.\0-~]{1,})+/">
  </xs:restriction>
</xs:simpleType>

```

This indicates the MIME type [6] of some data and must be used where it is applicable. The registered list of MIME types is available from the IANA list of Mime Types [14], [15]. However, an application is permitted to use values not in this list as long as they conform to the requirements set out in IETF RFC 2046 [14]. For example, an application may use the a private MIME type "application/x-myapplication", even if this is not a registered MIME type.

E.g.

text/shtml

5.2.10 originatorType

```
<!-- ##### -->
<!-- Definition of originatorType -->
<!-- ##### -->
<xs:simpleType name="originatorType">
  <xs:restriction base="xs:string">
    <xs:maxLength value="128"/>
  </xs:restriction>
</xs:simpleType>
```

This is used to indicate the originator of an EPG schedule.

5.2.11 recommendationType

```
<!-- ##### -->
<!-- Definition of recommendationType-->
<!-- ##### -->
<xs:simpleType name="recommendationType">
  <xs:restriction base="xs:NMTOKEN">
    <xs:enumeration value="yes"/>
    <xs:enumeration value="no"/>
  </xs:restriction>
</xs:simpleType>
```

This is used by the broadcaster to indicate a recommended programme or programme event.

5.2.12 regionCode

```
<!-- ##### -->
<!-- Definition of regionCode -->
<!-- ##### -->
<xs:simpleType name="regionCode">
  <xs:restriction base="xs:string">
    <xs:whiteSpace value="collapse"/>
    <xs:pattern value="[a-zA-Z]{2}(-[a-zA-Z0-9]{1,3})?"/>
  </xs:restriction>
</xs:simpleType>
```

This specifies a country and is defined using a valid ISO 3166-1-Alpha-2 code (a two-letter code identifying a country defined in [13]).

5.2.13 serviceProviderType

```
<!-- ##### -->
<!-- Definition of serviceProviderType -->
<!-- ##### -->
<xs:simpleType name="serviceProviderType">
  <xs:restriction base="xs:string">
    <xs:maxLength value="128"/>
  </xs:restriction>
</xs:simpleType>
```

This is used to indicate the service provider of the services contained in an EPG schedule.

5.2.14 systemType

```
<!-- ##### -->
<!-- Definition of systemType-->
<!-- ##### -->
<xs:simpleType name="systemType">
  <xs:restriction base="xs:NMTOKEN">
    <xs:enumeration value="DAB"/>
  </xs:restriction>
</xs:simpleType>
```

This specifies the broadcast system that this EPG data supports. This may be extended in the future to include other systems in addition to DAB, e.g. Digital Radio Mondiale (DRM) or Satellite Digital Audio Radios (SDARS).

5.2.15 timePointType

```
<!-- ##### -->
<!-- Definition of timePointType -->
<!-- ##### -->
<xs:simpleType name="timePointType">
  <xs:restriction base="basicTimePointType">
    <xs:whiteSpace value="collapse"/>
    <xs:pattern value="(\-?\d+(\-\d{2}(\-\d{2}))?)?(T\d{2}(:\d{2}(:\d{2}(:\d+)?))?)?(F\d+)?(((\-\|\/)\d{2}:\d{2})|Z)?"/>
  </xs:restriction>
</xs:simpleType>
```

This is a time field in local time. It is based on the ISO 8601 extended format [2]: *YYYY-MM-DDThh:mm:ss* Where "YYYY" is the year, "MM" the month and "DD" the date. The letter "T" is the date/time separator and "hh", "mm" and "ss" represent the hour, minute and second respectively. To indicate the time zone, i.e. the difference between the local time and UTC, the difference immediately follows the time and consists of a sign, + or -, followed by hh:mm. If this is not present then the difference between local time and UTC is 0.

NOTE: For future compatibility the representation may be immediately followed by a "Z" to indicate Co-ordinated Universal Time (UTC).

E.g.

2001-06-07T15:05:00+01:00

2001-02-03T23:00:00

5.2.16 triggerType

```
<!-- ##### -->
<!-- Definition of triggerType -->
<!-- ##### -->
<xs:simpleType name="triggerType">
  <xs:restriction base="xs:string">
    <xs:whiteSpace value="collapse"/>
    <xs:pattern value="[0-9a-fA-F]{8}"/>
  </xs:restriction>
</xs:simpleType>
```

This represents a trigger found in the broadcast stream that indicates when a programme is being broadcast. For the purposes of this specification this is the two SID and two Pnum bytes from the DAB FIG0/16 Programme Number. The triggerType requires a complete set of 8 hexadecimal characters. Hence, in some cases leading zeros will be required as place-holders.

E.g.

c2213ac1
0b74ff10

5.2.17 urlType

```
<!-- ##### -->
<!-- Definition of urlType-->
<!-- ##### -->
<xs:simpleType name="urlType">
  <xs:restriction base="xs:anyURI">
    <xs:whiteSpace value="collapse"/>
    <xs:pattern value="(crId|CRID|tel|mailto|postal|http|dab):(//|\+|SMS=)?([a-zA-Z0-9]|\.\|@|\%|\-|\_|_|\\|\+|\?|=|;){1,}"/>
  </xs:restriction>
</xs:simpleType>
```

This is a string describing the address and protocol of a resource in the URL format defined in [3]. Where URL schemes have previously been defined these should be used. The following schemes are supported in this version:

- *Telephone and fax*: Defined in IETF RFC 2806 [9].
- *SMS*: Address defined using IETF RFC 3191 [10] combined with the protocol defined in IETF RFC 2368 [11].

- *Postal addresses*: Defined in Appendix 1 - URL for postal addresses.
- *Email*: Defined in IETF RFC 2368 [11].
- *WWW and WAP*: Defined in IETF RFC 2396 [3] [4].
- *DAB*: Defined in Appendix 2 - URL for DAB addressing.
- *Programme*: A CRID as defined in clause 5.2.1

Note that this also defines the contents of a CRID (see clause 5.2.4). The 'CRID' prefix does not support mixed case, i.e. it must be either all lower-case or all upper-case.

E.g.

```
tel:+44-1737-839500
mailto:SMS=+44-7788-123456?body=more%20info
postal:Kingswood%20Warren/Tadworth/Surrey/KT20%206NP/United%20Kingdom/
mailto:gilles.peterson@bbc.co.uk
http://www.bbc.co.uk/
dab://e1.ce15.c221.0/data/logo.png
crid://www.bbc.co.uk;dab/BC81123456
```

5.3 Schema complex types

5.3.1 CAType

```
<!-- ##### -->
<!-- Definition of CAType -->
<!-- ##### -->
<xs:complexType name="CAType">
  <xs:sequence>
    <xs:group ref="descriptionGroup"/>
    <xs:element name="link" type="linkType" minOccurs="0" maxOccurs="unbounded"/>
  </xs:sequence>
  <xs:attribute name="type" default="none">
    <xs:simpleType>
      <xs:restriction base="xs:NMTOKEN">
        <xs:enumeration value="unspecified"/>
        <xs:enumeration value="none"/>
      </xs:restriction>
    </xs:simpleType>
  </xs:attribute>
</xs:complexType>
```

This defines Conditional Access (CA) information. The "type" attribute indicates which CA system is in use (see note); "unspecified" indicates that an unspecified or proprietary CA system is in use and "none" explicitly states that no CA system is in use.

NOTE: There will be additions to this list when CA systems are defined and further information may also be added.

E.g.

```
<CA type="unspecified"/>
```

5.3.2 dabLanguageType

```
<!-- ##### -->
<!-- Definition of element dabLanguageType-->
<!-- ##### -->
<xs:complexType name="dabLanguageType">
  <xs:attribute ref="xml:lang" default="en"/>
</xs:complexType>
```

This indicates the language for an element. This is in the form of an `xml:lang` attribute [5] and [7].

E.g.

```
xml:lang="en"
```

5.3.3 keywordsType

```
<!-- ##### -->
<!-- Definition of keywordsType -->
<!-- ##### -->
<xs:complexType name="keywordsType">
  <xs:simpleContent>
    <xs:extension base="messageType">
      </xs:extension>
    </xs:simpleContent>
  </xs:complexType>
```

This contains a comma-separated list of keywords. The language attribute indicates the language of the keyword list and is in the form of an `xml:lang` attribute [5] and [7]. The keywords must be separated by commas. The comma-separated list may have leading and trailing spaces, but these are not considered to contain information.

E.g.

```
<keywords xml:lang="en">music, dance, hip-hop, jazz, soul</keywords>
```

5.3.4 linkType

```
<!-- ##### -->
<!-- Definition of linkType -->
<!-- ##### -->
<xs:complexType name="linkType">
  <xs:attribute name="url" type="dab:urlType" use="required"/>
  <xs:attribute name="mimeType" type="mimeType"/>
  <xs:attribute ref="xml:lang" default="en"/>
  <xs:attribute name="description">
    <xs:simpleType>
      <xs:restriction base="xs:string">
        <xs:maxLength value="180"/>
      </xs:restriction>
    </xs:simpleType>
  </xs:attribute>
  <xs:attribute name="expiryTime" type="timePointType"/>
</xs:complexType>
```

This is used to link to additional information or content. The "url" attribute gives the protocol and address of the link. The "mimeType" attribute indicates the MIME type [6] of any data linked to and must be used where it is applicable. The language attribute indicates the language of the descriptive information and is in the form of an `xml:lang` attribute [5] and [7]. The "description" attribute is used to describe the link. The "expiryTime" attribute indicates when a link will expire.

E.g.

```
<link url="http://www.bbc.co.uk/radio1/urban/peterson_tracklistings_archive.shtml"
  mimeType="text/shtml"
  xml:lang="en"
  description="Track listing"
  expiryTime="2001-07-09T23:59:59+01:00"
/>
```

5.3.5 locationType

```

<!-- ##### -->
<!-- Definition of locationType -->
<!-- ##### -->
<xs:complexType name="locationType">
  <xs:sequence>
    <xs:element name="time" maxOccurs="unbounded">
      <xs:complexType>
        <xs:attribute name="time" type="timePointType" use="required"/>
        <xs:attribute name="duration" type="durationType" use="required"/>
        <xs:attribute name="actualTime" type="timePointType"/>
        <xs:attribute name="actualDuration" type="durationType"/>
      </xs:complexType>
    </xs:element>
    <xs:element name="bearer" minOccurs="0" maxOccurs="unbounded">
      <xs:complexType>
        <xs:attribute name="id" type="dabIDType" use="required"/>
        <xs:attribute name="trigger" type="triggerType"/>
      </xs:complexType>
    </xs:element>
  </xs:sequence>
</xs:complexType>

```

This describes the time information and the location in the DAB channel of a programme. There may be:

- One time element and one bearer element.
- One time element and multiple bearer elements.
- One bearer element and multiple time elements.

"Multiple time elements and multiple bearer elements" is ambiguous and must not be used. If the EPG data service is associated with an audio service (i.e. PAD within DAB) and the "bearer" element is not present then the programme information relates to that associated audio service.

The "time" element describes the time information for a programme. The "time" attribute is the billed start time of the programme (i.e. the time advertised to the public for when the programme starts) and the "duration" attribute is the billed duration. The "actualTime" attribute is the actual start time of the programme and the "actualDuration" is the actual duration of the programme. For example, a programme may be billed to start at 18:00 and last 30 minutes but is actually scheduled to start at 18:03 after a 3 minute news bulletin, and will therefore last only 27 minutes.

NOTE: A programme starting at 18:00:00 with a duration of 30 minutes will finish at 18:30:00. The next programme in a contiguous sequence starts at 18:30:00.

The "bearer" element describes the location of a programme in the DAB channel.

E.g.

```

<location>
  <time time="2001-03-01T00:00:00"
        duration="P2H"
        actualTime="2001-03-01T00:00:03"
        actualDuration="P1H55M"/>
  <bearer id="e1.ce15.c221.0" trigger="c2213ac1"/>
</location>

```

5.3.6 longDescriptionType

```

<!-- ##### -->
<!-- Definition of longDescriptionType -->
<!-- ##### -->
<xs:complexType name="longDescriptionType">
  <xs:simpleContent>
    <xs:restriction base="messageType">
      <xs:maxLength value="1200"/>
    </xs:restriction>
  </xs:simpleContent>
</xs:complexType>

```

This element is a string that represents a long description.

5.3.7 longNameType

```
<!-- ##### -->
<!-- Definition of longNameType -->
<!-- ##### -->
<xs:complexType name="longNameType">
  <xs:simpleContent>
    <xs:restriction base="messageType">
      <xs:maxLength value="128"/>
    </xs:restriction>
  </xs:simpleContent>
</xs:complexType>
```

This element is a string that represents a long name.

5.3.8 mediaDescriptionType

```
<!-- ##### -->
<!-- Definition of mediaDescriptionType -->
<!-- ##### -->
<xs:complexType name="mediaDescriptionType">
  <xs:choice>
    <xs:group ref="descriptionGroup"/>
    <xs:element name="multimedia">
      <xs:complexType>
        <xs:attribute name="mimeType" type="mimeType" use="required"/>
        <xs:attribute ref="xml:lang" default="en"/>
        <xs:attribute name="url" type="urlType"/>
      </xs:complexType>
    </xs:element>
  </xs:choice>
</xs:complexType>
```

This element represents an aggregation of all other descriptive elements (text and multimedia). The "multimedia" element links to a multimedia resource for this element. The "mimeType" attribute indicates the MIME type of the resource. The language attribute indicates the language of the source information and is in the form of an xml:lang attribute [5] and [7]. The "url" attribute points to the multimedia resource.

It is recommended that receivers with graphical capabilities should support one or more of the following formats:

- Wireless Bitmap (WBMP): This format is suitable for small, monochrome images for display on receivers with limited displays. The minimum image specification supported by WBMP-compatible receivers should be 16x16 pixels [12].
- PNG v1.1: This format is suitable for colour images for display on more capable receivers. The minimum image specification supported by PNG-compatible receivers should be 32x32 pixels at a colour depth of 256 [8].

It is recommended that receivers with the capability to play audio files should support the following formats:

- The native "system" audio format. For DAB the native audio format is MPEG-1 audio layer II [16] and MPEG-2 audio layer II [17].
- MPEG-1 layer 3 audio playback.

E.g.

```
<mediaDescription>
  <shortDescription xml:lang="en">Rock and pop music from the BBC.</shortDescription>
  <multimedia mimeType="image/png" url="http://www.bbc.co.uk/radiol/r1logo.png"/>
</mediaDescription>
```

5.3.9 mediumNameType

```
<!-- ##### -->
<!-- Definition of mediumNameType -->
<!-- ##### -->
<xs:complexType name="mediumNameType">
  <xs:simpleContent>
    <xs:restriction base="messageType">
      <xs:maxLength value="16"/>
    </xs:restriction>
  </xs:simpleContent>
</xs:complexType>
```

This element is a string that represents a medium name.

5.3.10 memberOfType

```
<!-- ##### -->
<!-- Definition of memberOfType -->
<!-- ##### -->
<xs:complexType name="memberOfType">
  <xs:attribute name="id" type="CRIDType" use="required"/>
  <xs:attribute name="index" type="xs:positiveInteger" use="optional"/>
</xs:complexType>
```

This indicates which group this element belongs to. The "id" attribute refers to the id of a group element (see clause 5.2.4). The "index" attribute is an index for the item within the specified group. This would be used, for example, to specify an episode number for a programme in a series

E.g.

```
<memberOf id="crid://www.bbc.co.uk;dab/G123456" index="206"/>
```

5.3.11 messageType

```
<!-- ##### -->
<!-- Definition of messageType -->
<!-- ##### -->
<xs:complexType name="messageType" abstract="true">
  <xs:simpleContent>
    <xs:extension base="xs:string">
      <xs:attribute ref="xml:lang" use="optional" default="en"/>
    </xs:extension>
  </xs:simpleContent>
</xs:complexType>
```

This is an abstract element for textual elements that have an optional language attribute.

5.3.12 parentalRatingType

```
<!-- ##### -->
<!-- Definition of parentalRatingType -->
<!-- ##### -->
<xs:complexType name="parentalRatingType">
  <xs:attribute name="minimumAge" type="xs:nonNegativeInteger" use="required"/>
  <xs:attribute name="country" type="regionCode"/>
</xs:complexType>
```

This indicates the suggested parental rating of an element. The "minimumAge" attribute gives the suggested minimum age of listeners and the "country" attribute indicates the country for which the parental guidance description is specified. If not specified, the parental guidance applies worldwide.

E.g.

```
<parentalRating minimumAge="12" country="UK"/>
```

5.3.13 programmeType

```

<!-- ##### -->
<!-- Definition of programmeType -->
<!-- ##### -->
<xs:complexType name="programmeType">
  <xs:sequence>
    <xs:group ref="scheduleNameGroup" maxOccurs="unbounded"/>
    <xs:element name="location" type="locationType" maxOccurs="unbounded"/>
    <xs:element name="mediaDescription" type="mediaDescriptionType" minOccurs="0"
maxOccurs="unbounded"/>
    <xs:element name="genre" type="genreType" minOccurs="0" maxOccurs="unbounded"/>
    <xs:element name="parentalRating" type="parentalRatingType" minOccurs="0"/>
    <xs:element name="CA" type="CAType" minOccurs="0"/>
    <xs:element name="keywords" type="keywordsType" minOccurs="0"/>
    <xs:element name="memberOf" type="memberOfType" minOccurs="0" maxOccurs="unbounded"/>
    <xs:element name="link" type="linkType" minOccurs="0" maxOccurs="unbounded"/>
    <xs:element name="programmeEvent" minOccurs="0" maxOccurs="unbounded">
      <xs:complexType>
        <xs:sequence>
          <xs:group ref="scheduleNameGroup" maxOccurs="unbounded"/>
          <xs:element name="location" type="locationType" maxOccurs="unbounded"/>
          <xs:element name="mediaDescription" type="mediaDescriptionType" minOccurs="0"
maxOccurs="unbounded"/>
          <xs:element name="parentalRating" type="parentalRatingType" minOccurs="0"/>
          <xs:element name="CA" type="CAType" minOccurs="0"/>
          <xs:element name="keywords" type="keywordsType" minOccurs="0"/>
          <xs:element name="memberOf" type="memberOfType" minOccurs="0"
maxOccurs="unbounded"/>
          <xs:element name="link" type="linkType" minOccurs="0" maxOccurs="unbounded"/>
        </xs:sequence>
        <xs:attribute name="id" type="CRIDType"/>
        <xs:attribute name="version" type="xs:integer"/>
        <xs:attribute name="recommendation" type="recommendationType" default="no"/>
        <xs:attribute name="broadcast" type="broadcastType" default="on-air"/>
      </xs:complexType>
    </xs:element>
  </xs:sequence>
  <xs:attribute name="id" type="CRIDType"/>
  <xs:attribute name="version" type="xs:integer"/>
  <xs:attribute name="recommendation" type="recommendationType" default="no"/>
  <xs:attribute name="broadcast" type="broadcastType" default="on-air"/>
  <xs:attribute name="bitrate" type="xs:nonNegativeInteger"/>
</xs:complexType>

```

This is used to describe and locate a programme. The "bitrate" is only an indication of the bitrate of the programme and the actual value may differ from the one here. The 'broadcast' flag can be set to 'off-air' to generate 'dummy' programmes for when a service is not being broadcast, by default this flag is 'on-air' and should not be set.

The "programmeEvent" element describes an event within a programme, this can be used to break a programme into sections or to highlight particular sections of the programme.

NOTE: The recommended practice for describing repeated programmes is to have a programme element with more than one location element, each location element specifies one of the programme's instances in time (and/or service).

E.g.

```

<programme id="crid://www.bbc.co.uk;dab/BC81123456"
  version="1"
  recommendation="yes"
  bitrate="160">
  ...
</programme>

```


5.3.14 shortDescriptionType

```
<!-- ##### -->
<!-- Definition of shortDescriptionType -->
<!-- ##### -->
<xs:complexType name="shortDescriptionType">
  <xs:simpleContent>
    <xs:restriction base="messageType">
      <xs:maxLength value="180"/>
    </xs:restriction>
  </xs:simpleContent>
</xs:complexType>
```

This element is a string that represents a short description.

5.3.15 shortNameType

```
<!-- ##### -->
<!-- Definition of shortNameType -->
<!-- ##### -->
<xs:complexType name="shortNameType">
  <xs:simpleContent>
    <xs:restriction base="messageType">
      <xs:maxLength value="8"/>
    </xs:restriction>
  </xs:simpleContent>
</xs:complexType>
```

This element is a string that represents a short name.

5.4 Schema groups

5.4.1 descriptionGroup

```
<!-- ##### -->
<!-- Definition of descriptionGroup -->
<!-- ##### -->
<xs:group name="descriptionGroup">
  <xs:sequence>
    <xs:element name="shortDescription" type="shortDescriptionType" minOccurs="0"
      maxOccurs="unbounded"/>
    <xs:element name="longDescription" type="longDescriptionType" minOccurs="0"
      maxOccurs="unbounded"/>
  </xs:sequence>
</xs:group>
```

The represents shortDescription and/or longDescription elements.

5.4.2 scheduleNameGroup

```
<!-- ##### -->
<!-- Definition of scheduleNameGroup -->
<!-- ##### -->
<xs:group name="scheduleNameGroup">
  <xs:sequence>
    <xs:element name="shortName" type="shortNameType" minOccurs="0" maxOccurs="unbounded"/>
    <xs:element name="mediumName" type="mediumNameType" maxOccurs="unbounded"/>
    <xs:element name="longName" type="longNameType" minOccurs="0" maxOccurs="unbounded"/>
  </xs:sequence>
</xs:group>
```

This represents shortName, mediumName, and longName elements where mediumName must occur at least once.

5.4.3 serviceNameGroup

```
<!-- ##### -->
<!-- Definition of serviceNameGroup -->
<!-- ##### -->
<xs:group name="serviceNameGroup">
  <xs:sequence>
    <xs:element name="shortName" type="shortNameType" maxOccurs="unbounded"/>
    <xs:element name="mediumName" type="mediumNameType" maxOccurs="unbounded"/>
    <xs:element name="longName" type="longNameType" minOccurs="0" maxOccurs="unbounded"/>
  </xs:sequence>
</xs:group>
```

This represents shortName, mediumName, and longName elements where both shortName and mediumName must occur at least once.

6 Schedules

6.1 dabLanguage

```
<!-- ##### -->
<!-- Declaration of element dabLanguage -->
<!-- ##### -->
<xs:element name="dabLanguage" type="epg:dabLanguageType"/>
```

This defines the language of an element.

6.2 epg

```
<!-- ##### -->
<!-- Declaration of element epg -->
<!-- ##### -->
<xs:element name="epg">
  <xs:complexType>
    <xs:choice minOccurs="0" maxOccurs="unbounded">
      <xs:element name="programmeGroups" minOccurs="0" maxOccurs="unbounded">
        <xs:complexType>
          <xs:sequence>
            <xs:element name="programmeGroup" maxOccurs="unbounded">
              <xs:complexType>
                <xs:sequence>
                  <xs:group ref="epg:scheduleNameGroup" maxOccurs="unbounded"/>
                  <xs:element name="mediaDescription"
                    type="epg:mediaDescriptionType" minOccurs="0"
                    maxOccurs="unbounded"/>
                  <xs:element name="genre" type="epg:genreType" minOccurs="0"/>
                  <xs:element name="memberOf" type="epg:memberOfType"
                    minOccurs="0" maxOccurs="unbounded"/>
                </xs:sequence>
              <xs:attribute name="id" type="epg:CRIDType" use="required"/>
              <xs:attribute name="version" type="xs:integer"/>
              <xs:attribute name="type">
                <xs:simpleType>
                  <xs:restriction base="xs:NMTOKEN">
                    <xs:enumeration value="series"/>
                    <xs:enumeration value="show"/>
                    <xs:enumeration value="programConcept"/>
                    <xs:enumeration value="magazine"/>
                    <xs:enumeration value="programCompilation"/>
                    <xs:enumeration value="otherCollection"/>
                    <xs:enumeration value="otherChoice"/>
                    <xs:enumeration value="topic"/>
                  </xs:restriction>
                </xs:simpleType>
              </xs:attribute>
              <xs:attribute name="numOfItems" type="xs:positiveInteger"/>
            </xs:element>
          </xs:sequence>
        </xs:complexType>
      </xs:element>
    </xs:choice>
  </xs:complexType>
</xs:element>
```

```

        <xs:attribute name="creationTime" type="epg:timePointType"/>
        <xs:attribute name="originator" type="epg:originatorType"/>
    </xs:complexType>
</xs:element>
<xs:element name="schedule" minOccurs="0" maxOccurs="unbounded">
    <xs:complexType>
        <xs:sequence>
            <xs:element name="scope" minOccurs="0">
                <xs:complexType>
                    <xs:sequence>
                        <xs:element name="serviceScope" minOccurs="0"
                            maxOccurs="unbounded">
                            <xs:complexType>
                                <xs:attribute name="id" type="epg:dabIDType"
                                    use="required"/>
                            </xs:complexType>
                        </xs:element>
                    </xs:sequence>
                    <xs:attribute name="startTime" type="epg:timePointType"
                        use="required"/>
                    <xs:attribute name="stopTime" type="epg:timePointType"
                        use="required"/>
                </xs:complexType>
            </xs:element>
            <xs:element name="programme" type="epg:programmeType"
                maxOccurs="unbounded"/>
        </xs:sequence>
        <xs:attribute name="version" type="xs:integer"/>
        <xs:attribute name="creationTime" type="epg:timePointType"/>
        <xs:attribute name="originator" type="epg:originatorType"/>
    </xs:complexType>
</xs:element>
<xs:element name="programme" type="epg:programmeType" minOccurs="0"
    maxOccurs="unbounded"/>
<xs:element name="alternateSource" minOccurs="0" maxOccurs="unbounded">
    <xs:complexType>
        <xs:attribute name="protocol" default="URL">
            <xs:simpleType>
                <xs:restriction base="xs:NMTOKEN">
                    <xs:enumeration value="DAB"/>
                    <xs:enumeration value="URL"/>
                </xs:restriction>
            </xs:simpleType>
        </xs:attribute>
        <xs:attribute name="type" default="identical">
            <xs:simpleType>
                <xs:restriction base="xs:NMTOKEN">
                    <xs:enumeration value="more"/>
                    <xs:enumeration value="less"/>
                    <xs:enumeration value="similar"/>
                    <xs:enumeration value="identical"/>
                </xs:restriction>
            </xs:simpleType>
        </xs:attribute>
        <xs:attribute name="url" type="epg:urlType" use="required"/>
    </xs:complexType>
</xs:element>
</xs:choice>
<xs:attribute name="system" type="epg:systemType" default="DAB"/>
</xs:complexType>
</xs:element>

```

The "epg" element is the root element of an EPG schedule. It may contain schedule, programme or group information elements in any order.

The "programmeGroups" element is used as a container for group elements. The "creationTime" attribute indicates the time at which this group was generated and the "originator" attribute is used to indicate the originator of the group.

The "programmeGroup" element is used to describe a grouping of programmes, programme events or other groups. The "numOfItems" is a positive integer field that indicates the total number of items in this group. The "type" attribute indicates the type of the grouping.

- series - an ordered or unordered collection of programmes that is shown in a sequence (e.g. "The News Quiz" season 1).
- show - a programme theme that is typically associated with a collection of series (e.g. all episodes of "The News Quiz")
- programConcept - the editorial concept for a programme from which specific programme versions have been derived (e.g. the concept of "Blood Runner" as opposed to "Blood Runner - The Director's Cut" as a specific version of that concept)
- magazine - a collection of individual programmes that are shown as a group because they are editorially coherent (e.g. a general sports programme with individual sub-programmes covering different events)
- topic - a collection of programmes on a particular topic or theme
- programCompilation - a collection of programmes that is used to allow segments from multiple programmes to be combined in segment groups.
- otherCollection - can be used for any group not defined in the preceding list where all members of the group should be acquired if the group is selected. For example, a group of channel highlights or recommendations.
- otherChoice - can be used for any group not defined in the list above where only one member of the group should be acquired if the group is selected

Programme, programmeEvent and group elements all point 'upwards' to their parent group/s using the memberOf element. The "numOfItems" attribute of a group element can be used by a client-side application to determine when all the items in a group have been found.

The "schedule" element allows programmes to be identified within a given time period. The "scope" element is used to indicate the time period covered by this schedule, from the billed start time of the first programme to the billed end time of the last programme. The "serviceScope" element is used to indicate the services covered by this schedule. The "time" data type indicates the time at which this schedule was generated and the "originator" attribute is used to indicate the originator of the schedule.

NOTE: For contiguous schedules the stop time of a schedule should be equal to the start time of the next schedule.

The "alternateSource" element is used to indicate whether this or related EPG data is available elsewhere. The "url" attribute identifies the location of this data and the "type" attribute indicates if there is more, less, equivalent or identical schedule information at the alternate location.

E.g.

```
<epg system=DAB">
  <groups version="1" creationTime="2001-02-28T00:00:00" originator="BBC">
    <group id="crid://www.bbc.co.uk;dab/WomansHour"
      version="1"
      type="magazine"
      numOfItems="5">
      ...
    </group>
  </groups>

  <schedule version="1" creationTime="2001-02-28T00:00:00" originator="BBC">
    <scope startTime="2001-03-01T00:00:00" stopTime="2001-03-02T00:00:00">
      <serviceScope id="e1.ce15.c221.0"/>
    </scope>
    ...
  </schedule>

  <alternateSource type="more" url="http://www.bbc.co.uk/whatson/radio4/xml/" />
</epg>
```

7 Service Information

7.1 serviceInformation

```

<xs:element name="serviceInformation">
  <xs:complexType>
    <xs:sequence>
      <xs:element name="ensemble" maxOccurs="unbounded">
        <xs:complexType>
          <xs:sequence>
            <xs:group ref="epg:serviceNameGroup" maxOccurs="unbounded"/>
            <xs:element name="frequency" minOccurs="0" maxOccurs="unbounded">
              <xs:complexType>
                <xs:attribute name="type" default="primary">
                  <xs:simpleType>
                    <xs:restriction base="xs:NMTOKEN">
                      <xs:enumeration value="primary"/>
                      <xs:enumeration value="alternative"/>
                    </xs:restriction>
                  </xs:simpleType>
                </xs:attribute>
                <xs:attribute name="kHz" type="xs:nonNegativeInteger"/>
              </xs:complexType>
            </xs:element>
            <xs:element name="mediaDescription" type="epg:mediaDescriptionType"
              minOccurs="0" maxOccurs="unbounded"/>
            <xs:element name="parentalRating" type="epg:parentalRatingType"
              minOccurs="0"/>
            <xs:element name="CA" type="epg:CAType" minOccurs="0"/>
            <xs:element name="keywords" type="epg:keywordsType" minOccurs="0"/>
            <xs:element name="link" type="epg:linkType" minOccurs="0"
              maxOccurs="unbounded"/>
            <xs:element name="service" minOccurs="0" maxOccurs="unbounded">
              <xs:complexType>
                <xs:sequence>
                  <xs:element name="serviceID" minOccurs="1" maxOccurs="unbounded">
                    <xs:complexType>
                      <xs:attribute name="id" type="epg:dabIDType"
                        use="required"/>
                      <xs:attribute name="type" default="primary">
                        <xs:simpleType>
                          <xs:restriction base="xs:NMTOKEN">
                            <xs:enumeration value="primary"/>
                            <xs:enumeration value="secondary"/>
                          </xs:restriction>
                        </xs:simpleType>
                      </xs:attribute>
                    </xs:complexType>
                  </xs:element>
                  <xs:group ref="epg:serviceNameGroup" maxOccurs="unbounded"/>
                  <xs:element name="mediaDescription"
                    type="epg:mediaDescriptionType" minOccurs="0"
                    maxOccurs="unbounded"/>
                  <xs:element name="genre" type="epg:genreType" minOccurs="0"
                    maxOccurs="unbounded"/>
                  <xs:element name="epgLanguage" type="epg:dabLanguageType"
                    minOccurs="0" maxOccurs="unbounded"/>
                  <xs:element name="parentalRating" type="epg:parentalRatingType"
                    minOccurs="0"/>
                  <xs:element name="CA" type="epg:CAType" minOccurs="0"/>
                  <xs:element name="keywords" type="epg:keywordsType"
                    minOccurs="0"/>
                  <xs:element name="link" type="epg:linkType" minOccurs="0"
                    maxOccurs="unbounded"/>
                </xs:sequence>
                <xs:attribute name="version" type="xs:integer"/>
                <xs:attribute name="format" default="audio">
                  <xs:simpleType>
                    <xs:restriction base="xs:NMTOKEN">
                      <xs:enumeration value="audio"/>
                      <xs:enumeration value="DLS"/>
                      <xs:enumeration value="MOTSlideshow"/>
                      <xs:enumeration value="MOTBWS"/>
                      <xs:enumeration value="TPEG"/>
                      <xs:enumeration value="DGPS"/>
                    </xs:restriction>
                  </xs:simpleType>
                </xs:element>
          </xs:sequence>
        </xs:complexType>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
</xs:element>

```

```

        <xs:enumeration value="proprietary"/>
      </xs:restriction>
    </xs:simpleType>
  </xs:attribute>
  <xs:attribute name="bitrate" type="xs:nonNegativeInteger"/>
</xs:complexType>
</xs:element>
</xs:sequence>
<xs:attribute name="id" type="epg:ensembleIDType" use="required"/>
<xs:attribute name="version" type="xs:integer"/>
</xs:complexType>
</xs:element>
</xs:sequence>
<xs:attribute name="version" type="xs:integer"/>
<xs:attribute name="creationTime" type="epg:timePointType"/>
<xs:attribute name="originator" type="epg:originatorType"/>
<xs:attribute name="serviceProvider" type="epg:serviceProviderType"/>
<xs:attribute name="system" type="epg:systemType" default="DAB"/>
</xs:complexType>
</xs:element>

```

The "serviceInformation" element is used as a container for ensemble elements. The "creationTime" attribute indicates the time at which this schedule was generated and the "originator" attribute is used to indicate the originator of the schedule. The "serviceProvider" attribute is used to indicate the service provider of the services contained in the EPG.

The "ensemble" element is used to describe and locate a DAB ensemble.

The "frequency" element is used to indicate primary and alternate frequencies for an ensemble. When used, there must be a maximum of 1 primary frequency element per ensemble. The "kHz" attribute gives the frequency in kHz.

The "service" element is used to describe a service. The "format" attribute indicates whether the service is audio or alternatively gives the FIG0/13 User Application Type (UATy) for data services. The "type" attribute indicates whether it is a primary or secondary service component. The "bitrate" is only an indication of the bitrate of the service and the actual value may differ from the one here.

E.g.

```

<serviceInformation version="1"
  creationTime="2001-02-28T00:00:00"
  originator="BBC"
  serviceProvider="BBC"
  system="DAB">

  <ensemble id="e1.ce15" version="1">
    <frequency type="primary" kHz="225648"/>
    <service version="1"
      format="audio"
      bitrate="192">
      <serviceID id="e1.ce15.c221.0"
        type="primary"/>
      ...
    </service>
  </ensemble>

</serviceInformation>

```

Annex A (normative): URL for postal addresses

This clause defines a URL scheme for defining postal addresses. The format is a URI-compliant and case insensitive string in the form:

```
addressuri = "postal:" addressdata
addressdata = segment * ("/" segment)
segment    = *urlchar
urlchar    = unreserved | escaped
```

Either the most generalized part OR the most localized part of the address should come first (depending on the postal scheme practices of the target country), separating each main fragment with a slash ("/"), through the hierarchy until the most localized/generalized resource is reached. `unreserved` and `escaped` are defined in [3].

NOTE: Where "/" is needed as a character in the address (e.g. "20/22 High St") it should be encoded as the hex equivalent (i.e. "%2F").

E.g.

```
postal:BBC%20Research%20and%20Development/Kingswood%20Warren/Tadworth/Surrey/KT20%206NP/United%20Kingdom/
```

Annex B (normative): URL for DAB addressing

This clause defines a URL scheme for addressing DAB content. The format is a URI-compliant and case insensitive string in the form:

```
dab://<ECC>.<EId>.<SID>.<SCIDs>/
```

For MOT-based services the location of MOT objects can optionally be specified using directory names and a filename separated by "/"s. The ensemble ID is optional. This allows identical services (given identical service IDs) in different ensembles to be addressed.

NOTE: This scheme does not yet address applications in X-PAD because it is currently not possible to uniquely identify a PAD application within DAB.

E.g.

```
dab://e1.ce15.c225.1/  
dab://e1.ce15.c221.0/data/logo.png
```

Annex C (informative): Filename conventions

When using file-based schedules the following filename conventions must be used (note that all filenames are case-insensitive):

C.1 Schedule files

One file per service per day named:

```
YYYYMMDD_<ECC>_<EId>_<SIId>_<SCIdS>_PI.xml
```

Where YYYY represents the year, MM represents the month, DD the day and <ECC>, <EId>, <SIId> and <SCIdS> uniquely identify the service using the form used in the serviceID XML element. This should contain a single <schedule> element and should contain <programme> elements, ordered by start time, for all programmes carried on this service that are billed to start at or between 00:00:00 and 23:59:59 on the date indicated in the filename.

NOTE: The scope element in a schedule indicates the time period covered by the schedule, from the billed start time of the first programme to the billed end time of the last programme.

E.g.

```
"20020407_c1_ce15_c221_0_PI.xml"
```

C.2 Service information files

One file per ensemble named:

```
YYYYMMDD_XXXXXXXXX_SI.xml
```

Where YYYY represents the year, MM represents the month, DD the day and XXXXXXXX is a string of up to 8 characters identifying the multiplex. There should be one file per ensemble and this should contain a single <ensemble> element which contains ensemble information and <service> elements for all services in that ensemble. The information should be valid from the date indicated in the filename.

E.g.

```
"20020101_BBC_SI.xml"
```

C.3 Group information files

One file per ensemble named:

```
YYYYMMDD_XXXXXXXXX_GI.xml
```

Where YYYY represents the year, MM represents the month, DD the day and XXXXXXXX is a string of up to 8 characters identifying the multiplex. This should contain a single <groups> element.

E.g.

```
"20020407_BBC_GI.xml"
```

Annex D (normative): epgDataTypes_10.xsd

```

<?xml version="1.0" encoding="UTF-8"?>
<xs:schema targetNamespace="http://www.worlddab.org/schemas/epg"
xmlns="http://www.worlddab.org/schemas/epg" xmlns:xs="http://www.w3.org/2001/XMLSchema"
elementFormDefault="unqualified" attributeFormDefault="unqualified">
  <xs:import namespace="http://www.w3.org/XML/1998/namespace"
schemaLocation="http://www.w3.org/2001/xml.xsd" />
  <!-- -->
  <!-- ##### -->
  <!-- Definition of CAType -->
  <!-- ##### -->
  <xs:complexType name="CAType">
    <xs:sequence>
      <xs:group ref="descriptionGroup"/>
      <xs:element name="link" type="linkType" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:attribute name="type" default="none">
      <xs:simpleType>
        <xs:restriction base="xs:NMTOKEN">
          <xs:enumeration value="unspecified"/>
          <xs:enumeration value="none"/>
        </xs:restriction>
      </xs:simpleType>
    </xs:attribute>
  </xs:complexType>
  <!-- -->
  <!-- ##### -->
  <!-- Definition of keywordsType -->
  <!-- ##### -->
  <xs:complexType name="keywordsType">
    <xs:simpleContent>
      <xs:restriction base="messageType"/>
    </xs:simpleContent>
  </xs:complexType>
  <!-- -->
  <!-- ##### -->
  <!-- Definition of parentalRatingType -->
  <!-- ##### -->
  <xs:complexType name="parentalRatingType">
    <xs:attribute name="minimumAge" type="xs:nonNegativeInteger" use="required"/>
    <xs:attribute name="country" type="regionCode"/>
  </xs:complexType>
  <!-- -->
  <!-- ##### -->
  <!-- Definition of mediaDescriptionType -->
  <!-- ##### -->
  <xs:complexType name="mediaDescriptionType">
    <xs:choice>
      <xs:group ref="descriptionGroup"/>
      <xs:element name="multimedia">
        <xs:complexType>
          <xs:attribute name="mimeValue" type="mimeType" use="required"/>
          <xs:attribute ref="xml:lang" default="en"/>
          <xs:attribute name="url" type="urlType"/>
        </xs:complexType>
      </xs:element>
    </xs:choice>
  </xs:complexType>
  <!-- -->
  <!-- ##### -->
  <!-- Definition of locationType -->
  <!-- ##### -->
  <xs:complexType name="locationType">
    <xs:sequence>
      <xs:element name="time" maxOccurs="unbounded">
        <xs:complexType>
          <xs:attribute name="time" type="timePointType" use="required"/>
          <xs:attribute name="duration" type="durationType" use="required"/>
          <xs:attribute name="actualTime" type="timePointType"/>
          <xs:attribute name="actualDuration" type="durationType"/>
        </xs:complexType>
      </xs:element>
    </xs:sequence>
  </xs:complexType>

```

```

    <xs:element name="bearer" minOccurs="0" maxOccurs="unbounded">
      <xs:complexType>
        <xs:attribute name="id" type="dabIDType" use="required"/>
        <xs:attribute name="trigger" type="triggerType"/>
      </xs:complexType>
    </xs:element>
  </xs:sequence>
</xs:complexType>
<!-- -->
<!-- ##### -->
<!-- Definition of memberOfType -->
<!-- ##### -->
<xs:complexType name="memberOfType">
  <xs:attribute name="id" type="CRIDType" use="required"/>
  <xs:attribute name="index" type="xs:positiveInteger" use="optional"/>
</xs:complexType>
<!-- -->
<!-- ##### -->
<!-- Definition of element dabLanguageType-->
<!-- ##### -->
<xs:complexType name="dabLanguageType">
  <xs:attribute ref="xml:lang" default="en"/>
</xs:complexType>
<!-- -->
<!-- ##### -->
<!-- Definition of linkType -->
<!-- ##### -->
<xs:complexType name="linkType">
  <xs:attribute name="url" type="urlType" use="required"/>
  <xs:attribute name="mimeType" type="mimeType"/>
  <xs:attribute ref="xml:lang" default="en"/>
  <xs:attribute name="description">
    <xs:simpleType>
      <xs:restriction base="xs:string">
        <xs:maxLength value="180"/>
      </xs:restriction>
    </xs:simpleType>
  </xs:attribute>
  <xs:attribute name="expiryTime" type="timePointType"/>
</xs:complexType>
<!-- -->
<!-- ##### -->
<!-- Definition of programmeType -->
<!-- ##### -->
<xs:complexType name="programmeType">
  <xs:sequence>
    <xs:group ref="scheduleNameGroup" maxOccurs="unbounded"/>
    <xs:element name="location" type="locationType" maxOccurs="unbounded"/>
    <xs:element name="mediaDescription" type="mediaDescriptionType" minOccurs="0"
maxOccurs="unbounded"/>
    <xs:element name="genre" type="genreType" minOccurs="0" maxOccurs="unbounded"/>
    <xs:element name="parentalRating" type="parentalRatingType" minOccurs="0"/>
    <xs:element name="CA" type="CAType" minOccurs="0"/>
    <xs:element name="keywords" type="keywordsType" minOccurs="0"/>
    <xs:element name="memberOf" type="memberOfType" minOccurs="0" maxOccurs="unbounded"/>
    <xs:element name="link" type="linkType" minOccurs="0" maxOccurs="unbounded"/>
    <xs:element name="programmeEvent" minOccurs="0" maxOccurs="unbounded">
      <xs:complexType>
        <xs:sequence>
          <xs:group ref="scheduleNameGroup" maxOccurs="unbounded"/>
          <xs:element name="location" type="locationType" maxOccurs="unbounded"/>
          <xs:element name="mediaDescription" type="mediaDescriptionType"
minOccurs="0" maxOccurs="unbounded"/>
          <xs:element name="parentalRating" type="parentalRatingType" minOccurs="0"/>
          <xs:element name="CA" type="CAType" minOccurs="0"/>
          <xs:element name="keywords" type="keywordsType" minOccurs="0"
maxOccurs="unbounded"/>
          <xs:element name="memberOf" type="memberOfType" minOccurs="0"
maxOccurs="unbounded"/>
          <xs:element name="link" type="linkType" minOccurs="0"
maxOccurs="unbounded"/>
        </xs:sequence>
        <xs:attribute name="id" type="CRIDType"/>
        <xs:attribute name="version" type="xs:integer"/>
        <xs:attribute name="recommendation" type="recommendationType" default="no"/>
        <xs:attribute name="broadcast" type="broadcastType" default="on-air"/>
      </xs:complexType>
    </xs:element>
  </xs:sequence>
  <xs:attribute name="id" type="CRIDType"/>
  <xs:attribute name="version" type="xs:integer"/>
  <xs:attribute name="recommendation" type="recommendationType" default="no"/>
  <xs:attribute name="broadcast" type="broadcastType" default="on-air"/>
</xs:complexType>
</xs:element>

```

```

</xs:sequence>
<xs:attribute name="id" type="CRIDType"/>
<xs:attribute name="version" type="xs:integer"/>
<xs:attribute name="recommendation" type="recommendationType" default="no"/>
<xs:attribute name="broadcast" type="broadcastType" default="on-air"/>
<xs:attribute name="bitrate" type="xs:nonNegativeInteger"/>
</xs:complexType>
<!-- -->
<!-- ##### -->
<!-- Definition of messageType -->
<!-- ##### -->
<xs:complexType name="messageType" abstract="true">
  <xs:simpleContent>
    <xs:extension base="xs:string">
      <xs:attribute ref="xml:lang" use="optional" default="en"/>
    </xs:extension>
  </xs:simpleContent>
</xs:complexType>
<!-- -->
<!-- ##### -->
<!-- Definition of shortNameType -->
<!-- ##### -->
<xs:complexType name="shortNameType">
  <xs:simpleContent>
    <xs:restriction base="messageType">
      <xs:maxLength value="8"/>
    </xs:restriction>
  </xs:simpleContent>
</xs:complexType>
<!-- -->
<!-- ##### -->
<!-- Definition of mediumNameType -->
<!-- ##### -->
<xs:complexType name="mediumNameType">
  <xs:simpleContent>
    <xs:restriction base="messageType">
      <xs:maxLength value="16"/>
    </xs:restriction>
  </xs:simpleContent>
</xs:complexType>
<!-- -->
<!-- ##### -->
<!-- Definition of longNameType -->
<!-- ##### -->
<xs:complexType name="longNameType">
  <xs:simpleContent>
    <xs:restriction base="messageType">
      <xs:maxLength value="128"/>
    </xs:restriction>
  </xs:simpleContent>
</xs:complexType>
<!-- -->
<!-- ##### -->
<!-- Definition of shortDescriptionType -->
<!-- ##### -->
<xs:complexType name="shortDescriptionType">
  <xs:simpleContent>
    <xs:restriction base="messageType">
      <xs:maxLength value="180"/>
    </xs:restriction>
  </xs:simpleContent>
</xs:complexType>
<!-- -->
<!-- ##### -->
<!-- Definition of longDescriptionType -->
<!-- ##### -->
<xs:complexType name="longDescriptionType">
  <xs:simpleContent>
    <xs:restriction base="messageType">
      <xs:maxLength value="1200"/>
    </xs:restriction>
  </xs:simpleContent>
</xs:complexType>
<!-- -->
<!-- ##### -->
<!-- Definition of originatorType -->
<!-- ##### -->
<xs:simpleType name="originatorType">

```

```

    <xs:restriction base="xs:string">
      <xs:maxLength value="128"/>
    </xs:restriction>
  </xs:simpleType>
<!-- -->
<!-- ##### -->
<!-- Definition of serviceProviderType -->
<!-- ##### -->
<xs:simpleType name="serviceProviderType">
  <xs:restriction base="xs:string">
    <xs:maxLength value="128"/>
  </xs:restriction>
</xs:simpleType>
<!-- -->
<!-- ##### -->
<!-- Definition of genreType -->
<!-- ##### -->
<xs:simpleType name="genreType">
  <xs:restriction base="xs:string">
    <xs:whiteSpace value="collapse"/>
    <xs:enumeration value="pty00"/>
    <xs:enumeration value="pty01"/>
    <xs:enumeration value="pty02"/>
    <xs:enumeration value="pty03"/>
    <xs:enumeration value="pty04"/>
    <xs:enumeration value="pty05"/>
    <xs:enumeration value="pty06"/>
    <xs:enumeration value="pty07"/>
    <xs:enumeration value="pty08"/>
    <xs:enumeration value="pty09"/>
    <xs:enumeration value="pty10"/>
    <xs:enumeration value="pty11"/>
    <xs:enumeration value="pty12"/>
    <xs:enumeration value="pty13"/>
    <xs:enumeration value="pty14"/>
    <xs:enumeration value="pty15"/>
    <xs:enumeration value="pty16"/>
    <xs:enumeration value="pty17"/>
    <xs:enumeration value="pty18"/>
    <xs:enumeration value="pty19"/>
    <xs:enumeration value="pty20"/>
    <xs:enumeration value="pty21"/>
    <xs:enumeration value="pty22"/>
    <xs:enumeration value="pty23"/>
    <xs:enumeration value="pty24"/>
    <xs:enumeration value="pty25"/>
    <xs:enumeration value="pty26"/>
    <xs:enumeration value="pty27"/>
    <xs:enumeration value="pty28"/>
    <xs:enumeration value="pty29"/>
  </xs:restriction>
</xs:simpleType>
<!-- -->
<!-- ##### -->
<!-- Definition of CRIDType -->
<!-- ##### -->
<xs:simpleType name="CRIDType">
  <xs:restriction base="xs:anyURI">
    <xs:whiteSpace value="collapse"/>
    <xs:pattern value="(c|C)(r|R)(i|I)(d|D)://.*/*"/>
  </xs:restriction>
</xs:simpleType>
<!-- -->
<!-- ##### -->
<!-- Definition of basicTimePointType -->
<!-- ##### -->
<xs:simpleType name="basicTimePointType">
  <xs:restriction base="xs:string">
    <xs:whiteSpace value="collapse"/>
    <xs:pattern value="\-?(\d+(\-\d{2})(\-\d{2})?)?(T\d{2}(:\d{2}(:\d{2}(\.\d{2})?)?)?)?(F\d+)?(((\-\|+)\d{2}:\d{2})|Z)?"/>
  </xs:restriction>
</xs:simpleType>
<!-- -->
<!-- ##### -->
<!-- Definition of basicDurationType -->
<!-- ##### -->
<xs:simpleType name="basicDurationType">

```



```

<!-- ##### -->
<!-- Definition of mimeType (Multipurpose Internet Mail Extension -->
<!-- ##### -->
<xs:simpleType name="mimeType">
  <xs:restriction base="xs:string">
    <xs:whiteSpace value="collapse" />
    <xs:pattern value="([!-\.\0-~]{1,}/[!-\.\0-~]{1,})+" />
  </xs:restriction>
</xs:simpleType>
<!-- -->
<!-- ##### -->
<!-- Definition of regionCode -->
<!-- ##### -->
<xs:simpleType name="regionCode">
  <xs:restriction base="xs:string">
    <xs:whiteSpace value="collapse" />
    <xs:pattern value="[a-zA-Z]{2}(-[a-zA-Z0-9]{1,3})?" />
  </xs:restriction>
</xs:simpleType>
<!-- -->
<!-- ##### -->
<!-- Definition of triggerType -->
<!-- ##### -->
<xs:simpleType name="triggerType">
  <xs:restriction base="xs:string">
    <xs:whiteSpace value="collapse" />
    <xs:pattern value="[0-9a-fA-F]{8}" />
  </xs:restriction>
</xs:simpleType>
<!-- -->
<!-- ##### -->
<!-- Definition of ensembleIDType -->
<!-- ##### -->
<xs:simpleType name="ensembleIDType">
  <xs:restriction base="xs:string">
    <xs:whiteSpace value="collapse" />
    <xs:pattern value="[0-9a-fA-F]{1,2}\.[0-9a-fA-F]{1,4}" />
  </xs:restriction>
</xs:simpleType>
<!-- -->
<!-- Definition of scheduleNameGroup -->
<!-- ##### -->
<xs:group name="scheduleNameGroup">
  <xs:sequence>
    <xs:element name="shortName" type="shortNameType" minOccurs="0" maxOccurs="unbounded" />
    <xs:element name="mediumName" type="mediumNameType" maxOccurs="unbounded" />
    <xs:element name="longName" type="longNameType" minOccurs="0" maxOccurs="unbounded" />
  </xs:sequence>
</xs:group>
<!-- -->
<!-- ##### -->
<!-- Definition of serviceNameGroup -->
<!-- ##### -->
<xs:group name="serviceNameGroup">
  <xs:sequence>
    <xs:element name="shortName" type="shortNameType" maxOccurs="unbounded" />
    <xs:element name="mediumName" type="mediumNameType" maxOccurs="unbounded" />
    <xs:element name="longName" type="longNameType" minOccurs="0" maxOccurs="unbounded" />
  </xs:sequence>
</xs:group>
<!-- -->
<!-- ##### -->
<!-- Definition of descriptionGroup -->
<!-- ##### -->
<xs:group name="descriptionGroup">
  <xs:sequence>
    <xs:element name="shortDescription" type="shortDescriptionType" minOccurs="0"
maxOccurs="unbounded" />
    <xs:element name="longDescription" type="longDescriptionType" minOccurs="0"
maxOccurs="unbounded" />
  </xs:sequence>
</xs:group>
<!-- -->
</xs:schema>

```

Annex E (normative): epgSchedule_10.xsd

```

<?xml version="1.0" encoding="UTF-8"?>
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema"
xmlns:epg="http://www.worlddab.org/schemas/epg" elementFormDefault="qualified"
attributeFormDefault="unqualified">
  <xs:import namespace="http://www.w3.org/XML/1998/namespace"
schemaLocation="http://www.w3.org/2001/xml.xsd"/>
  <xs:import namespace="http://www.worlddab.org/schemas/epg"
schemaLocation="http://www.worlddab.org/schemas/epg/epgDataTypes_10.xsd"/>

  <!-- ##### -->
  <!-- Declaration of element epg -->
  <!-- ##### -->
  <xs:element name="epg">
    <xs:complexType>
      <xs:choice minOccurs="0" maxOccurs="unbounded">
        <xs:element name="programmeGroups" minOccurs="0" maxOccurs="unbounded">
          <xs:complexType>
            <xs:sequence>
              <xs:sequence>
                <xs:element name="programmeGroup" maxOccurs="unbounded">
                  <xs:complexType>
                    <xs:sequence>
                      <xs:group ref="epg:scheduleNameGroup"
maxOccurs="unbounded"/>
                      <xs:element name="mediaDescription"
type="epg:mediaDescriptionType" minOccurs="0" maxOccurs="unbounded"/>
                      <xs:element name="genre" type="epg:genreType"
minOccurs="0"/>
                      <xs:element name="memberOf" type="epg:memberOfType"
minOccurs="0" maxOccurs="unbounded"/>
                    </xs:sequence>
                    <xs:attribute name="id" type="epg:CRIDType" use="required"/>
                    <xs:attribute name="version" type="xs:integer"/>
                    <xs:attribute name="type">
                      <xs:simpleType>
                        <xs:restriction base="xs:NMTOKEN">
                          <xs:enumeration value="series"/>
                          <xs:enumeration value="show"/>
                          <xs:enumeration value="programConcept"/>
                          <xs:enumeration value="magazine"/>
                          <xs:enumeration value="programCompilation"/>
                          <xs:enumeration value="otherCollection"/>
                          <xs:enumeration value="otherChoice"/>
                          <xs:enumeration value="topic"/>
                        </xs:restriction>
                      </xs:simpleType>
                    </xs:attribute>
                    <xs:attribute name="numOfItems" type="xs:positiveInteger"/>
                  </xs:complexType>
                </xs:element>
              </xs:sequence>
              <xs:attribute name="version" type="xs:integer"/>
              <xs:attribute name="creationTime" type="epg:timePointType"/>
              <xs:attribute name="originator" type="epg:originatorType"/>
            </xs:complexType>
          </xs:element>
        <xs:element name="schedule" minOccurs="0" maxOccurs="unbounded">
          <xs:complexType>
            <xs:sequence>
              <xs:sequence>
                <xs:element name="scope" minOccurs="0">
                  <xs:complexType>
                    <xs:sequence>
                      <xs:element name="serviceScope" minOccurs="0"
maxOccurs="unbounded">
                        <xs:complexType>
                          <xs:attribute name="id" type="epg:dabIDType"
use="required"/>
                        </xs:complexType>
                      </xs:element>
                    </xs:sequence>
                  </xs:element>
                <xs:attribute name="startTime" type="epg:timePointType"
use="required"/>
              </xs:sequence>
            </xs:complexType>
          </xs:element>
        </xs:choice>
      </xs:element>

```



```

        <xs:attribute name="stopTime" type="epg:timePointType"
use="required"/>
    </xs:complexType>
</xs:element>
<xs:element name="programme" type="epg:programmeType"
maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:attribute name="version" type="xs:integer"/>
    <xs:attribute name="creationTime" type="epg:timePointType"/>
    <xs:attribute name="originator" type="epg:originatorType"/>
</xs:complexType>
</xs:element>
<xs:element name="programme" type="epg:programmeType" minOccurs="0"
maxOccurs="unbounded"/>
    <xs:element name="alternateSource" minOccurs="0" maxOccurs="unbounded">
        <xs:complexType>
            <xs:attribute name="protocol" default="URL">
                <xs:simpleType>
                    <xs:restriction base="xs:NMTOKEN">
                        <xs:enumeration value="DAB"/>
                        <xs:enumeration value="URL"/>
                    </xs:restriction>
                </xs:simpleType>
            </xs:attribute>
            <xs:attribute name="type" default="identical">
                <xs:simpleType>
                    <xs:restriction base="xs:NMTOKEN">
                        <xs:enumeration value="more"/>
                        <xs:enumeration value="less"/>
                        <xs:enumeration value="similar"/>
                        <xs:enumeration value="identical"/>
                    </xs:restriction>
                </xs:simpleType>
            </xs:attribute>
            <xs:attribute name="url" type="epg:urlType" use="required"/>
        </xs:complexType>
    </xs:element>
</xs:choice>
    <xs:attribute name="system" type="epg:systemType" default="DAB"/>
</xs:complexType>
</xs:element>
<!-- -->
<!-- ##### -->
<!-- Declaration of element dabLanguage -->
<!-- ##### -->
<xs:element name="dabLanguage" type="epg:dabLanguageType"/>
</xs:schema>

```

Annex F (normative): epgSI_10.xsd

```

<?xml version="1.0" encoding="UTF-8"?>
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema"
xmlns:epg="http://www.worlddab.org/schemas/epg" elementFormDefault="qualified"
attributeFormDefault="unqualified">
  <xs:import namespace="http://www.w3.org/XML/1998/namespace"
schemaLocation="http://www.w3.org/2001/xml.xsd"/>
  <xs:import namespace="http://www.worlddab.org/schemas/epg"
schemaLocation="http://www.worlddab.org/schemas/epg/epgDataTypes_10.xsd"/>
  <!-- -->
  <!-- ##### -->
  <!-- Declaration of serviceInformation -->
  <!-- ##### -->
  <xs:annotation>
    <xs:documentation xml:lang="en">
      Service information includes the structure of and information about the multiplex and its
associated services
    </xs:documentation>
  </xs:annotation>
  <xs:element name="serviceInformation">
    <xs:complexType>
      <xs:sequence>
        <xs:element name="ensemble" maxOccurs="unbounded">
          <xs:complexType>
            <xs:sequence>
              <xs:group ref="epg:serviceNameGroup" maxOccurs="unbounded"/>
              <xs:element name="frequency" minOccurs="0" maxOccurs="unbounded">
                <xs:complexType>
                  <xs:attribute name="type" default="primary">
                    <xs:simpleType>
                      <xs:restriction base="xs:NMTOKEN">
                        <xs:enumeration value="primary"/>
                        <xs:enumeration value="alternative"/>
                      </xs:restriction>
                    </xs:simpleType>
                  </xs:attribute>
                  <xs:attribute name="kHz" type="xs:nonNegativeInteger"/>
                </xs:complexType>
              </xs:element>
              <xs:element name="mediaDescription" type="epg:mediaDescriptionType"
minOccurs="0" maxOccurs="unbounded"/>
              <xs:element name="parentalRating" type="epg:parentalRatingType"
minOccurs="0"/>
              <xs:element name="CA" type="epg:CAType" minOccurs="0"/>
              <xs:element name="keywords" type="epg:keywordsType" minOccurs="0"/>
              <xs:element name="link" type="epg:linkType" minOccurs="0"
maxOccurs="unbounded"/>
              <xs:element name="service" minOccurs="0" maxOccurs="unbounded">
                <xs:complexType>
                  <xs:sequence>
                    <xs:element name="serviceID" minOccurs="1"
maxOccurs="unbounded">
                      <xs:complexType>
                        <xs:attribute name="id" type="epg:dabIDType"
use="required"/>
                        <xs:attribute name="type" default="primary">
                          <xs:simpleType>
                            <xs:restriction base="xs:NMTOKEN">
                              <xs:enumeration value="primary"/>
                              <xs:enumeration value="secondary"/>
                            </xs:restriction>
                          </xs:simpleType>
                        </xs:attribute>
                      </xs:complexType>
                    </xs:element>
                    <xs:group ref="epg:serviceNameGroup" maxOccurs="unbounded"/>
                    <xs:element name="mediaDescription"
type="epg:mediaDescriptionType" minOccurs="0" maxOccurs="unbounded"/>
                    <xs:element name="genre" type="epg:genreType" minOccurs="0"
maxOccurs="unbounded"/>

```

```

minOccurs="0" maxOccurs="unbounded" />
    <xs:element name="epgLanguage" type="epg:dabLanguageType"
type="epg:parentalRatingType" minOccurs="0" />
    <xs:element name="parentalRating"
type="epg:parentalRatingType" minOccurs="0" />
    <xs:element name="CA" type="epg:CAType" minOccurs="0" />
    <xs:element name="keywords" type="epg:keywordsType"
minOccurs="0" />
    <xs:element name="link" type="epg:linkType" minOccurs="0"
maxOccurs="unbounded" />
    </xs:sequence>
    <xs:attribute name="version" type="xs:integer" />
    <xs:attribute name="format" default="audio">
    <xs:simpleType>
        <xs:restriction base="xs:NMTOKEN">
            <xs:enumeration value="audio" />
            <xs:enumeration value="DLS" />
            <xs:enumeration value="MOTSlideshow" />
            <xs:enumeration value="MOTBWS" />
            <xs:enumeration value="TPEG" />
            <xs:enumeration value="DGPS" />
            <xs:enumeration value="proprietary" />
        </xs:restriction>
    </xs:simpleType>
    </xs:attribute>
    <xs:attribute name="bitrate" type="xs:nonNegativeInteger" />
    </xs:complexType>
    </xs:element>
    </xs:sequence>
    <xs:attribute name="id" type="epg:ensembleIDType" use="required" />
    <xs:attribute name="version" type="xs:integer" />
    </xs:complexType>
    </xs:element>
    </xs:sequence>
    <xs:attribute name="version" type="xs:integer" />
    <xs:attribute name="creationTime" type="epg:timePointType" />
    <xs:attribute name="originator" type="epg:originatorType" />
    <xs:attribute name="serviceProvider" type="epg:serviceProviderType" />
    <xs:attribute name="system" type="epg:systemType" default="DAB" />
    </xs:complexType>
    </xs:element>
</xs:schema>

```

Annex G (informative): Future extensions of the schema

Schema can be changed and not break well-written parsers as long as certain guidelines are followed:

- 1) Elements cannot be removed.
- 2) Attributes cannot be removed.
- 3) Attribute cannot be changed from "implied" to "required".
- 4) Default values should not be modified (generally).
- 5) A "value" cannot be removed from an attribute "value" list.
- 6) The required structure of a document cannot be changed. For example, ? cannot become + and a new element cannot be required to appear inside an existing element. Only ? and * can be used when changing the document structure.

History

Document history		
V1.1.1	December 2002	Publication