

SMPTE STANDARD

Broadcast Exchange Format (BXF) — Schema Documentation



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Foreword

SMPTE (the Society of Motion Picture and Television Engineers) is an internationally-recognized standards developing organization. Headquartered and incorporated in the United States of America, SMPTE has members in over 80 countries on six continents. SMPTE's Engineering Documents, including Standards, Recommended Practices and Engineering Guidelines, are prepared by SMPTE's Technology Committees. Participation in these Committees is open to all with a bona fide interest in their work. SMPTE cooperates closely with other standards-developing organizations, including ISO, IEC and ITU.

SMPTE Engineering Documents are drafted in accordance with the rules given in Part XIII of its Administrative practices. SMPTE Standard 2021-4 was prepared by Technology Committee 34CS.

Intellectual Property

At the time of publication, no notice had been received by SMPTE claiming patent rights essential to the implementation of this Standard. However, attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. SMPTE shall not be held responsible for identifying any or all such patent rights.

Introduction

This section is entirely informative and does not form an integral part of this Engineering Document

Broadcast Exchange Format (BXF) is a protocol for exchange of data among broadcast systems such as Traffic, Program Management, Automation, and Content Distribution. It is intended to facilitate the movement of content and its associated metadata for better management, coordination and reporting between these broadcast systems. The BXF Protocol serves as a replacement for the many proprietary interfaces in place today between vendors in these areas.

Unless otherwise specified the order of precedence of the types of normative information in this document shall be as follows. Normative prose shall be the authoritative definition. Tables shall be next, followed by formal languages, then figures, and then any other language forms. In the event of a conflict between the schema and other information in this document, the schema is authoritative.

With this new release of BXF, additional schema changes including new headers have taken place. These have been accomplished with the minimum of adjustments or effect on previous versions. However, as with any update, systems based on prior BXF versions should be thoroughly tested for their ability to work correctly under this new version before their release to the public. The changes in the BXF schema for this version are described under the appropriate schema sections in this document and represent only the changes since the previous release of BXF. Please reference prior release documentation for any BXF modifications included in prior releases.

1. Scope

This document provides documentation of the BXF schemas specified in the associated Data Supplement, including schema changes and additional elements of BXF Version 7.0.

2. Conformance Notation

Documents consist of normative text and, optionally, informative text. Normative text is that describes elements of the design that are indispensable or contains the conformance language keywords: "shall", "should", or "may". Informative text is text that is potentially helpful to the user, but not indispensable, and can be removed, changed, or added editorially without affecting interoperability. Informative text does not contain any conformance keywords.

All text in a Standard, Recommended Practice, Amendment, Addendum, or Corrigendum, is, by default, normative, except: the Introduction, any section explicitly labeled as "Informative" or individual paragraphs that start with "Note:"

Normative references are external documents referenced in normative text that are indispensable to the user. Bibliographic references are references made in informative text or are those otherwise not indispensable to the user. Normative references shall conform to the types and procedures specified in the Engineering Administrative Practices.

The keywords "shall" and "shall not" indicate requirements strictly to be followed in order to conform to the document and from which no deviation is permitted. The keywords, "should" and "should not" indicate that, among several possibilities, one is recommended as particularly suitable, without mentioning or excluding others; or that a certain course of action is preferred but not necessarily required; or that (in the negative form) a certain possibility or course of action is deprecated but not prohibited.

The keywords "may" and "need not" indicate courses of action permissible within the limits of the document.

The keyword "reserved" indicates a provision that is not defined at this time, shall not be used, and may be defined in the future. The keyword "forbidden" indicates "reserved" and in addition indicates that the provision will never be defined in the future.

A conformant implementation according to an Engineering Document is one that includes all mandatory provisions ("shall") and, if implemented, all recommended provisions ("should") as described. A conformant implementation need not implement optional provisions ("may") and need not implement them as described.

3. Description of BXF Schema

This documentation does not contain the actual schema, but instead provides a reference to the individual files that can be viewed with any number of tools, including most commonly used browsers as well as other third party tools. In addition to the XML Schema Files (.XSD) the user can also browse the schema using the .html files.

Depending on the tools you use, different parts of the schema may appear in different formatting. The section below describes the meaning of various parts of the schema as you would see them in the .html version.

The schema shall be normative and this document informative should any differences exist between the two.

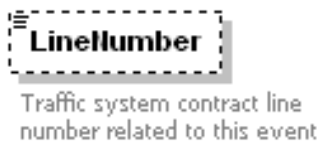
4. Schema Documentation

A number of graphics and symbols are used in the documentation to help describe the various elements of the schema and how the elements are related. These represent components and the relationships between schema components. The different components are represented by the following:

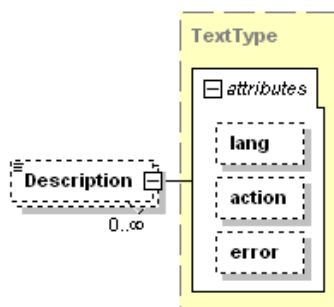
Single element – mandatory: Indicated by a rectangle with a solid border. The element name is inside the shape.



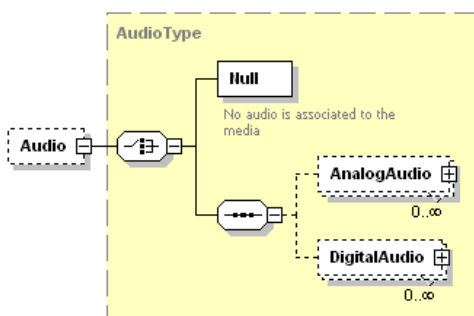
Single element – optional: Indicated by a rectangle with a dashed border. The element name is inside the shape.



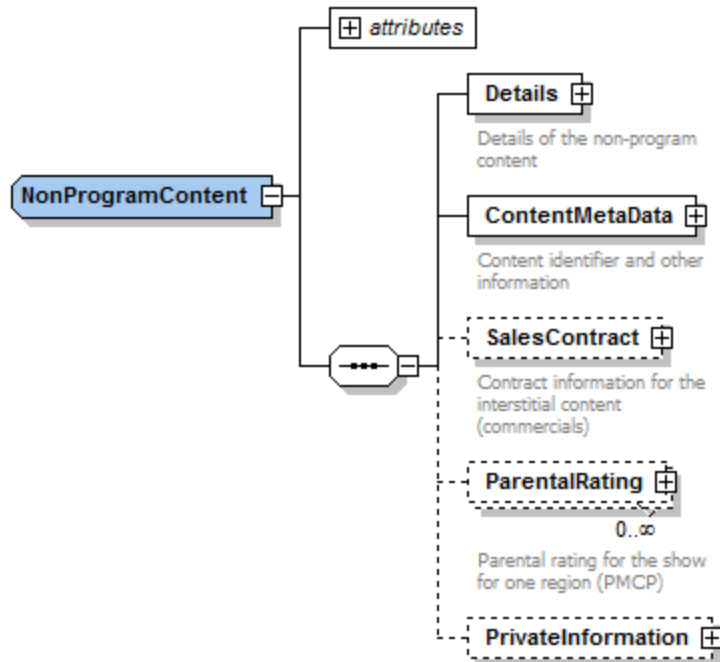
Multiple elements: Indicated by a rectangle with a solid border with a number range representing the minimum and maximum number of occurrences possible. In the example, 0 to infinity ($0..∞$) is shown.



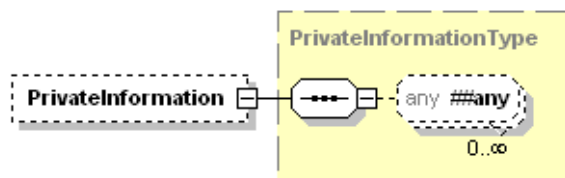
Elements containing child elements: Indicated by a [+] or [-] on the element, representing an element containing additional attributes or elements. The [+] indicates that additional elements are available for display. The [-] indicates that the child elements are displayed.



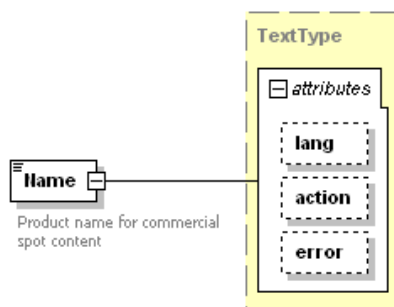
Complex type: Indicated by a partial hexagon and a child element symbol.



Wildcards: Indicated by an octagon with any at the left.

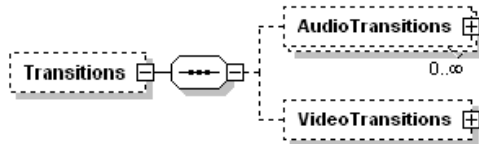


Attributes: Indicated by the word 'attributes'

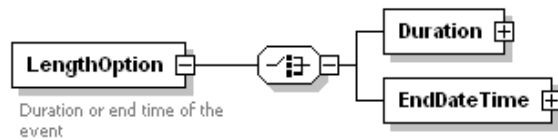


The relationships between components are represented by symbols for sequence and choice.

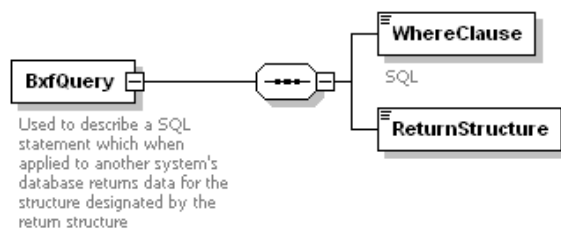
Sequence: The sequence compositor (—) shows that all elements occur in sequence.



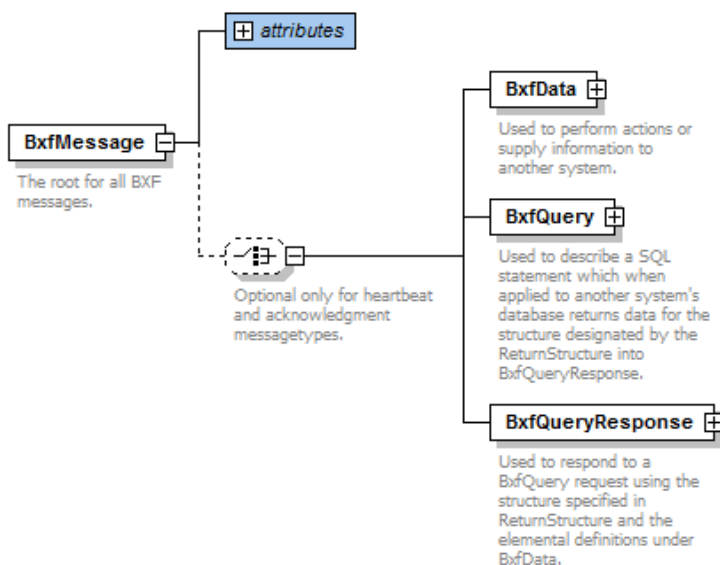
Choice: The choice compositor (⊞) shows the 'or' relationship between associated components (only one choice may be made).



Solid lines: Solid lines connecting elements represent mandatory connections within the schema diagrams.

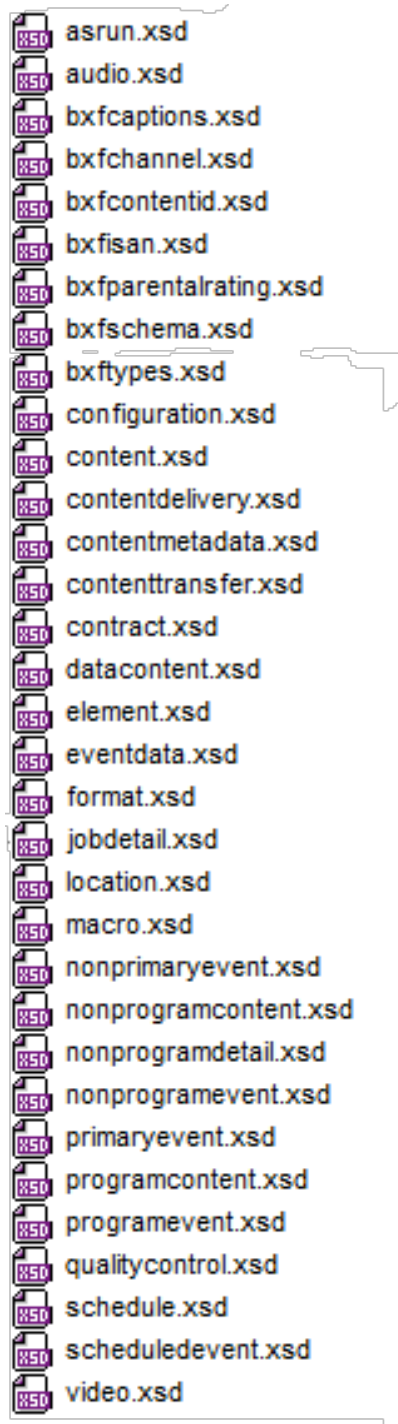


Dashed lines: Dashed lines between elements represent optional connections within the schema diagrams.



4.1 Schema File List

The Schema is actually composed of 33 files listed below. The root file (starting point) is bxfschema.xsd and all other files are referenced from this file. A brief description of each file is given below in alphabetical order. This same description may also be contained in the schema for major elements, but some elements do not contain a description and were segregated into separate files for the convenience of managing the schema. Note that no new XSDs have been added as part of version 7.0, but there are several new elements added into contentmetadata.xsd, video.xsd and contentdelivery.xsd. There are also a documentation that has been clarified, a few typos and enumeration values that have been fixed to be consistent throughout the schema.



4.2 Header Change in BXF 7.0

All XSD file headers have the same change regarding copyright and targetNamespace:

```
<!-- Copyright 2019 Society of Motion Picture and Television Engineers. All rights reserved. -->

<xs:schema xmlns="http://smpte-ra.org/schemas/2021/2019/BXF"
  xmlns:xs="http://www.w3.org/2001/XMLSchema"
  xmlns:pmcp="http://www.atsc.org/XMLSchemas/pmcp/2007/3.1" targetNamespace="http://smpte-
  ra.org/schemas/2021/2019/BXF" elementFormDefault="qualified" attributeFormDefault="unqualified"
  version="7.000">
```

Most of the XSDs (27) had only their header changed and are listed below. There are six (6) XSD's with more substantial changes and these changes are illustrated below.

- Asrun.XSD
- Audio.XSD
- BXFCaptions.XSD
- BXFChannel.XSD
- BXFContentID.XSD
- BXFISAN.XSD
- BXFParentalRating.XSD
- BXFSchema.XSD
- Configuration.XSD
- Content.XSD
- ContentTransfer.XSD
- Contract.XSD
- DataContent.XSD
- Element.XSD
- EventData.XSD
- Format.XSD
- Location.XSD
- Macro.XSD
- NonProgramContent.XSD
- NonProgramDetail.XSD
- NonProgramEvent.XSD
- PrimaryEvent.XSD
- ProgramContent.XSD
- ProgramEvent.XSD
- QualityControl.XSD
- Schedule.XSD
- ScheduleEvent.XSD

Schema Details and Changes for Version 7.0

4.2.1 Asrun.XSD

Contains:

include	loc:bxftypes.xsd	
include	loc:scheduleevent.xsd	
complexType	AsRunDetail	ann:
complexType	BasicAsRun	ann:
complexType	CompleteAsRun	ann:

Used to describe the exact timing of events on a schedule after the event has been aired, including any errors or other problems that occurred during the broadcast or transmission of the content.

4.2.2 Audio.XSD

Contains:

import	loc:http://www.atsc.org/XMLSchemas/pmcp/2007/3.1/pmcp31.xsd	ns:http://www.atsc.org/XMLSchemas/pmcp/2007/3.1
include	loc:bxftypes.xsd	
complexType	AudioChannel	ann:Distinct collection of sequenced audio samples that are intended for delivery to a single loudspeaker or other reproduction device. (v6.0)
complexType	Audios	ann:Extends PMCP AudioType
complexType	Ac3AudioExt	ann:Extends PMCP Ac3Audio
complexType	AnalogAudio	ann:Enumerates the settings of audio included in analog content
complexType	Audio	ann:The base for all audio definitions
complexType	AudioTransition	ann:Enumerates the settings to transition from one audio to another
complexType	DigitalAudio	ann:Enumerates the different types of digital audio streams. (v3.0)
complexType	DigitalAudioAttribute	ann:Enumerates the parameters of a digital audio stream
complexType	GroupOfSoundfieldGroups	ann:A group of groups allows encapsulation of SoundfieldGroups into defined streams. It is often used to classify the purpose of the audio such as Main Program, Alternate Program, etc. (v6.0)
complexType	Loudness	ann:Indicates the loudness of the SoundfieldGroup as measured in various ways and using various standards. (v6.0)
complexType	MultiChannelAudioStreams	ann:A collection of one or more audio streams with the same encoding method that further incorporate groups of audio channels in a specific format as defined in ST 377-4. If a data stream (MXF a
complexType	SoundFieldGroup	ann:Used to organize a group of multiple audio channels that comprise the complete audio structure for the program. For example, Stereo, or Stereo-Spanish, or 5.1. It may be comprised of a single
complexType	TSAudio	ann:Enumerates the parameters of digital audio in a transport stream
simpleType	AudioModeType	ann:Defines the way audio is transitioned
simpleType	AudioRateType	ann:Defines the speed of an audio transition
simpleType	AudioTransitionEnumType	ann:Indicates if an audio transition is to be mixed or a cut

The basis for all audio definitions.

4.2.3 BxfCaptions.XSD

Contains:

import	loc:http://www.atsc.org/XMLSchemas/pmcp/2007/3.1/pmcp31.xsd	ns:http://www.atsc.org/XMLSchemas/pmcp/2007/3.1
include	loc:bxftypes.xsd	
complexType	AccessServices	ann:Indicators of the type of access services provided as part of the Library Master content. (v6.0)
complexType	AlternativeCaptions	ann:Additional caption and subtitle options as used worldwide as well as the ability to extend to other customized types. (v6.0)
complexType	BXFCaptionOP42	ann:Describes Teletext Based Closed Captions According FreeTV Australia OP 42. (v6.0)
complexType	BXFCaptionOP47	ann:Describes Teletext Based Closed Captions According FreeTV Australia OP 47 Note that when used, DigitalVideo and CaptionshVAIAC should both be set to True in VideoType. (v6.0)
complexType	BxfCaptions	ann:Caption Service Descriptor (A/65B 6.9.3)
complexType	BxfCaption608	ann:
complexType	BxfCaption708	ann:

Caption Service Descriptor (A/65B 6.9.3) plus Australia's OP42, OP47 and UK formats are now include (v6.0) along with the ability to extend.

4.2.4 BxfChannel.XSD

Contains:

import	loc: http://www.atsc.org/XMLSchemas/pmcp/2007/3.1/pmcp31.xsd	ns: http://www.atsc.org/XMLSchemas/pmcp/2007/3.1
include	loc: bxfatypes.xsd	
complexType	Channel	ann:

Extends ATSC's PMCP 3.1 definition of a channel.

4.2.5 BxfContentId.XSD

Contains:

import	loc: http://www.atsc.org/XMLSchemas/pmcp/2007/3.1/pmcp31.xsd	ns: http://www.atsc.org/XMLSchemas/pmcp/2007/3.1
include	loc: bxfisan.xsd	
complexType	BxfAlternateId	ann:
complexType	BxfHouseNumber	ann:
complexType	BxfContentId	ann: Groups several content IDs that may be used simultaneously to label and reference a show

Groups several Content IDs that may be used simultaneously to label and reference a show. In Version 2, support was added for the reuse of House Numbers by adding "duration of effectiveness" as supported under ATSC's A57/B standard.

4.2.6 BxfISAN.XSD

Contains:

import	loc: http://www.atsc.org/XMLSchemas/pmcp/2007/3.1/pmcp31.xsd	ns: http://www.atsc.org/XMLSchemas/pmcp/2007/3.1
include	loc: bxfatypes.xsd	
complexType	Bxfisan	ann:

Used to define entry of an ISAN value into ContentID. Go to www.isan.org for more information on the use of ISAN with content identification.

4.2.7 BxfParentalRating.XSD

Contains:

import	loc: http://www.atsc.org/XMLSchemas/pmcp/2007/3.1/pmcp31.xsd	ns: http://www.atsc.org/XMLSchemas/pmcp/2007/3.1
include	loc: bxfypes.xsd	
complexType	BxfParentalRating	ann:

Used to define entry of parental rating values as an extension of ATSC's PMCP 3.1.

4.2.8 BxfSchema.XSD

Contains:

import	loc: http://www.w3.org/2001/xml.xsd	ns: http://www.w3.org/XML/1998/namespace
include	loc: bxfypes.xsd	
include	loc: bxfchannel.xsd	
include	loc: schedule.xsd	
include	loc: contenttransfer.xsd	
include	loc: configuration.xsd	
include	loc: jobdetail.xsd	
element	BxfMessage	ann: The root for all BFX messages.

The root for all BFX messages.

4.2.9 BxfTypes.XSD

Contains:

Report	http://www.atsc.org/ML/Schemas/smp2020/1	
complexType	BxfAddress	Address details
complexType	BxfCompany	Defines the attributes required for a company
complexType	BxfContact	A contact is a person that is being referenced including phone, email and address details
complexType	BxfCoverage	An area of physical locations that represent the coverage for a broadcast station or the areas of distribution for a distributor of media content.
complexType	BxfDateTime	Allows either SMPTE or UTC based date-time notation
complexType	BxfDaypart	A defined range of days, for one or more time period ranges and optionally dates that can be used to include or exclude for scheduling of content. Note that it is possible to create logical periods of time when potentially crossing the start of the broadcast day or crossing midnight depending on the system ingesting the definition.
complexType	BxfDuration	Duration can be expressed using either SMPTE time code or xs:duration
complexType	BxfExtensions	Used to describe customized metadata using data pairs and optionally a validation data type (v3.0)
complexType	BxfPrivateInformation	Any sequence of well-formed private XML elements
complexType	BxfSingleTime	"New" Used for time duration or offset (v5.0 added support for 60 fps)
complexType	BxfSmpteDateType	Used for date-time entry in the schema
complexType	BxfStation	A transmitter or distributor of media content either over the air or by other means
complexType	BxfText	Used for all free text entry elements in the schema
complexType	BxfUtcDateType	Standard UTC Date-Time
complexType	EventNotes	Operator notes used to annotate the event with reference to the person that created the note.
attributeGroup	Action-ErrorGroup	Used to set an action or report an error and add attribute extensibility
attributeGroup	PmpcActionErrorExtensionGroup	Used to set an action or report an error and add attribute extensibility
attributeGroup	GCTypeUnitRep	"New" Used to set the allowed Types, Units and Representations for GC test items as of December 2016. Expected to change with future technologies.
complexType	AsRunStatusType	
complexType	BxfShortname	
complexType	BxfElementaryErrorExt	Type for an elementary error
complexType	BxfElementaryError	Type for an elementary error
complexType	BxfError	
complexType	BxfStatus	Status of a reply message
complexType	BxfStatusExtType	
complexType	BxfUri	Used to denote a universal file location
complexType	DayPattern	A binary representation of the days of the week with Monday in the left-most position (eg - "1111100" = M-F)
complexType	DestinationType	Type of the destination system (see ATSC code point registry - www.atsc.org/standards/Code_Point_Registry.pdf)
complexType	ECCode	FCC Children's and Information Codes
complexType	EndModeType	
complexType	MessageType	Allowed types of messages in this schema
complexType	OperationalModeType	
complexType	OriginType	Type of the origin system (see ATSC code point registry - www.atsc.org/standards/Code_Point_Registry.pdf)
complexType	QueryStringIdentifier	Restricts Query ReturnStructure based on a pattern that would restrict the return structure to follow the "camel back" style used in the Schema
complexType	QueryString	Restricts the Query where clause based on a pattern. Note that negation requests are not supported.
complexType	ScheduleEventType	
complexType	ScheduleType	A type of schedule
complexType	Smpte258MTimeCode	Reference SMPTE 258M, section 0 "New" Supports 60 frames per second (v5.0)
complexType	StartModeType	
complexType	Uuid	A universal unique identifier, as described by RFC 4122.

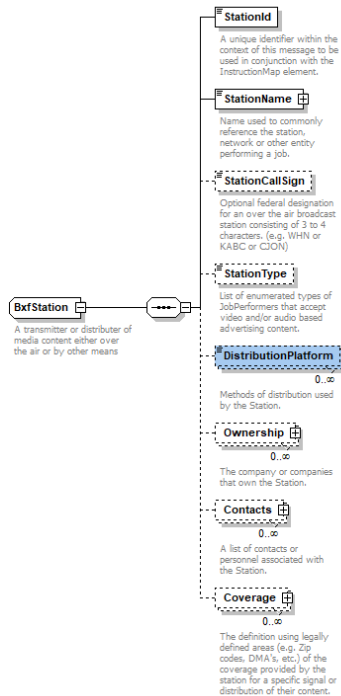
Used to organize all the utility elements that are used by most of the other schema files.

4.2.9.1 BXF 7.0 Changes

Description of change: Under BxfStation, DistributionPlatform was modified to be unbounded and the annotation was changed slightly.

Text representations:

```
<xs:element name="DistributionPlatform" minOccurs="0" maxOccurs="unbounded">
  <xs:annotation>
    <xs:documentation>Methods of distribution used by the Station.</xs:documentation>
  </xs:annotation>
  <xs:simpleType>
    <xs:restriction base="xs:string">
      <xs:enumeration value="AM"/>
      <xs:enumeration value="FM"/>
      <xs:enumeration value="Internet"/>
      <xs:enumeration value="Mobile"/>
      <xs:enumeration value="TV"/>
      <xs:enumeration value="Other"/>
    </xs:restriction>
  </xs:simpleType>
</xs:element>
```



4.2.10 Configuration.XSD

Contains:

include		loc:bxftypes.xsd	
complexType	Configuration	ann:	

Used to describe the configuration values of a system, to be shared with other BXF-compliant systems.

4.2.11 Content.XSD

Contains:

			
	include	loc:bxftypes.xsd	
	include	loc:programcontent.xsd	
	include	loc:nonprogramcontent.xsd	
	complexType	Content	ann:

Used to describe the content at a specific location.

4.2.12 ContentDelivery.XSD

Contains:

include	loc:bxcontentid.xsd	
include	loc:bxftypes.xsd	
include	loc:qualitycontrol.xsd	
include	loc:bxcaptions.xsd	
include	loc:video.xsd	
include	loc:audio.xsd	
complexType	ContentDelivery	ann:Used to specify the method by which media content should be created and formatted for downstream use by a designated media company. AirReadyMaster added (v5.0) and LibraryMaster added (v6.0) and minor modifications made (v7.0).
complexType	DescriptiveMetadata	ann:Indicates the presence of various types of descriptive metadata in the Library Master (v6.0).
complexType	IMFLibraryMasterApp2	ann:Added content delivery options for Library Masters that conform to the IMF Framework as specified by ST 2067 (v6.0)
complexType	IMFLibraryMasterApp2e	ann:Added content delivery options for Library Masters that conform to the IMF Framework as specified by ST 2067 (v6.0)
complexType	J2KLibraryMasterApp	ann:Added content delivery options for Library Masters in various configurations (v6.0)
complexType	ProResLibraryMasterApp	ann:Added content delivery options for Library Masters in various configurations (v6.0)

Used to specify the method by which media content should be created and formatted for downstream use by a designated media company. Media is often formatted in different manors depending on the planned use for that media downstream. ContentDelivery now supports both media designated to be aired as well as media content that is considered a Library Master, but may have additional modification before used for air. AirReadyMaster was released in v5.0 and the corresponding document for that version should be consulted for details. LibraryMaster was added in release v6.0 and this version has several new enhancements as well as some fixes.

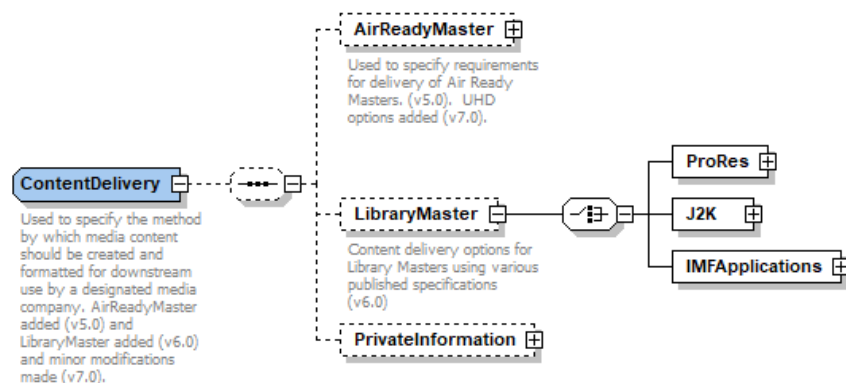
4.2.12.1 BXF 7.0 Changes

Description of change: Description updated to included notation that changes were made for version 7.0. A new UHD Delivery option (UHDDeliverySpecification) was added for AirReadyMaster based on the NABA DPP specification. In addition, the J2KLibraryMasterApp was modified to clarify the options under J2K by modifying the ImageEssence to be more restrictive, linking to a new extension base, J2KImageEssence that also included a new J2KChromaSubsampling and J2KEncodingProfile. There were also minor changes to the IMFImageEssenceApp2E. (see Video.XSD for details).

Text representations:

```
<xs:complexType name="ContentDelivery">
  <xs:annotation>
    <xs:documentation>Used to specify the method by which media content should be created and formatted for downstream use by a
    designated media company. AirReadyMaster added (v5.0) and LibraryMaster added (v6.0) and minor modifications made
    (v7.0).</xs:documentation>
  </xs:annotation>

  <xs:element name="AirReadyMaster" minOccurs="0">
    <xs:annotation>
      <xs:documentation>Used to specify requirements for delivery of Air Ready Masters. (v5.0). UHD options added. (v7.0)</xs:documentation>
    </xs:annotation>
```



```
<xs:element name="DeliveryOptions">
  <xs:annotation>
```