ETSI TS 102 818 V1.4.1 (2008-06)

Technical Specification

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

European Broadcasting Union — Union Européenne de Radio-Télévision

EBU·UER

DAB Digital Audio Broadcasting

ETSI

Reference

RTS/JTC-DAB-56

Keywords

audio, broadcasting, DAB, DRM, digital, EPG

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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 1: 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 2) 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 2: 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) (EN 300 401 [18]) and Digital Radio Mondiale (DRM) (ES 201 980 [23]). 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

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.
- Non-specific reference may be made only to a complete document or a part thereof and only in the following cases:
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  - for informative references.

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

For online referenced documents, information sufficient to identify and locate the source shall be provided. Preferably, the primary source of the referenced document should be cited, in order to ensure traceability. Furthermore, the reference should, as far as possible, remain valid for the expected life of the document. The reference shall include the method of access to the referenced document and the full network address, with the same punctuation and use of upper case and lower case letters.

NOTE: While any hyperlinks included in this clause were valid at the time of publication ETSI cannot guarantee their long term validity.

2.1 Normative references

The following referenced documents are indispensable for the application of the present document. For dated references, only the edition cited applies. For non-specific references, the latest edition of the referenced document (including any amendments) applies.

[1] ETSI TS 102 822-4: "Broadcast and On-line Services: Search, select, and rightful use of content on personal storage systems ("TV-Anytime"); Part 4: 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 Recommendation: "Extensible Markup Language (XML) 1.0 (Third Edition)".

[6] IETF RFC 2045: "Multipurpose Internet Mail Extensions (MIME) Part One: Format of Internet Message Bodies".

[7] IETF RFC 3066: "Tags for the Identification of Languages".

[8] PNG Development Group: "Portable Network Graphics (PNG) 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 2.0".

[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: "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: "Information technology - Generic coding of moving pictures and associated audio information - Part 3: Audio".

[18] ETSI EN 300 401: "Radio Broadcasting Systems; Digital Audio Broadcasting (DAB) to mobile, portable and fixed receivers".

[19] ISO/IEC 10646: "Information technology - Universal Multiple-Octet Coded Character Set (UCS)".

[20] ISO 8859-2: "Information technology - 8-bit single-byte coded graphic character sets - Part 2: Latin alphabet No. 2".

[21] ETSI TS 102 822-3-1: "Broadcast and On-line Services: Search, select, and rightful use of content on personal storage systems ("TV-Anytime"); Part 3: Metadata; Sub-part 1: Phase 1 - Metadata schemas".

[22] ETSI TS 102 371: "Digital Audio Broadcasting (DAB); Digital Radio Mondiale (DRM); Transportation and Binary Encoding Specification for Electronic Programme Guide (EPG)".

[23] ETSI ES 201 980: "Digital Radio Mondiale (DRM); System specification".

[24] ETSI TS 102 563: "Digital Audio Broadcasting (DAB); Transport of Advanced Audio Coding (AAC) audio".

2.2 Informative references

The following referenced documents are not essential to the use of the present document but they assist the user with regard to a particular subject area**.** For non-specific references, the latest version of the referenced document (including any amendments) applies.

Not applicable.

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)

NOTE: 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

NOTE: 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-bit, 24-bit 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
CRC	Cyclic Redundancy Check
CRID	Content Reference ID
CS	Classification Schemes
DAB	Digital Audio Broadcasting
DRM	Digital Radio Mondiale
ECC	Extended Country Code
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).

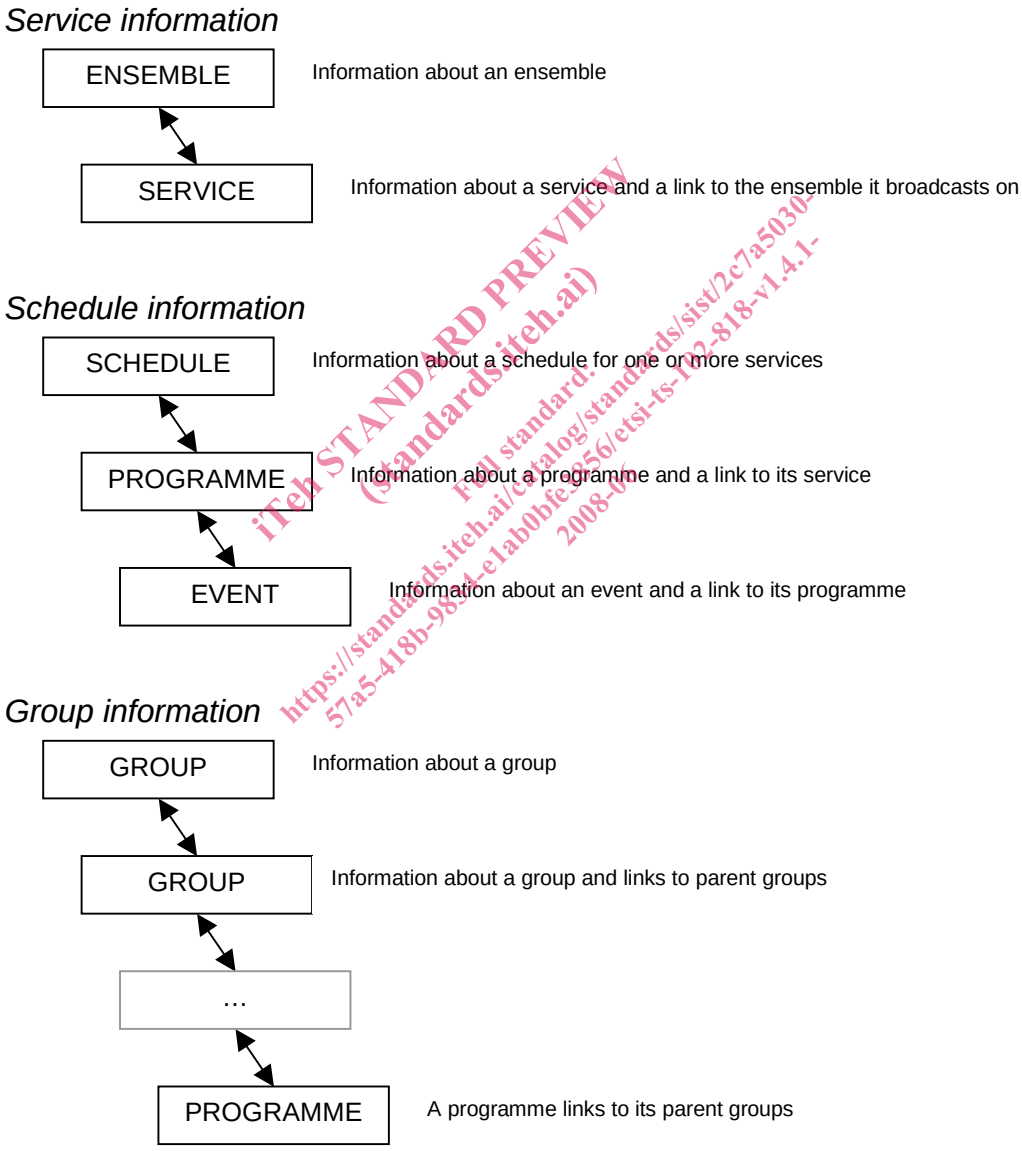

Figure 1

The EPG may be delivered using the DAB or DRM broadcasting systems. The philosophy is that DAB will carry a DAB EPG describing DAB services and DRM will carry a DRM EPG describing DRM services. In general, the DAB and DRM EPGs are the same; however there are slight differences to the format of certain fields to deal with the specific requirements for these two systems and signalling is provided to receivers to ensure there is no confusion.

4.1 Document structure

The EPG specification is split into 3 schemas:

- Common data types - epgDataTypes_14.xsd.
- Schedules - epgSchedule_14.xsd.
- Service information - epgSI_14.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/IEC 10646 [19] character set using UTF-8 character encoding must be used in all EPG XML documents where applicable.

NOTE: The ISO/IEC 10646 [19] character set contains all characters of the DAB character sets (three EBU Latin-based sets, ISO 8859-2 [20] and ISO/IEC 10646 [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="http://www.worlddab.org/schemas/epgSchedule/14"
xmlns:epg="http://www.worlddab.org/schemas/epgDataTypes/14"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://www.worlddab.org/schemas/epgSchedule/14 epgSchedule_14.xsd" system="DAB"
xml:lang="en">
    <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.ce15.c221.0"/>
            <serviceScope id="e1.ce15.c224.0"/>
        </scope>
        <!-- Comprehensive example -->
        <programme shortId="213456" id="crid://bbc.co.uk/4969758988" recommendation="yes">
            <epg:mediumName>Gilles Peterson:</epg:mediumName>
            <epg:longName>Gilles Peterson: Worldwide</epg:longName>
```

```
            <epg:location>
                <epg:time time="2003-12-18T00:00:00" duration="PT2H0M0S" actualTime="2003-12-
18T00:00:00" actualDuration="PT2H0M0S"/>
                <epg:bearer id="e1.ce15.c221.0"/>
            </epg:location>
            <epg:mediaDescription>
                <epg:shortDescription><![CDATA[Gilles Peterson brings you two hours of global beats
and the best of cool.   Including the Worldwide family. KV5 are live from Maida Vale with special
guests.]]></epg:shortDescription>
            </epg:mediaDescription>
            <epg:genre href="urn:tva:metadata:cs:ContentCS:2002:3.6.7">
                <epg:name><![CDATA[ Rap/Hip Hop/Reggae]]></epg:name>
            </epg:genre>
            <epg:genre href="urn:tva:metadata:cs:ContentCS:2002:3.6.8">
                <epg:name><![CDATA[ Electronic/Club/Urban/Dance]]></epg:name>
            </epg:genre>
            <epg:genre href="urn:tva:metadata:cs:FormatCS:2002:2.5">
                <epg:name><![CDATA[ ARTISTIC PERFORMANCE]]></epg:name>
            </epg:genre>
            <epg:genre href="urn:tva:metadata:cs:IntentionCS:2002:1.1">
                <epg:name><![CDATA[ ENTERTAINMENT]]></epg:name>
            </epg:genre>
            <epg:genre href="urn:tva:metadata:cs:ContentCS:2002:3.6.9">
                <epg:name><![CDATA[ World/Traditional/Ethnic/Folk music]]></epg:name>
            </epg:genre>
            <epg:memberOf shortId="1000" id="crid://www.bbc.co.uk/WorldwideGroup"/>
            <epg:link url="mailto:gilles.peterson@bbc.co.uk" description="Email:"/>
            <epg:link url="http://www.bbc.co.uk/radio1/urban/peterson/" description="Web:"/>
            <epg:programmeEvent shortId="6353" 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:relativeTime time="PT45M" 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 shortId="59033">
            <epg:mediumName>PM</epg:mediumName>
            <epg:location>
                <epg:time time="2003-12-18T17:00:00" duration="PT1H0M0S"/>
                <epg:bearer id="e1.ce15.c224.0"/>
            </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="http://www.worlddab.org/schemas/epgSchedule/14"
xmlns:epg="http://www.worlddab.org/schemas/epgDataTypes/14"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://www.worlddab.org/schemas/epgSchedule/14 epgSchedule_14.xsd" system="DAB"
xml:lang="en">
    <programmeGroups version="1" creationTime="2001-02-28T00:00:00" originator="BBC">
        <programmeGroup shortId="1000" id="crid://www.bbc.co.uk/WorldwideGroup" 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 href="urn:tva:metadata:cs:ContentCS:2002:3.6.7">
                <epg:name><![CDATA[ Rap/Hip Hop/Reggae]]></epg:name>
            </genre>
            <genre href="urn:tva:metadata:cs:ContentCS:2002:3.6.8">
                <epg:name><![CDATA[ Electronic/Club/Urban/Dance]]></epg:name>
            </genre>
            <genre href="urn:tva:metadata:cs:FormatCS:2002:2.5">
                <epg:name><![CDATA[ ARTISTIC PERFORMANCE]]></epg:name>
            </genre>
            <genre href="urn:tva:metadata:cs:IntentionCS:2002:1.1">
                <epg:name><![CDATA[ ENTERTAINMENT]]></epg:name>
            </genre>
            <genre href="urn:tva:metadata:cs:ContentCS:2002:3.6.9">
                <epg:name><![CDATA[ World/Traditional/Ethnic/Folk music]]></epg:name>
            </genre>
            <memberOf shortId="100" id="crid://www.bbc.co.uk/Radio1_Series"/>
        </programmeGroup>
    </programmeGroups>
</epg>
```

4.3.3 Service information

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

```
<?xml version="1.0" encoding="UTF-8"?>
<serviceInformation xmlns="http://www.worlddab.org/schemas/epgSI/14"
xmlns:epg="http://www.worlddab.org/schemas/epgDataTypes/14"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://www.worlddab.org/schemas/epgSI/14 epgSI_14.xsd" version="1"
creationTime="2001-02-28T00:00:00" originator="BBC" serviceProvider="BBC" system="DAB"
xml:lang="en">
    <!-- 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 url="http://www.bbc.co.uk/radio1/images/bbclogo.png"
type="logo_colour_rectangle"/>
        </mediaDescription>
        <mediaDescription>
            <epg:multimedia mimeValue="image/png" url="http://www.bbc.co.uk/radio/bbclogo_large.png"
type="logo_unrestricted" height="200" width="200"/>
        </mediaDescription>
        <CA type="none"/>
        <keywords xml:lang="en">Radio1, Radio2, Radio3, Radio4, Radio5,Live</keywords>
        <link url="http://www.bbc.co.uk/radio/" mimeValue="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 url="http://www.bbc.co.uk/radio1/images/r1logo.png"
type="logo_colour_square"/>
            </mediaDescription>
            <genre href="urn:tva:metadata:cs:ContentCS:2002:3.6.7">
                <epg:name><![CDATA[ Rap/Hip Hop/Reggae]]></epg:name>
            </genre>
            <genre href="urn:tva:metadata:cs:ContentCS:2002:3.6.8">
                <epg:name><![CDATA[ Electronic/Club/Urban/Dance]]></epg:name>
            </genre>
            <genre href="urn:tva:metadata:cs:FormatCS:2002:2.5">
                <epg:name><![CDATA[ ARTISTIC PERFORMANCE]]></epg:name>
            </genre>
            <genre href="urn:tva:metadata:cs:IntentionCS:2002:1.1">
                <epg:name><![CDATA[ ENTERTAINMENT]]></epg:name>
```

```
            </genre>
            <epgLanguage xml:lang="en"/>
            <keywords xml:lang="en"> music, pop, rock, dance, hip-hop, soul   </keywords>
            <link url="http://www.bbc.co.uk/radio1/" mimeValue="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"/>
            <epg:shortName xml:lang="en">BBCR4</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 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.