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Information technology — MPEG systems technologies —

Part 1: Binary MPEG format for XML

AMENDMENT 2: Conservation of prefixes and extensions on encoding of wild cards

Technologies de l'information — Technologies des systèmes MPEG —

Partie 1: Format binaire de MPEG pour XML

AMENDEMENT 2: Conservation des préfixes et des extensions pour l'encodage des caractères de remplacement

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Information technology — MPEG systems technologies —

Part 1:
Binary MPEG format for XML

AMENDMENT 2: Conservation of prefixes and extensions on encoding of wild cards

In 6.2.2, replace:

DecoderInit () {	Number of bits	Mnemonic
SystemsProfileLevelIndication	8+	vluimsbf8
…		

with:

DecoderInit () {	Number of bits	Mnemonic
SystemsProfileLevelIndication	8+	vluimsbf8
UnitSizeCode	3	bslbf
NoAdvancedFeatures	1	bslbf
ReservedBits	4	bslbf
If (! NoAdvancedFeatures) {		
AdvancedFeatureFlags_Length	8+	vluimsbf8
/** FeatureFlags **/		
InsertFlag	1	bslbf
AdvancedOptimisedDecodersFlag	1	bslbf
AdditionalSchemaFlag	1	bslbf
AdditionalSchemaUpdatesOnlyFlag	1	bslbf
FragmentReferenceFlag	1	bslbf
MPCOnlyFlag	1	bslbf
HierarchyBasedSubstitutionCodingFlag	1	bslbf
ContextPathTableFlag	1	bslbf
PrefixTableFlag	1	bslbf
ReservedBitsZero /for additional Flags **/**	24	bslbf
If (**PrefixTableFlag**) {		
PrefixTable ()		
}		
ReservedBitsZero	AdvancedFeatureFlags_Lent	

	h*8-33-PrefixTable_length*8	
}/** FeatureFlags end **/		
/** Start FUUConfig **/		
If (! AdditionalSchemaUpdatesOnlyFlag) {		
NumberOfSchemas	8+	vluimsbf8
for (k=0; k< NumberOfSchemas; k++) {		
SchemaURI_Length[k]	8+	vluimsbf8
SchemaURI[k]	8* SchemaURI_Length[k]	bslbf
LocationHint_Length[k]	8+	vluimsbf8
LocationHint[k]	8* LocationHint_Length[k]	bslbf
NumberOfTypeCodecs[k]	8+	vluimsbf8
for (i=0; i< NumberOfTypeCodecs[k]; i++) {		
TypeCodecURI_Length[k][i]	8+	vluimsbf8
TypeCodecURI[k][i]	8* TypeCodecURI _Length[k][i]	bslbf
NumberOfTypes[k][i]	8+	vluimsbf8
for (j=0; j< NumberOfTypes[k][i]; j++) {		
TypeIdentificationCode[k][i][j]	8+	vluimsbf8
}		
}		
}		
If (ContextPathTableFlag) {		
ContextPathTable()		
}		
/** FUUConfig - Advanced optimised decoder framework **/		
If (AdvancedOptimisedDecodersFlag) {		
NumOfAdvancedOptimisedDecoderTypes	8+	vluimsbf8
for (i=0; i< NumOfAdvancedOptimisedDecoderTypes; i++) {		
AdvancedOptimisedDecoderTypeURI_Length[i]	8+	vluimsbf8
AdvancedOptimisedDecoderTypeURI[i]	8* AdvancedOptimisedDecoder TypeURI_Length[i]	bslbf
}		
AdvancedOptimisedDecodersConfig ()		
}		
/** FUUConfig - Fragment reference framework **/		
If (FragmentReferenceFlag) {		
NumOfSupportedFragmentReferenceFormat	8	uimsbf
for (i=0;i< NumOfSupportedFragmentReferenceFormat;i++) {		
SupportedFragmentReferenceFormat[i]	8	blsbf
}		

}		
}		
/** end FUUConfig **/		
If (AdditionalSchemaFlag) {		
AdditionalSchemaConfig ()		
}		
/** Initial document **/		
If (!AdditionalSchemaUpdateOnlyFlag) {		
InitialDocument_Length	8+	vluimsbf8
InitialDocument()		
}		
}		

Add the following paragraph:

PrefixTable {		
NumberofPrefixes	8+	vluimsbf8
for (k=0; k< NumberOfPrefixes; k++) {		
SchemaURI_Length[k]	8+	vluimsbf8
SchemaURI[k]	8* SchemaURI_Length[k]	bslbf
Prefix_Length[k]	8+	vluimsbf8
Prefix[k]	8* [Prefix_Length[k]]	bslbf
}		
}		

Add the following paragraph:

Semantics

Name	*Definition*
PrefixTable_length	Indicates length in Bytes of PrefixTable.
PrefixTableFlag	Indicates whether a prefix table is given in the `decoderInit`.
NumberofPrefixes	Specifies the number of prefixes defined in the PrefixTable.
Prefix_Length[k]	Indicates the size in bytes of the Prefix[k]. A value of zero is forbidden.
Prefix[k]	This is the UTF-8 representation of the prefix associated to SchemaURI[k] in the `PrefixTable`. The decoder SHOULD bind the namespace names in the current document to the prefixes given in the `PrefixTable` if present. The default namespace, used to construct unprefixed elements, will be declared as a null string “”. If different prefixes are associated to a same namespace name in the

`PrefixTable`, or a given namespace name is associated to different prefixes, the decoder should only use the first defined prefix/namespace binding in the output document.

NOTE A document author wishing to use prefix conservation in order to maintain, after decoding, the validity of QNames/XPath expressions in the content of an element should only use one global prefix/namespace name mapping for those prefix and namespace names that are used in the QNames/XPath expressions. However, in order to ensure in all cases the validity of those expressions after decoding, the optimized decoder for QName expressions specified in subclause 8.8 should be used.

In 6.2.2, replace:

Table 1 — Index Table for SystemsProfileLevelIndication

Index	***Systems Profile and Level***
0	no profile specified
1 – 127	Reserved for ISO Use

with:

Table 1 — Index Table for SystemsProfileLevelIndication

Index	***Systems Profile and Level***
0	no profile specified
1 – 124	Reserved for ISO Use
125	ETSI TS 102 323/102 529 (DVB GBS TV-A and DVB IPTV BCG)
126	ETSI TS 102 034 (DVB IPTV SD&S)
127	ETSI TS 102 471 (DVB IPDC ESG)
128-	User specific

In 7.5.2.4.5.2 (AnyElementDecoding Syntax), replace:

AnyElementDecoding() {	**Number of bits**	**Mnemonic**
GlobalElementSchemaID	ceil(log2(`NumberOfSchemas` + `NumberOfAdditionalSchemas`))	uimsbf
AnyElement_Length	5+	vluimsbf
Any_SBC_Operand_Selector	5+	vluimsbf
If (inPayloadDecoding()) {		
Element(ChildrenSchemaMode, theAnyType)		
}		
}		

with:

AnyElementDecoding() {	Number of bits	Mnemonic
GlobalElementSchemaID	ceil(log2(`NumberOfSchemas` + `NumberOfAdditionalSchemas`))	uimsbf
AnyElement_Length	5+	vluimsbf
if (GlobalElementSchemaID == LAXSchemaID) {		
//lax encoding		
AnyElementLaxDecoding();		
} else {		
Any_SBC_Operand_Selector	5+	vluimsbf
If (inPayloadDecoding()) {		
Element(ChildrenSchemaMode, theAnyType)		
}		
}		
}		

In 7.5.2.4.5.3 (AnyElementDecoding Semantics), replace:

Name	*Definition*
GlobalElementSchemaID	The schema in which the global element is defined. Its value is the index of the URI in the `SchemaURI` array defined in 6.2 (optionally extended with the list of additional schemas).
AnyElement_Length	Indicates the length in bits of the remainder of this `AnyElementDecoding`.
Any_SBC_Operand_Selector	Selects one global element of the schema referenced by `GlobalElementSchemaID` using the `OperandTBC` table for Extended_SBC_Operand_Selector as specified in 6.6.5.2.3. Therefore, Any_SBC_Operand_Selector is equivalent to the Extended_SBC_Operand_Selector but with a bit representation in vluimsbf5.
inPayloadDecoding()	Returns true if the AnyElementDecoding procedure has been triggered from a payload decoding procedure.
Element()	See 7.4.1.
theAnyType	The type of the element identified by the `SBC_GlobalElement_SelectorCode` as defined in the schema identified by the `GlobalElementSchemaID`.

with:

Name	*Definition*
GlobalElementSchemaID	The schema in which the global element is defined. Its value is the index of the URI in the `SchemaURI` array defined in 6.2 (optionally extended with the list of additional schemas). If GlobalElementSchemaID is equal to the ID of the virtual lax schema `urn:mpeg:mpegb:bim:laxencoding:2007` specified in the decoderInit (i.e., GlobalElementSchemaID == LAXSchemaID), the lax decoding procedure AnyElementLaxDecoding() is called.
AnyElement_Length	Indicates the length in bits of the remainder of this `AnyElementDecoding`.
Any_SBC_Operand_Selector	Selects one global element of the schema referenced by `GlobalElementSchemaID` using the `OperandTBC` table for Extended_SBC_Operand_Selector as specified in 6.6.5.2.3. Therefore, Any_SBC_Operand_Selector is equivalent to the Extended_SBC_Operand_Selector but with a bit representation in vluimsbf5.
inPayloadDecoding()	Returns true if the AnyElementDecoding procedure has been triggered from a payload decoding procedure.
Element()	See 7.4.1.
theAnyType	The type of the element identified by the `SBC_GlobalElement_SelectorCode` as defined in the schema identified by the `GlobalElementSchemaID`.
AnyElementLaxDecoding()	See 7.5.2.4.5.4.

In 7.5.2.4.5 (Wildcard transition behavior), add:

7.5.2.4.5.4 AnyElementLaxDecoding procedure

7.5.2.4.5.4.1 AnyElementLaxDecoding

AnyElementLaxDecoding() {	**Number of bits**	**Mnemonic**
ReservedBits	4	bmsbf
AnyElementLaxCompressionScheme	4	bmsbf
AnyElementLaxDecodingContent()		
}		

Name	*Definition*
ReservedBits	Reserved bits for future use.
AnyElementLaxCompressionScheme	Indicates the compression scheme used in the AnyElementLaxDecoding() procedure. Table AMD2.1 gives the possible values.
AnyElementLaxDecodingContent	See 7.5.2.4.5.4.2.

Table AMD2.1 — Compression methods

AnyElementLaxCompressionScheme	*Definition*
0	No compression
1	Compression method described in 7.5.2.4.5.4.2
2-10	ISO reserved
11-16	Private use

7.5.2.4.5.4.2 AnyElementLaxDecodingContent

7.5.2.4.5.4.2.1 Overview

The `AnyElementLaxDecodingContent` function contains the decoding of lax format syntax. This is a byte-aligned SAX tokenized events stream, which is decoded by a large switch statement.

Three dynamic dictionaries are used to store the XML structural items names: namespaces, elements names and attributes names. These strings dictionaries are dynamic and can grow during the encoding process, with the help of the ADD_NS, ADD_ENAME and ADD_ANAME special events, discussed below. By default, these dictionaries are initialized as empty ones.

Currently understood events are described in Table AMD2.2. All SAX events are defined by a corresponding SAX event callback and three special events are used to dynamically add a namespace, an element name or an attribute name in the corresponding dictionary. The first event with zero UID triggers decoding according to the general BiM syntax.

The UID is a fixed numerical ID able to unambiguously define an event, but this is not the value used to encode an event, as explained in 7.5.2.4.5.4.3. An event can carry zero, one or several parameters, which can be strings or numerical IDs, which point to the corresponding dynamic strings dictionary. Strings are encoded in UTF-8 format, with a terminating zero.

Table AMD2.2 — Event table

Event name	UID	Parameters	Semantics
BiM Encoding	0	Ø	Fragment update payload syntax defined in subclause 7.3.
ADD_NS	1	*ns*	Adds a new namespace in the namespace table.
ADD_ENAME	2	*nsid, elt*	Adds a new element in the element table.
ADD_ANAME	3	*nsid, att*	Adds a new attribute in the attribute table.
END_ELEMENT	4	Ø	SAX — ContentHandler callback
START_PFX_MAPPING	5	*nsid, pfx*	SAX — ContentHandler callback
CHARACTERS	6	*value*	SAX — ContentHandler callback
END_DOCUMENT	7	Ø	SAX — ContentHandler callback
PI	8	*target, data*	SAX — ContentHandler callback
SKIPPED_ENTITY	9	*name*	SAX — ContentHandler callback
NOTATION_DECL	10	name, pid, sid	SAX — DTDHandler callback
UNPARSED_ENTITY_DECL	11	*name, pid, sid, not*	SAX — DTDHandler callback
ATTRIBUTE_DECL	12	*el, at, type, mode, value*	SAX — DeclHandler callback
ELEMENT_DECL	13	*name, model*	SAX — DeclHandler callback
EXT_ENTITY_DECL	14	*name, pid, sid*	SAX — DeclHandler callback
INT_ENTITY_DECL	15	name, value	SAX — DeclHandler callback
COMMENT	16	*value*	SAX — LexicalHandler callback
START_CDATA	17	Ø	SAX — LexicalHandler callback
END_CDATA	18	Ø	SAX — LexicalHandler callback
START_DTD	19	*name, pid, sid*	SAX — LexicalHandler callback
END_DTD	20	Ø	SAX — LexicalHandler callback
START_ENTITY	21	*name*	SAX — LexicalHandler callback
END_ENTITY	22	*name*	SAX — LexicalHandler callback
Reserved	*23-24*	—	*Reserved*
START_ELEMENT_eltid	23+2*eltid	Ø	SAX — ContentHandler callback
ATTRIBUTE_attid	24+2*attid	*value*	SAX — ContentHandler callback

Note that there is no START_ELEMENT generic event. Instead, the SAX START_ELEMENT event is split into specific ATTRIBUTE_*#att* events and a specific START_ELEMENT_*#elt* event. Therefore, an infinite number of ATTRIBUTE_*#att* events and START_ELEMENT_*#elt* virtually belongs to the table of events.

7.5.2.4.5.4.2.2 Syntax

AnyElementLaxDecodingContent() {	**Number of bits**	**Mnemonic**
ReservedBits	6	bmsbf
Agglutinated	1	bmsbf
zlib	1	bmsbf
do {		
event = readEvent();		
switch (event) {		
case ADD_NS:		
NamespaceName	8+	string
addNamespace(NamespaceName);		
break;		
case ADD_ENAME:		
NSID	8	uimsbf8
ElementName	8+	string
addElement(NSID,ElementName);		
break;		
case ADD_ANAME:		
NSID	8	uimsbf8
AttributeName	8+	string
addAttribute(NSID,AttributeName);		
break;		
case END_ELEMENT:		
sax_endElement();		
break;		
case START_PFX_MAPPING:		
NSID	8	uimsbf8
PfxName	8+	string
sax_startPrefixMapping(NSID,PfxName);		
break;		
case CHARACTERS:		
Value	8+	string
sax_characters(Value);		
break;		
case END_DOCUMENT:		
sax_endDocument ();		
break;		
case PI:		
Target	8+	string

Data	8+	string
sax_processingInstruction(Target,Data);		
break;		
case SKIPPED_ENTITY:		
Name	8+	string
sax_skippedEntity(Name);		
break;		
case NOTATION_DECL:		
Name	8+	string
PublicID	8+	string
SystemID	8+	string
sax_notationDecl(Name,PublicID, SystemID);		
break;		
case UNPARSED_ENTITY_DECL:		
Name	8+	string
PublicID	8+	string
SystemID	8+	string
NotationName	8+	string
sax_unparsedEntityDecl(Name, PublicID,SystemID,NotationName);		
break;		
case ATTRIBUTE_DECL:		
Ename	8+	string
Aname	8+	string
Type	8+	string
Mode	8+	string
Value	8+	string
sax_attributeDecl(Ename,Aname,Type, Mode,Value);		
break;		
case ELEMENT_DECL:		
Name	8+	string
Model	8+	string
sax_elementDecl(Name,Model);		
break;		
case EXT_ENTITY_DECL:		
Name	8+	string
PublicID	8+	string
SystemID	8+	string
sax_extEntityDecl(Name,PublicID, SystemID);		
break;		

case INT_ENTITY_DECL:		
Name	8+	string
PublicID	8+	string
sax_intEntityDecl(Name, PublicID);		
break;		
case COMMENT:		
Value	8+	string
sax_commentl(Value);		
break;		
case START_CDATA:		
sax_startCData();		
break;		
case END_CDATA:		
sax_endCData();		
break;		
case START_DTD:		
Name	8+	string
PublicID	8+	string
SystemID	8+	string
sax_startDTD(Name, PublicID, PublicID);		
break;		
case END_DTD:		
sax_endDTD();		
break;		
case START_ENTITY:		
Name	8+	string
sax_startEntity(Name);		
break;		
case END_ENTITY:		
Name	8+	string
sax_endEntity(Name);		
break;		
default:		
if (event % 2 == 1) {		
eltid = (event – END_ENTITY – 1)/2;		
sax_startElement(eltid,attrs);		
attrs=NULL;		
} else {		
AttributeValue	8+	string
atid = (event – END_ENTITY – 2)/2;		
attrs.newAttribute(atid,value);		
}		

break;		
}		
} while (event != END_DOCUMENT);		
}		

7.5.2.4.5.4.2.3 Semantics

Name	*Definition*
ReservedBits	Reserved bits for future use.
Agglutinated	A value of 1 indicates the agglutination of events has been activated at encoding time. See 7.5.2.4.5.4.3.1.
zlib	A value of 1 indicates that the sequence of symbols is further compressed with zlib.
readEvent	Returns the next event. See 7.5.2.4.5.4.2.
addNamespace	Adds a new namespace, which is a string, at the end of the namespace table. The index of a namespace in this table is referred as the namespace ID.
addElement	Adds a new element, which is a doublet of a namespace ID and a string, at the end of the element table. The index of an element in this table is referred as the element ID.
addAttribute	Adds a new attribute, which is a doublet of a namespace ID and a string, at the end of the attribute table. The index of an attribute in this table is referred as the attribute ID.
sax_X	Triggers a SAX callback X with the usual SAX parameters. String parameters can be recovered from ID ones using the namespace, elements and attributes dictionaries.
attrs	Set of attributes in a given element.
attrs.newAttribute	Adds a new attribute in the current set of attributes, which will be used in the next sax_startElement SAX event.

7.5.2.4.5.4.3 readEvent

7.5.2.4.5.4.3.1 Overview

The `readEvent` function returns the next event to be triggered by the decoder. It relies on a buffered event model, based on an events FIFO buffer of size 3; therefore, the function can return an event without necessarily requiring reading a byte in the bitstream.

A sequence of up to three events can be agglutinated into a single new event. It allows more efficient encoding, especially when not using zlib.

An event or a sequence of up to three events can be encoded with a single byte. Events encoding is done with the help of a fixed-size symbol table, which contains 128 entries. This table maps a set of events or sequence of events to a set of integer values (the symbols) ranging from 0 to 127. The table is sorted in the "most recently seen" order.

After an event or a sequence of events has been decoded, the table of symbols is updated with the `updateModel`, `updateModelOne` and `updateSymbol` procedures. The sequence of the three latest seen events is moved (or added if doesn't still exist in the table) to the front of the table. The sequence of the two latest two decoded events is then moved to the front of the table. At last, the latest encoded event is moved to the front of the table. In case of addition of an event (or sequence of events), the oldest events or sequence of events are deleted from the table. By doing this, the most recent sequences of up to 3 events are kept in the table and need only 1 byte to be encoded. The symbol table is initialized with the first events from the table of events (Table AMD2.2), and the symbol of each event is set to its UID.

7.5.2.4.5.4.3.2 Syntax

readEvent() {	**Number of bits**	**Mnemonic**
if (events_fifo.empty()) {		
ExtendedCode	1	bmsbf
if (ExtendedCode) {		
UID	15	uimsbf
events = [UID];		
} else {		
Code	7	uimsbf
events = SymbolCodeMap.getSymbol(Code);		
}		
updateModel(events);		
events_fifo.push(events);		
}		
return events_fifo.pull();		
}		

The `ExtendedCode` field allows decoding a single event which doesn't belong to the symbol table. In this case, the event is decoded by reading directly its UID. After an event or a sequence of events has been decoded, the symbol table is updated by `updateModel` procedure with a sequence of `events` (which can contain only one event).

updateModel(events) {	**Number of bits**	**Mnemonic**
for (i=0 ; i < events.size ; i++) {		
If (Agglutinated) {		
updateModelOne(events[i]);		
} else {		
updateSymbol(events[i]);		
}		
}		
}		

updateModelOne(evt) {	Number of bits	Mnemonic
if (last_evt != null) {		
if (last2_evt != null) {		
updateSymbol(last2_evt@last_evt@evt);		
}		
updateSymbol(last_evt@evt);		
}		
updateSymbol(evt);		
last2_evt = last_evt;		
last_evt = evt;		
}		

updateSymbol(symbol) {	Number of bits	Mnemonic
if (SymbolTable.contains(symbol)) {		
SymbolTable.remove(symbol);		
SymbolTable.moveToFront(symbol);		
} else {		
oldsym = SymbolTable.removeLast();		
SymbolTable.moveToFront(symbol);		
code = SymbolCodeMap.get(oldsym);		
SymbolCodeMap.put(symbol, code):		
SymbolCodeMap.remove(oldsym):		
}		
}		

7.5.2.4.5.4.3.3 Semantics

Name	*Definition*
events_fifo	FIFO (First-In First-Out) events container.
events_fifo.empty	Returns true if the FIFO events container is empty and false otherwise.
SymbolCodeMap.getSymbol	Returns the symbol (the set of events) associated to a code.
updateModel	Updates the Symbol Table with a set of new events.
events_fifo.push	Adds a new event or a set of new events (up to 3) at the end of the FIFO events container.
events_fifo.pull	Pulls a single event from the beginning of the FIFO events container.
events.size	Number of newly decoded events (=1,2, or 3).
updateModelOne	Updates the Symbol Table with a new incoming event.
updateSymbol	Updates a symbol in the Symbol Table.
SymbolTable	Fixed-size table aimed to contain the symbols.
SymbolTable.contains	Returns true if the SymbolTable contains the given symbol and else otherwise.
SymbolTable.moveToFront	Appends a new symbol at the beginning of the SymbolTable.
SymbolTable.size	Returns the current size of the SymbolTable.
SymbolTable.removeFirst	Removes the first entry of the SymbolTable.
SymbolTable.remove	Removes a given symbol from the SymbolTable.
SymbolCodeMap	Container aimed to contain the mappings between a symbol and its corresponding code.
SymbolCodeMap.put	Adds a (symbol, code) mapping into the SymbolCodeMap.
SymbolCodeMap.remove	Removes a mapping form the SymbolCodeMap.

7.5.2.4.5.4.3.4 Encoding example (informative)

Below is an *example* of the encoding algorithm with the agglutination process. Suppose that we want to encode the following XML document:

<a>

which is equivalent to encoding the following sequence of events:

START_ELT_1, START_ELT_2, END_ELT, START_ELT_2, END_ELT

Below is a representation of the initial table of symbols (the IDLE event is a non-existent event).

Events	Symbol
IDLE	0
ADD_ANAME	1
ADD_ENAME	2
ADD_NS	3
END_ELEMENT	4
…	…
START_ELEMENT_1	25
…	…
START_ATTRIBUTE_51	126
START_ELEMENT_52	127

The START_ELEMENT_1 is first encoded with byte #25. The event is then moved to the front of the table, which leads to:

Events	Symbol
START_ELEMENT_1	25
IDLE	0
ADD_ANAME	1
ADD_ENAME	2
ADD_NS	3
END_ELEMENT	4
…	…
START_ATTRIBUTE_51	126
START_ELEMENT_52	127

Then, the START_ELT_2 is encoded with the byte #27. The double event [START_ELT_1 ; START_ELT_2] is then added to the front of the table, pulling out the START_ELEMENT_52 event. The event START_ELT_2 is then moved up. This leads to: