**3GPP TSG- Meeting #**

**, , - revision of S4-251509 and S4aI250117**

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| *CR-Form-v12.3* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  |  | **CR** |  | **rev** |  | **Current version:** |  |  |
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| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* | | | | | | | | |
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| ***Proposed change affects:*** | UICC apps |  | ME | **X** | Radio Access Network |  | Core Network | **X** |

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| ***Work item code:*** |  | | | | |  | ***Date:*** | | |  |
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| ***Category:*** |  |  | | | | | ***Release:*** | | |  |
|  | *Use one of the following categories:* ***F*** *(correction)* ***A*** *(mirror corresponding to a change in an earlier release)* ***B*** *(addition of feature),* ***C*** *(functional modification of feature)* ***D*** *(editorial modification)*  Detailed explanations of the above categories can be found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | | | | | | | *Use one of the following releases: Rel-8 (Release 8) Rel-9 (Release 9) Rel-10 (Release 10) Rel-11 (Release 11) … Rel-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)  Rel-20 (Release 20)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | 1. Provide relevant extensions for MBS protocols:  a. For *Key Issue #8: In-session unicast repair for MBS Object Distribution* as introduced in clause 5.9 of TR 26.802, address Gaps #2, #3, #4, and #5 in clause 5.9.5 by the candidate solution in clause 5.9.6 in TS 26.517 and possibly in TS 26.346:  i. On gap #2 identified in clause 5.9.5 of TR 26.802, both of the following signalling options are expected to be supported:  - Using FDT parameters to signal the time when repairs can be requested using the Expires attribute).  - Using LCT header information to signal the time when repairs can be requested using the B-Flag.  ii. On Gap #3 identified in clause 5.9.5 of TR 26.802, the following signalling options exist in the FLUTE File Delivery Table (FDT):  - Defining a new FDT extensions parameter to signal the availability time when the object needs to be released.  iii. On gap #4 identified in clause 5.9.5 of TR 26.802, the execution of MBS object delivery and in-session unicast repair can run in parallel in the MBS Client. However, this should be validated if there are cases this is not the case and whether these cases need to be explicitly stated, for example reduced capability (RedCaP) UEs.  iv. On gap #5 identified in clause 5.9.5 of TR 26.802, time synchronization can reuse functionalities defined in TS 26.346, but tighter synchronization that 1 second. This work is aligned with the findings and work in clause 5.11.3.6 of TR 26.802.  v. Support other relevant aspects resulting from stage-2.  3. For key topic address the following aspects:  a. Specify the required protocols or protocol extensions  b. Define relevant APIs  c. Specify the OpenAPIs YAML as well as other stage-3 API.  e. Address remaining stage-3 aspects.  4. Coordinate work with other 3GPP groups as needed. For details see clause 8.  5. Coordinate work with external organizations such as SVTA (primarily the DASH-IF WG), CTA WAVE, ISO/IEC JTC29 WG3 (MPEG Systems), 5G-MAG, DVB and/or IETF, as needed.  This document initiates the work topic for unicast repair. It is also considered to support the development of the unicast repair feature with parallel implementation in 5G-MAG Reference Tools. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | * Update FDT * Update Associated delivery procedure description. * Refer to procedures in TS 26.517 for in-session repair | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | Feature not supported | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 2, 7.2.9, 7.2.10.1, 7.2.10.2, 7.2.3.5, 9.4B (new), 9.5.1, L.6.1, L.6.2, L6.3, L6.4 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | | **X** |  | Other core specifications | | | | TS 26.517 CR 0031 | | |
| ***affected:*** | |  | **X** | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | | The XML schemas impacted need to be updated on 3GPP Forge:  <https://forge.3gpp.org/rep/sa4/amd-pro-med/-/tree/in-session-repair> | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | | |  |  |  |  | | --- | --- | --- | --- | | [**S4aI250117**](https://www.3gpp.org/ftp/TSG_SA/WG4_CODEC/3GPP_SA4_AHOC_MTGs/SA4_MBS/Docs/S4aI250117.zip) | [AMD\_PRO-MED] In-session Unicast Repair for MBMS Object Distribution | Qualcomm Incorporated | Thomas Stockhammer |   **E-mail Discussion**: none  **Revisions**:   * <https://www.3gpp.org/ftp/tsg_sa/WG4_CODEC/3GPP_SA4_AHOC_MTGs/SA4_MBS/Inbox/Drafts/S4aI250117_BBC.docx>   **Presenter**: Thomas Stockhammer  **Online Discussion**: (September 3/4/5 2025)  Richard: I like the several rule identifiers, since it is useful for various use cases. If you are signaling the rule in SDP, it tells what to expected in transmission. Who tells the transmitter to use the rule?  Thorsten: We are silent where the MBS SDP is generated.  Richard: if some entity in system generate the rule and the SDP, it is fine.  Thorsten: I like the idea of indicating the sequences. But we need to be clear this is object level and not at the segment level. It might be worth to add a note.  Thomas: We can add a note that the objects in same order are not necessarily from the same media type.  Thomas: When MPD update is done, do you use a new TOI?  Thorsten: yes.  Thomas: we need to update the figure.  **Decision**:  [S4aI250117](https://www.3gpp.org/ftp/TSG_SA/WG4_CODEC/3GPP_SA4_AHOC_MTGs/SA4_MBS/Docs/S4aI250117.zip) is **revised to 148  to be reviewed in wash up**. | | | | | | | | |

## ===== CHANGE =====

# 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, edition number, version number, etc.) or non‑specific.

- For a specific reference, subsequent revisions do not apply.

- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[26517] 3GPP TS 26.517 "5G Multicast-Broadcast User Services; Protocols and Formats".

## ===== CHANGE =====

### 7.2.9 Signalling of parameters with FDT instances

The extended FLUTE FDT instance schema defined in clause 7.2.10.1 (based on the one in RFC 3926 [9]) shall be used. In addition, the following applies to both the session level information and all files of a FLUTE session.

The inclusion of these FDT Instance data elements is mandatory according to the FLUTE specification:

- *Content-Location* (URI of a file).

- *TOI* (Transport Object Identifier of a file instance).

- *Expires* (expiry data for the FDT Instance).

For MBMS operation, the UE shall not use a received FDT Instance to interpret packets received beyond the expiration time of the FDT Instance.

NOTE 1: This requirement is strengthened for MBMS compared to RFC 3926 [9], where it is mentioned that "the receiver SHOULD NOT use a received FDT Instance to interpret packets received beyond the expiration time of the FDT Instance."

NOTE 2: It is expected that a TOI value may be reused after the highest expiry time of the FDT instances containing that TOI value.

NOTE 3: Since the expiry time corresponds to the end of transmission, A UE can either clean up its memory in case not sufficient symbols are received, or perform file repair if enabled in the system, or make partial file delivery available to the application (e.g. see clause 7.2.3 in TR 26.946 [110]).

Additionally, the inclusion of these FDT Instance data elements is mandatory. Note the following elements are optional in the FDT schema to stay aligned with the IETF RFC defined schema:

- *Content-Length* (source file length in bytes).

- *Content-Type* (content MIME type).

- *FEC Encoding ID*.

Other FEC Object Transmission Information specified by the FEC scheme in use:

NOTE 4: The FEC Object Transmission Information elements used are dependent on the FEC scheme, as indicated by the FEC Encoding ID.

- *FEC-OTI-Maximum-Source-Block-Length*. When the FEC Encoding ID indicates the "Compact No-Code FEC scheme", the value of this data element shall not exceed 65535, consistent with the 16-bit constraint on the Encoding Symbol ID specified in section 3 of RFC 3695 [13] and in section 3.3 of RFC 3926 [9].

- *FEC-OTI-Encoding-Symbol-Length*.

- *FEC-OTI-Max-Number-of-Encoding-Symbols*.

- *FEC-OTI-Scheme-Specific-Info*.

NOTE 5: RFC 3926 [9] describes which part or parts of an FDT Instance may be used to provide these data elements.

These optional FDT Instance data elements may or may not be included for FLUTE in MBMS:

- *Complete* (the signalling that an FDT Instance provides a complete, and subsequently unmodifiable, set of file parameters for a FLUTE session may or may not be performed according to this method).

- *Content-Encoding*.

- *Content-MD5*: represents a digest of the transport object. The file server should indicate the MD5 hash value whenever multiple versions of the file are anticipated for the download session.

- *IndependentUnitPositions*: represents a list of byte position in the file, at which the handler assigned to the Content-Type for the file may access the file.

- *File-ETag*: represents the value of the entity tag as defined in RFC 9110 [155] which may also serve as the version identifier of the file object described by the FDT Instance.

- *Repair-Start*: the earliest date–time at which unicast repair may be started for the file object described by the FDT Instance.

- *Repair-Limit-Percentage*: the maximum number of unicast repairs that the MBMS Client may attempt over the last 100 objects received on this session. This allows, for example, the service provider to configure a limit on the number of requests from clients outside coverage.

NOTE 6: The values for each of the above data elements are calculated or discovered by the FLUTE sender.

The FEC-OTI-Scheme-Specific-Info FDT Instance data element contains information specific to the FEC scheme indicated by the FEC Encoding ID encoded using Base 64.

## ===== CHANGE =====

#### 7.2.10.1 Extended FLUTE FDT syntax

The XML schema specified in listing 7.2.10‑1 below shall be use for the FDT Instance. The filename of this schema is "TS26346\_FLUTE-FDT.xsd". This schema extends the baseline IETF schema reproduced in clause 7.2.10.3 by importing the 3GPP extensions specified in clauses 7.2.10.2 and J.2.

In this version of the present document the network shall set the content of the *schemaVersion* element, defined as a child of the *FDT-Instance* element, to the value 5.

The schema *version* attribute (part of the schema instruction) shall be included in the UE schema and the network schema.

NOTE: The value of the *schemaVersion* element and *version* attribute is intended to be increased by 1 in every future release where new element(s) or attribute(s) are added.

When a UE receives an instantiation of an FDT compliant to this schema, it shall determine the schema version required to parse the instantiation as follows:

- If the UE supports one or more versions of the FDT schema with the schema *version* attribute, then the UE shall use the schema that has the highest schema *version* attribute value that is equal to or less than the value in the received *schemaVersion* element;

Listing 7.2.10‑1: Extended FLUTE FDT schema

|  |
| --- |
| <?xml version="1.0" encoding="UTF-8"?>  <xs:schema targetNamespace="urn:IETF:metadata:2005:FLUTE:FDT" version="5"  xmlns="urn:IETF:metadata:2005:FLUTE:FDT"  xmlns:xs="http://www.w3.org/2001/XMLSchema"  xmlns:mbms2005="urn:3GPP:metadata:2005:MBMS:FLUTE:FDT"  xmlns:mbms2007="urn:3GPP:metadata:2007:MBMS:FLUTE:FDT"  xmlns:mbms2008="urn:3GPP:metadata:2008:MBMS:FLUTE:FDT\_ext"  xmlns:mbms2009="urn:3GPP:metadata:2009:MBMS:FLUTE:FDT\_ext"  xmlns:mbms2012="urn:3GPP:metadata:2012:MBMS:FLUTE:FDT"  xmlns:mbms2015="urn:3GPP:metadata:2015:MBMS:FLUTE:FDT"  xmlns:sv="urn:3gpp:metadata:2009:MBMS:schemaVersion"  elementFormDefault="qualified">  <xs:annotation>  <xs:documentation>Extended MBMS FLUTE File Delivery Table schema</xs:documentation>  <xs:documentation>3GPP TS 26.346 clause 7.2.10.1</xs:documentation>  <xs:documentation>Copyright © 2005, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC). All rights reserved.</xs:documentation>  </xs:annotation>  <xs:import namespace="urn:3GPP:metadata:2005:MBMS:FLUTE:FDT"  schemaLocation="TS26346\_FLUTE-FDT\_Extensions\_Rel-6.xsd"/>  <xs:import namespace="urn:3GPP:metadata:2007:MBMS:FLUTE:FDT"  schemaLocation="TS26346\_FLUTE-FDT\_Extensions\_Rel-7.xsd"/>  <xs:import namespace="urn:3GPP:metadata:2008:MBMS:FLUTE:FDT\_ext"  schemaLocation="TS26346\_FLUTE-FDT\_Extensions\_Rel-8.xsd"/>  <xs:import namespace="urn:3GPP:metadata:2009:MBMS:FLUTE:FDT\_ext"  schemaLocation="TS26346\_FLUTE-FDT\_Extensions\_Rel-9.xsd"/>  <xs:import namespace="urn:3GPP:metadata:2012:MBMS:FLUTE:FDT"  schemaLocation="TS26346\_FLUTE-FDT\_Extensions\_Rel-11.xsd"/>  <xs:import namespace="urn:3GPP:metadata:2015:MBMS:FLUTE:FDT"  schemaLocation="TS26346\_FLUTE-FDT\_Extensions\_Rel-13.xsd"/>  <xs:import namespace="urn:3gpp:metadata:2009:MBMS:schemaVersion"  schemaLocation="TS26346\_SchemaVersion.xsd"/>  <xs:element name="FDT-Instance" type="FDT-InstanceType"/>  <xs:complexType name="FDT-InstanceType">  <xs:sequence>  <xs:element name="File" type="FileType" maxOccurs="unbounded"/>  <xs:element ref="sv:schemaVersion"/>  <xs:element ref="mbms2012:Base-URL-1" minOccurs="0" maxOccurs="unbounded"/>  <xs:element ref="mbms2012:Base-URL-2" minOccurs="0" maxOccurs="unbounded"/>  <xs:element ref="sv:delimiter"/>  <xs:element name="Group" type="mbms2005:groupIdType" minOccurs="0" maxOccurs="unbounded"/>  <xs:element name="MBMS-Session-Identity-Expiry" type="mbms2005:MBMS-Session-Identity-Expiry-Type" minOccurs="0" maxOccurs="unbounded"/>  <xs:any namespace="##other" processContents="skip" minOccurs="0" maxOccurs="unbounded"/>  </xs:sequence>  <xs:attribute name="Expires" type="xs:string" use="required"/>  <xs:attribute name="Complete" type="xs:boolean" use="optional"/>  <xs:attribute name="Content-Type" type="xs:string" use="optional"/>  <xs:attribute name="Content-Encoding" type="xs:string" use="optional"/>  <xs:attribute name="FEC-OTI-FEC-Encoding-ID" type="xs:unsignedLong" use="optional"/>  <xs:attribute name="FEC-OTI-FEC-Instance-ID" type="xs:unsignedLong" use="optional"/>  <xs:attribute name="FEC-OTI-Maximum-Source-Block-Length" type="xs:unsignedLong" use="optional"/>  <xs:attribute name="FEC-OTI-Encoding-Symbol-Length" type="xs:unsignedLong" use="optional"/>  <xs:attribute name="FEC-OTI-Max-Number-of-Encoding-Symbols" type="xs:unsignedLong" use="optional"/>  <xs:attribute name="FEC-OTI-Scheme-Specific-Info" type="xs:base64Binary" use="optional"/>  <xs:attribute ref="mbms2008:FullFDT" use="optional" default="false"/>  <xs:anyAttribute processContents="skip"/>  </xs:complexType>  <xs:complexType name="FileType">  <xs:sequence>  <xs:element ref="mbms2007:Cache-Control" minOccurs="0"/>  <xs:element ref="sv:delimiter"/>  <xs:element ref="mbms2012:Alternate-Content-Location-1" minOccurs="0" maxOccurs="unbounded"/>  <xs:element ref="mbms2012:Alternate-Content-Location-2" minOccurs="0" maxOccurs="unbounded"/>  <xs:element ref="sv:delimiter"/>  <xs:element name="Group" type="mbms2005:groupIdType" minOccurs="0" maxOccurs="unbounded"/>  <xs:element name="MBMS-Session-Identity" type="mbms2005:MBMS-Session-Identity-Type" minOccurs="0" maxOccurs="unbounded"/>  <xs:any namespace="##other" processContents="skip" minOccurs="0" maxOccurs="unbounded"/>  </xs:sequence>  <xs:attribute name="Content-Location" type="xs:anyURI" use="required"/>  <xs:attribute name="TOI" type="xs:positiveInteger" use="required"/>  <xs:attribute name="Content-Length" type="xs:unsignedLong" use="optional"/>  <xs:attribute name="Transfer-Length" type="xs:unsignedLong" use="optional"/>  <xs:attribute name="Content-Type" type="xs:string" use="optional"/>  <xs:attribute name="Content-Encoding" type="xs:string" use="optional"/>  <xs:attribute name="Content-MD5" type="xs:base64Binary" use="optional"/>  <xs:attribute name="FEC-OTI-FEC-Encoding-ID" type="xs:unsignedLong" use="optional"/>  <xs:attribute name="FEC-OTI-FEC-Instance-ID" type="xs:unsignedLong" use="optional"/>  <xs:attribute name="FEC-OTI-Maximum-Source-Block-Length" type="xs:unsignedLong" use="optional"/>  <xs:attribute name="FEC-OTI-Encoding-Symbol-Length" type="xs:unsignedLong" use="optional"/>  <xs:attribute name="FEC-OTI-Max-Number-of-Encoding-Symbols" type="xs:unsignedLong" use="optional"/>  <xs:attribute name="FEC-OTI-Scheme-Specific-Info" type="xs:base64Binary" use="optional"/>  <xs:attribute ref="mbms2009:Decryption-KEY-URI" use="optional"/>  <xs:attribute ref="mbms2012:FEC-Redundancy-Level" use="optional"/>  <xs:attribute ref="mbms2012:File-ETag" use="optional"/>  <xs:attribute ref="mbms2015:IndependentUnitPositions" use="optional"/>  <xs:attribute ref="mbms2025:Repair-Start" use="optional"/>  <xs:attribute ref="mbms2025:Repair-Limit-Percentage" use="optional"/>  <xs:anyAttribute processContents="skip"/>  </xs:complexType>  </xs:schema> |

#### 7.2.10.2 3GPP FLUTE FDT schema extensions

The Release 6 extensions to the 3GPP FLUTE FDT schema are specified in listing 7.2.10.2‑1 below. The filename of this schema is "TS26346\_FLUTE-FDT\_Extensions\_Rel-6.xsd".

Listing 7.2.10.2‑1: 3GPP FLUTE FDT schema extensions (Release 6)

|  |
| --- |
| <?xml version="1.0" encoding="UTF-8"?>  <xs:schema targetNamespace="urn:3GPP:metadata:2005:MBMS:FLUTE:FDT"xmlns="urn:3GPP:metadata:2005:MBMS:FLUTE:FDT"  xmlns:xs="http://www.w3.org/2001/XMLSchema"  elementFormDefault="qualified">  <xs:annotation>  <xs:documentation>MBMS FLUTE FDT schema extensions (Release 6)</xs:documentation>  <xs:documentation>3GPP TS 26.346 clause 7.2.10.2</xs:documentation>  <xs:documentation>Copyright © 2005, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC). All rights reserved.</xs:documentation>  </xs:annotation>  <xs:complexType name="MBMS-Session-Identity-Expiry-Type">  <xs:simpleContent>  <xs:extension base="MBMS-Session-Identity-Type">  <xs:attribute name="value" type="xs:unsignedInt" use="required"/>  </xs:extension>  </xs:simpleContent>  </xs:complexType>  <xs:simpleType name="MBMS-Session-Identity-Type">  <xs:restriction base="xs:unsignedByte"/>  </xs:simpleType>  <xs:simpleType name="groupIdType">  <xs:restriction base="xs:string"/>  </xs:simpleType>  </xs:schema> |

The Release 7 extensions to the 3GPP FLUTE FDT schema are specified in listing 7.2.10.2‑2 below. The filename of this schema is "TS26346\_FLUTE-FDT\_Extensions\_Rel-7.xsd".

Listing 7.2.10.2‑2: 3GPP FLUTE FDT schema extensions (Release 7)

|  |
| --- |
| <?xml version="1.0" encoding="UTF-8"?>  <xs:schema targetNamespace="urn:3GPP:metadata:2007:MBMS:FLUTE:FDT"  xmlns="urn:3GPP:metadata:2007:MBMS:FLUTE:FDT"  xmlns:xs="http://www.w3.org/2001/XMLSchema"  elementFormDefault="qualified">  <xs:annotation>  <xs:documentation>MBMS FLUTE FDT schema extensions (Release 7)</xs:documentation>  <xs:documentation>3GPP TS 26.346 clause 7.2.10.2</xs:documentation>  <xs:documentation>Copyright © 2007, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC). All rights reserved.</xs:documentation>  </xs:annotation>    <xs:element name="Cache-Control">  <xs:complexType>  <xs:choice>  <xs:element name="no-cache" type="xs:boolean" fixed="true"/>  <xs:element name="max-stale" type="xs:boolean" fixed="true"/>  <xs:element name="Expires" type="xs:unsignedInt"/>  </xs:choice>  <xs:anyAttribute processContents="skip"/>  </xs:complexType>  </xs:element>  </xs:schema> |

The Release 8 extensions to the 3GPP FLUTE FDT schema are specified in listing 7.2.10.2‑3 below. The filename of this schema is "TS26346\_FLUTE-FDT\_Extensions\_Rel-8.xsd".

Listing 7.2.10.2‑3: 3GPP FLUTE FDT schema extensions (Release 8)

|  |
| --- |
| <?xml version="1.0" encoding="UTF-8"?>  <xs:schema targetNamespace="urn:3GPP:metadata:2008:MBMS:FLUTE:FDT\_ext"  xmlns="urn:3GPP:metadata:2008:MBMS:FLUTE:FDT\_ext"  xmlns:xs="http://www.w3.org/2001/XMLSchema"  elementFormDefault="qualified">  <xs:annotation>  <xs:documentation>MBMS FLUTE FDT schema extensions (Release 8)</xs:documentation>  <xs:documentation>3GPP TS 26.346 clause 7.2.14</xs:documentation>  <xs:documentation>Copyright © 2008, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC). All rights reserved.</xs:documentation>  </xs:annotation>  <xs:attribute name="FullFDT" type="xs:boolean"/>  </xs:schema> |

The Release 9 extensions to the 3GPP FLUTE FDT schema are specified in listing 7.2.10.2‑4 below. The filename of this XML schema is "TS26346\_FLUTE-FDT\_Extensions\_Rel-9.xsd".

Listing 7.2.10.2‑4: 3GPP FLUTE FDT schema extensions (Release 9)

|  |
| --- |
| <?xml version="1.0" encoding="UTF-8"?>  <xs:schema targetNamespace="urn:3GPP:metadata:2009:MBMS:FLUTE:FDT\_ext"  xmlns="urn:3GPP:metadata:2009:MBMS:FLUTE:FDT\_ext"  xmlns:xs="http://www.w3.org/2001/XMLSchema"  elementFormDefault="qualified">  <xs:annotation>  <xs:documentation>MBMS FLUTE FDT schema extensions (Release 9)</xs:documentation>  <xs:documentation>3GPP TS 26.346 clause 7.2.15</xs:documentation>  <xs:documentation>Copyright © 2009, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC). All rights reserved.</xs:documentation>  </xs:annotation>  <xs:attribute name="Decryption-KEY-URI" type="xs:anyURI"/>  </xs:schema> |

The Release 11 extensions to the 3GPP FLUTE FDT schema are specified in listing 7.2.10.2‑5 below. The filename of this schema is "TS26346\_FLUTE-FDT\_Extensions\_Rel-11.xsd".

Listing 7.2.10.2‑5: 3GPP FLUTE FDT schema extensions (Release 11)

|  |
| --- |
| <?xml version="1.0" encoding="UTF-8"?>  <xs:schema targetNamespace="urn:3GPP:metadata:2012:MBMS:FLUTE:FDT"  xmlns="urn:3GPP:metadata:2012:MBMS:FLUTE:FDT"  xmlns:xs="http://www.w3.org/2001/XMLSchema"  elementFormDefault="qualified">  <xs:annotation>  <xs:documentation>MBMS FLUTE FDT schema extensions (Release 11)</xs:documentation>  <xs:documentation>3GPP TS 26.346 clause 7.2.10.2</xs:documentation>  <xs:documentation>Copyright © 2012, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC). All rights reserved.</xs:documentation>  </xs:annotation>  <xs:element name="Alternate-Content-Location-1" type="Alternative-Content-LocationType"/>  <xs:element name="Alternate-Content-Location-2" type="Alternative-Content-LocationType"/>  <xs:complexType name="Alternative-Content-LocationType">  <xs:sequence>  <xs:element name="Alternate-Content-Location" type="xs:anyURI" minOccurs="0" maxOccurs="unbounded"/>  </xs:sequence>  <xs:attribute name="Availability-Time" type="xs:dateTime"/>  </xs:complexType>  <xs:element name="Base-URL-1" type="xs:anyURI"/>  <xs:element name="Base-URL-2" type="xs:anyURI"/>  <xs:attribute name="FEC-Redundancy-Level" type="xs:unsignedInt"/>  <xs:attribute name="File-ETag" type="xs:string"/>  </xs:schema> |

The Release 13 extensions to the 3GPP FLUTE FDT schema are specified in listing 7.2.10.2‑6 below. The filename of this schema is "TS26346\_FLUTE-FDT\_Extensions\_Rel-13.xsd".

Listing 7.2.10.2‑6: 3GPP FLUTE FDT schema extensions (Release 13)

|  |
| --- |
| <?xml version="1.0" encoding="UTF-8"?>  <xs:schema targetNamespace="urn:3GPP:metadata:2015:MBMS:FLUTE:FDT"  xmlns="urn:3GPP:metadata:2015:MBMS:FLUTE:FDT"  xmlns:xs="http://www.w3.org/2001/XMLSchema"  elementFormDefault="qualified">  <xs:annotation>  <xs:documentation>MBMS FLUTE FDT schema extensions (Release 13)</xs:documentation>  <xs:documentation>3GPP TS 26.346 clause 7.2.10.2</xs:documentation>  <xs:documentation>Copyright © 2015, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC). All rights reserved.</xs:documentation>  </xs:annotation>  <xs:attribute name="IndependentUnitPositions" type="IndependentUnitPositionsType"/>  <xs:simpleType name="IndependentUnitPositionsType">  <xs:list itemType="xs:unsignedLong"/>  </xs:simpleType>  </xs:schema> |

The Release 19 extensions to the 3GPP FLUTE FDT schema are specified in listing 7.2.10.2‑7 below. The filename of this schema is "TS26346\_FLUTE-FDT\_Extensions\_Rel-19.xsd".

Listing 7.2.10.2‑7: 3GPP FLUTE FDT schema extensions (Release 19)

|  |
| --- |
| <?xml version="1.0" encoding="UTF-8"?>  <xs:schema targetNamespace="urn:3GPP:metadata:2015:MBMS:FLUTE:FDT"  xmlns="urn:3GPP:metadata:2025:MBMS:FLUTE:FDT"  xmlns:xs="http://www.w3.org/2001/XMLSchema"  elementFormDefault="qualified">  <xs:annotation>  <xs:documentation>MBMS FLUTE FDT schema extensions (Release 19)</xs:documentation>  <xs:documentation>3GPP TS 26.346 clause 7.2.10.2</xs:documentation>  <xs:documentation>Copyright © 2025, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC). All rights reserved.</xs:documentation>  </xs:annotation>  <xs:attribute name="Repair-Start" type="xs:dateTime"/>  <xs:attribute name="Repair-Limit-Percentage" type="xs:unsignedInt"/>  </xs:schema> |

## ===== CHANGE =====

#### 7.3.2.5 Multiple objects transport indication

RFC 3626 [9] requires the use of the Transport Object Identifier (TOI) header field (with one exception for packets with no payload when the A flag is used). The transport of a single FLUTE file requires that multiple TOIs are used (TOI 0 for FDT Instances). Generally, there is no further need to indicate to receivers that the session carries packets for more than one object. However, in certain circumstances, the FLUTE transmitter applies specific sending rules for objects in a session and the knowledge of this is potentially beneficial for the receiver is applied.

The following sending rules are defined:

- *Object sequence number* rule: The FLUTE sender increments the TOI to sequentially with every object sent, allowing the receiving end to detect object loss. The initial sequence number is randomized, and the sequence number wraps around from the highest value (for 16 bit TOIs 65535, i.e. 0xFFFF, and for 32-bit TOIs 0xFFFFFFFF) to 1 (0 is reserved for the FDT).

NOTE: Objects sent in order are necessarily of the same media type. For example, in DASH-over-MBMS streaming, the sequence of objects may include audio segments, video segments and MPD updates.

- *Sequential object sending* rule: The FLUTE sender completes the sending of all packets of one object before it sends any LCT packet of another object, allowing the receiving end to detect completion of sending an object with the reception of a packet for a new object.

Table 7.3.2.5-1 define several rule identifiers.

Table 7.3.2.5-1: Rule identifiers for sending rules

|  |  |
| --- | --- |
| Rule Identifier | Definition |
| 0 | No specific sending rules are defined. In the absence of the sending rules attribute, this is the default value. |
| 1 | The *object sequence number* rule is in use. |
| 2 | The *sequential object sending* rule is in use. |
| 3 | Both the *object sequence number* rule and the *sequential object sending* rule are in use. |
| 4 – 9 | Reserved for future use. |

In order to define sending rules a new attribute "flute-sending-rules" is defined as follows

- flute-sending-rules-declaration-line = "a= flute-sending-rules:" rule-id CRLF

- rule-id = 1 \* DIGIT

## ===== CHANGE =====

### 7.3.3 SDP examples for FLUTE Session

Here is a full example of SDP description describing a FLUTE session:

v=0

o=user123 2890844526 2890842807 IN IP6 2201:056D::112E:144A:1E24

s=File delivery session example

i=More information

t=2873397496 2873404696

a=mbms-mode:broadcast 123869108302929 1

a=FEC-declaration:0 encoding-id=1

a=source-filter: incl IN IP6 \* 2001:210:1:2:240:96FF:FE25:8EC9

a=flute-tsi:3

m=application 12345 FLUTE/UDP 0

c=IN IP6 FF1E:03AD::7F2E:172A:1E24/1

b=64

a=lang:EN

a=FEC:0

Below is a second example of an SDP description describing a FLUTE session and which indicates that 25% redundant FEC protection is applied to the FEC encoding of the video Segments of the associated DASH-formatted content:

v=0

o=user123 2890844526 2890842807 IN IP6 2201:056D::112E:144A:1E24

s=Download session carrying 2-hour DASH-encoded program

i=More information

t=3615124600 3615131800

a=mbms-mode:broadcast 123869108302929 1

a=FEC-declaration:0 encoding-id=1

a=FEC-redundancy-level:0 redundancy-level=25

a=source-filter: incl IN IP6 \* 2001:210:1:2:240:96FF:FE25:8EC9

a=flute-tsi:5

m=video 10111 FLUTE/UDP 0

c=IN IP6 FF1E:03AD::7F2E:172A:1E24/1

b=512

a=lang:EN

Below is a third example of an SDP description describing a FLUTE session with three TMGIs: one associated with the MBMS bearer mode declaration attribute, and two others that are carried in the "*alternative-tmgi*" attribute:

v=0

o=user123 2890844526 2890842807 IN IP6 2201:056D::112E:144A:1E24

s=Download session carrying 2-hour DASH-encoded program

i=More information

t=3615124600 3615131800

a=mbms-mode:broadcast-mbsfn 123869108302929

a=FEC-declaration:0 encoding-id=1

a=FEC-redundancy-level:0 redundancy-level=25

a=source-filter: incl IN IP6 \* 2001:210:1:2:240:96FF:FE25:8EC9

a=flute-tsi:5

a=alternative-tmgi:123869108302899,123869108302915

m=video 10111 FLUTE/UDP 0

c=IN IP6 FF1E:03AD::7F2E:172A:1E24/1

b=512

a=lang:EN

Below is a fourth example of SDP description describing a FLUTE session for which the sending rules specified in clause 7.3.2.5 are applied:

v=0

o=user123 2890844526 2890842807 IN IP6 2201:056D::112E:144A:1E24

s=File delivery session example

i=More information

t=2873397496 2873404696

a=mbms-mode:broadcast 123869108302929 1

a=FEC-declaration:0 encoding-id=1

a=source-filter: incl IN IP6 \* 2001:210:1:2:240:96FF:FE25:8EC9

a=flute-tsi:3

**a=flute-sending-rules:3**

m=application 12345 FLUTE/UDP 0

c=IN IP6 FF1E:03AD::7F2E:172A:1E24/1

b=64

a=lang:EN

a=FEC:0

## ===== CHANGE =====

## 9.1 Introduction

Associated delivery procedures describe general procedures, which start before, during or after the MBMS data transmission phase. They provide auxiliary features to MBMS user services in addition, and in association with, MBMS delivery methods and their sessions. Those procedures that shall only be permitted after the MBMS Data transmission phase may also be described as post-delivery procedures.

To enable future backwards compatibility, clause 9 specifies generic and extensible techniques for a potentially wide range of associated delivery procedures.

Clauses 9.3 and 9.4 specify the associated delivery procedures that are initiated only after an MBMS data transmission phase. These procedures can be supported by any UE that is unicast-capable, including one that is not capable of operating MBMS bearer services and unicast services concurrently.

The present document describes the following associated delivery procedures:

- File repair, for post-delivery repair of files initially delivered as part of an MBMS download session (clause 9.3).

- Content reception reporting of download files and/or media streams of an MBMS User Service delivered to an MBMS UE, which may include the reporting of DASH QoE metrics for a DASH-over-MBMS service (clause 9.4).

- Consumption reporting of MBMS User Service (clause 9.4A).

- In-session file repair for files delivered as part of an MBMS download session during an ongoing MBMS download session (clause 9.4B).

These procedures are enabled by establishing a point-to-point connection; and using the MBMS session parameters, received during User Service Discovery/Announcement, to communicate the context (e.g. file and session in question) to the network and the MBMS sender infrastructure. To avoid network congestion in the uplink and downlink directions, and also to protect servers against overload situations, the associated delivery procedures from different MBMS UEs shall be distributed over time and resources (network elements).

One or more *serviceURI* elements in the Associated Delivery Procedure Description are used to specify the network server(s) associated with one or more of the following Associated Delivery Procedure functionality: symbol-based file repair, reception reporting, and consumption reporting. In MBMS download delivery, the use of the *Alternate-Content-Location-1* or *Alternate-Content-Location-2* elements alone, or in combination with the *Base-URL-1* or *Base-URL-2* elements in the FDT specify standard HTTP/1.1 servers in support of byte-range-based file repair. The network can selectively enable or disable the use of confidentiality protection of Reception Reporting, Consumption Reporting, and/or File Repair, based on indicating in the server identities the use of the ‘HTTPS’ or ‘HTTP’ scheme as specified in TS 33.246 [10] clause 6.7.

NOTE: The use of the HTTPS scheme for Reception Reporting, Consumption Reporting, or File Repair Associated Delivery Procedures is restricted to servers for which a trusted root certificate is present in the list described in TS 33.246 [10], clause 6.7.3.

An instance of an "associated procedure description" is an XML file that describes the configuration parameters of one or more associated delivery procedures.

MBMS Download receivers shall support the file repair procedure as defined in clause 9.3.

MBMS Download receivers shall support the reception reporting procedure as defined in clause 9.4.

MBMS Download receivers shall support the consumption reporting procedures as defined in clause 9.4A.

MBMS Streaming receivers shall support reception reporting procedures (StaR and StaR-all report types) as defined in clause 9.4.

MBMS Download receivers shall support the in-session unicast file repair procedure as defined in clause 9.6 if the UE permits concurrent usage of MBMS bearer services and unicast reception.

MBMS Transparent Delivery receivers are not expected to support any associated delivery procedures.

## ===== CHANGE =====

## 9.4B In-session unicast file repair

### 9.4B.1 Overview

This clause defines the unicast file repair retrieval protocol for in-session repair between the MBMS Client and the BM-SC when the delivery of a file in an MBMS Download Delivery Session was not completely successful during the session. The detailed procedures are based on the in-session object repair procedure is specified in clause 6.2.4.3 of TS 26.517 [26517].

The unicast file repair protocol is based on HTTP per RFC 9110 [155] and the general requirements specified in clause 8.2 and 8.3 of TS 26.517 [26517] shall apply to all interactions between these two functional entities at this reference point.

The remainder of this clause provides the following:

- The mapping of the MBMS User Service Announcement parameters to the in-session unicast file repair procedure parameters in order to execute the procedures defined in clause 6.2.4.3 of TS 26.517 [26517].

- An MBMS Client shall implement the procedures defined in clause 9.4B.3 to support the object repair protocol.

- A BM-SC shall implement the procedures defined in clause 9.4B.4 to support the object repair protocol.

### 9.4B.2 Parameter mapping to MBMS

Clause 6.2.4.3.2 of TS 26.517 [26517] defines generic parameters for the in-session object repair procedure. Table 9.4B.2-1 provides a mapping of parameters included in the Associated Delivery Procedures defined in clause 9.4B.5 to the parameters defined in clause 6.2.4.3.2 of TS 26.517 [26517].

Table 9.4B.2‑1: Mapping of abstract in-session to Associated Delivery Procedure parameters

| Abstract parameter | Associated Delivery Procedure Description property | Clause reference |
| --- | --- | --- |
| *offset‌Time* | inSessionRepair**‌**@offsetTime | 9.5.1 |
| *randomTimePeriod* | inSessionRepair**‌**@randomTimePeriod | 9.5.1 |
| *repair‌Limit‌Percentage* | inSessionRepair**‌**@repair‌Limit‌Percentage | 9.5.1 |
| *object‌Distribution‌BaseLocator* | inSessionRepair.‌object‌Distribution‌Base‌Locator | 9.5.1 |
| *object‌Repair‌BaseLocators* | inSessionRepair.‌object‌RepairBase‌Locator | 9.5.1 |

NOTE: The use of File@Alternate-Content-Location-1 and File@Alternate-Content-Location-2 to advertise the Object Repair parameters in the FLUTE FDT instance is for further study.

### 9.4B.3 MBMS Client procedures

This clause defines the MBMS Client procedures for the in-session unicast file repair protocol.

The MBMS Client shall follow the requirements and recommendations specified in clause 6.2.4.3 of TS 26.517 [26517] based on the parameters defined in clause 9.6.2.

### 9.4B.4 BM-SC requirements

This clause defines the BM-SC procedures for the in-session unicast file repair protocol.

A functional component of the BM-SC is assigned to an MBMS Download delivery session and hosts all objects at a location as specified in clause 6.2.4.4 of TS 26.517 [26517].

- This functional component shall be an HTTP server that complies with the general provisions in clause 8.2 and 8.3 of TS 26.517 [26517] and shall respond to all requests as specified in clause 9.4B.3.

- When used for in-session unicast file repair, this functional component shall follow the requirements and recommendations of the object delivery server specified in clause 6.2.4.3 of TS 26.517 [26517].

## ===== CHANGE =====

### 9.5.1 Associated Delivery Procedures Description syntax

Below is the formal XML syntax of Associated Delivery Procedures Description instances. Documents following this schema can be identified with the MIME media type "application/mbms‑associated-procedure-description+xml" specified in clause C.7. The schema filename of delivery procedure description is "TS26346\_AssociatedDeliveryProceduresDescription.xsd".

In this version of the present document, the network shall set the content of the *schemaVersion* element, defined as a child of the *associatedProcedureDescription* element, to the value 3.

The schema *version* attribute (part of the schema instruction) shall be included in the UE schema and the network schema.

NOTE: The value of the *schemaVersion* element and *version* attribute is intended to be increased by 1 in every future release where new element(s) or attribute(s) are added.

When a UE receives an instantiation of an Associated Delivery Procedures Description instance compliant to this schema, it shall determine the Associated Delivery Procedures Description schema version required to parse the instantiation as follows:

- If the UE supports one or more versions of the Associated Delivery Procedures Description schema with the schema *version* attribute, then the UE shall use the schema that has the highest schema *version* attribute value that is equal to or less than the value in the received *schemaVersion* element;

- Otherwise, if the UE supports an Associated Delivery Procedures Description schema without a schema *version* attribute, or if all of its Associated Delivery Procedures Description schemas with the *schema* *version* attribute have a value greater than the value received in the *schemaVersion* element, then the UE shall use its schema without a *version* attribute.

Listing 9.5.1‑1: Associated Delivery Procedures Description schema

|  |
| --- |
| <?xml version="1.0" encoding="UTF-8"?>  <xs:schema targetNamespace="urn:3gpp:metadata:2005:MBMS:associatedProcedure" version="3"  xmlns="urn:3gpp:metadata:2005:MBMS:associatedProcedure"  xmlns:xs="http://www.w3.org/2001/XMLSchema"  xmlns:r12="urn:3gpp:metadata:2005:MBMS:associatedProcedure-rel-12-extension"  xmlns:r13="urn:3gpp:metadata:2005:MBMS:associatedProcedure-rel-13-extension"  xmlns:r14="urn:3gpp:metadata:2005:MBMS:associatedProcedure-rel-14-extension"  xmlns:sv="urn:3gpp:metadata:2009:MBMS:schemaVersion"  elementFormDefault="qualified">  <xs:annotation>  <xs:documentation>MBMS Associated Delivery Procedures Description schema</xs:documentation>  <xs:documentation>3GPP TS 26.346 clause 9.5.1</xs:documentation>  <xs:documentation>Copyright © 2005, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC). All rights reserved.</xs:documentation>  </xs:annotation>  <xs:import namespace="urn:3gpp:metadata:2009:MBMS:schemaVersion" schemaLocation="TS26346\_SchemaVersion.xsd"/>  <xs:import namespace="urn:3gpp:metadata:2005:MBMS:associatedProcedure-rel-12-extension" schemaLocation="TS26346\_AssociatedDeliveryProceduresDescription\_Extensions\_Rel-12.xsd"/>  <xs:import namespace="urn:3gpp:metadata:2005:MBMS:associatedProcedure-rel-13-extension" schemaLocation="TS26346\_AssociatedDeliveryProceduresDescription\_Extensions\_Rel-13.xsd"/>  <xs:import namespace="urn:3gpp:metadata:2005:MBMS:associatedProcedure-rel-14-extension" schemaLocation="TS26346\_AssociatedDeliveryProceduresDescription\_Extensions\_Rel-14.xsd"/>  <xs:import namespace="urn:3gpp:metadata:2005:MBMS:associatedProcedure-rel-19-extension" schemaLocation="TS26346\_AssociatedDeliveryProceduresDescription\_Extensions\_Rel-19.xsd"/>  <xs:element name="associatedProcedureDescription" type="associatedProcedureType"/>  <xs:complexType name="associatedProcedureType">  <xs:sequence>  <xs:element name="postFileRepair" type="basicProcedureType" minOccurs="0"/>  <xs:element name="bmFileRepair" type="bmFileRepairType" minOccurs="0"/>  <xs:element name="postReceptionReport" type="reportProcedureType" minOccurs="0"/>  <xs:element ref="r12:consumptionReport" minOccurs="0"/>  <xs:element ref="sv:schemaVersion"/>  <xs:element ref="r13:DASHQoEProcedure" minOccurs="0"/>  <xs:element ref="sv:delimiter"/>  <xs:element ref="r19:inSessionRepair" minOccurs="0"/>  <xs:element ref="sv:delimiter"/>  <xs:any namespace="##other" processContents="skip" minOccurs="0" maxOccurs="unbounded"/>  </xs:sequence>  </xs:complexType>  <xs:complexType name="basicProcedureType">  <xs:sequence>  <xs:element name="serviceURI" type="xs:anyURI" maxOccurs="unbounded"/>  </xs:sequence>  <xs:attribute name="offsetTime" type="xs:unsignedLong" use="optional"/>  <xs:attribute name="randomTimePeriod" type="xs:unsignedLong" use="required"/>  </xs:complexType>  <xs:complexType name="bmFileRepairType">  <xs:attribute name="sessionDescriptionURI" type="xs:anyURI" use="required"/>  </xs:complexType>  <xs:complexType name="reportProcedureType">  <xs:complexContent>  <xs:extension base="basicProcedureType">  <xs:attribute name="samplePercentage" type="xs:decimal" use="optional" default="100"/>  <xs:attribute name="forceTimeIndependence" type="xs:boolean" use="optional" default="false"/>  <xs:attribute name="reportType" use="optional" default="RAck">  <xs:simpleType>  <xs:union memberTypes="knownReportType xs:string"/>  </xs:simpleType>  </xs:attribute>  <xs:attribute ref="r14:reportInterval" use="optional"/>  </xs:extension>  </xs:complexContent>  </xs:complexType>  <xs:simpleType name="knownReportType">  <xs:restriction base="xs:string">  <xs:enumeration value="RAck"/>  <xs:enumeration value="StaR"/>  <xs:enumeration value="StaR-all"/>  <xs:enumeration value="StaR-only"/>  </xs:restriction>  </xs:simpleType>  </xs:schema> |

The Release 12 extensions to the Associated Delivery Procedures Description schema are specified in listing 9.5.1‑2. The schema filename is "TS26346\_AssociatedDeliveryProceduresDescription\_Extensions\_Rel-12.xsd".

Listing 9.5.1‑2: Associated Delivery Procedures Description schema extensions (Release 12)

|  |
| --- |
| <?xml version="1.0" encoding="UTF-8"?>  <xs:schema targetNamespace="urn:3gpp:metadata:2005:MBMS:associatedProcedure-rel-12-extension"  xmlns="urn:3gpp:metadata:2005:MBMS:associatedProcedure-rel-12-extension"  xmlns:xs="http://www.w3.org/2001/XMLSchema"  elementFormDefault="qualified">  <xs:annotation>  <xs:documentation>MBMS Associated Delivery Procedures Description schema extensions (Release 12)</xs:documentation>  <xs:documentation>3GPP TS 26.346 clause 9.5.1</xs:documentation>  <xs:documentation>Copyright © 2014, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC). All rights reserved.</xs:documentation>  </xs:annotation>  <xs:element name="consumptionReport" type="consumptionReportType"/>  <xs:complexType name="consumptionReportType">  <xs:sequence>  <xs:element name="serviceURI" type="xs:anyURI" maxOccurs="unbounded"/>  <xs:element name="location" type="uELocationType" minOccurs="0"/>  <xs:any namespace="##other" processContents="skip" minOccurs="0" maxOccurs="unbounded"/>  </xs:sequence>  <xs:attribute name="samplePercentage" type="xs:decimal" default="100"/>  <xs:attribute name="reportInterval" type="xs:duration"/>  <xs:attribute name="offsetTime" type="xs:unsignedLong"/>  <xs:attribute name="randomTimePeriod" type="xs:unsignedLong" use="required"/>  <xs:attribute name="reportClientId" type="xs:boolean" default="0"/>  <xs:anyAttribute processContents="skip"/>  </xs:complexType>  <xs:simpleType name="uELocationType">  <xs:union memberTypes="knownUELocationType xs:string"/>  </xs:simpleType>  <xs:simpleType name="knownUELocationType">  <xs:restriction base="xs:string">  <xs:enumeration value="CGI"/>  <xs:enumeration value="ECGI"/>  <xs:enumeration value="MBMS SAI"/>  </xs:restriction>  </xs:simpleType>  </xs:schema> |

The Release 13 extensions to the Associated Delivery Procedures Description schema are specified in listing 9.5.1‑3. The schema filename is "TS26346\_AssociatedDeliveryProceduresDescription\_Extensions\_Rel-13.xsd".

Listing 9.5.1‑3: Associated Delivery Procedures Description schema extensions (Release 13)

|  |
| --- |
| <?xml version="1.0" encoding="UTF-8"?>  <xs:schema targetNamespace="urn:3gpp:metadata:2005:MBMS:associatedProcedure-rel-13-extension"  xmlns="urn:3gpp:metadata:2005:MBMS:associatedProcedure-rel-13-extension"  xmlns:xs="http://www.w3.org/2001/XMLSchema"  elementFormDefault="qualified">  <xs:annotation>  <xs:documentation>MBMS Associated Delivery Procedures Description schema extensions (Release 13)</xs:documentation>  <xs:documentation>3GPP TS 26.346 clause 9.5.1</xs:documentation>  <xs:documentation>Copyright © 2015, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC). All rights reserved.</xs:documentation>  </xs:annotation>  <xs:element name="DASHQoEProcedure" type="DASHQoEProcedureType"/>  <xs:complexType name="DASHQoEProcedureType">  <xs:sequence>  <xs:element name="DASHQoEMetrics" type="xs:string"/>  <xs:element name="DASHQoESamplePercentage" type="xs:decimal" default="100" minOccurs="0"/>  <xs:any namespace="##other" processContents="skip" minOccurs="0" maxOccurs="unbounded"/>  </xs:sequence>  <xs:anyAttribute processContents="skip"/>  </xs:complexType>  </xs:schema> |

The Release 14 extensions to the Associated Delivery Procedures Description schema are specified in listing 9.5.1‑3. The schema filename is "TS26346\_AssociatedDeliveryProceduresDescription\_Extensions\_Rel-14.xsd".

Listing 9.5.1‑3: Associated Delivery Procedures Description schema extensions (Release 14)

|  |
| --- |
| <?xml version="1.0" encoding="UTF-8"?>  <xs:schema targetNamespace="urn:3gpp:metadata:2005:MBMS:associatedProcedure-rel-14-extension"  xmlns="urn:3gpp:metadata:2005:MBMS:associatedProcedure-rel-14-extension"  xmlns:xs="http://www.w3.org/2001/XMLSchema"  elementFormDefault="qualified">  <xs:annotation>  <xs:documentation>MBMS Associated Delivery Procedures Description schema extensions (Release 14)</xs:documentation>  <xs:documentation>3GPP TS 26.346 clause 9.5.1</xs:documentation>  <xs:documentation>Copyright © 2016, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC). All rights reserved.</xs:documentation>  </xs:annotation>  <xs:attribute name="reportInterval" type="xs:duration"/>  </xs:schema> |

The Release 19 extensions to the Associated Delivery Procedures Description schema are specified in listing 9.5.1‑4. The schema filename is "TS26346\_AssociatedDeliveryProceduresDescription\_Extensions\_Rel-19.xsd".

Listing 9.5.1‑4: Associated Delivery Procedures Description schema extensions (Release 19)

|  |
| --- |
| <?xml version="1.0" encoding="UTF-8"?>  <xs:schema targetNamespace="urn:3gpp:metadata:2005:MBMS:associatedProcedure-rel-19-extension"  xmlns="urn:3gpp:metadata:2005:MBMS:associatedProcedure-rel-19-extension"  xmlns:xs="http://www.w3.org/2001/XMLSchema"  elementFormDefault="qualified">  <xs:annotation>  <xs:documentation>MBMS Associated Delivery Procedures Description schema extensions (Release 13)</xs:documentation>  <xs:documentation>3GPP TS 26.346 clause 9.5.1</xs:documentation>  <xs:documentation>Copyright © 2015, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC). All rights reserved.</xs:documentation>  </xs:annotation>  <xs:element name="inSessionRepair" type="inSessionRepairType"/>  <xs:complexType name="inSessionRepairType">  <xs:sequence>  <xs:element name="objectDistributionBaseLocator" type="xs:anyURI" minOccurs="0" maxOccurs="1"/>  <xs:element name="objectRepairBaseLocator" type="xs:anyURI" minOccurs="0" maxOccurs="unbounded"/>  <xs:any namespace="##other" processContents="skip" minOccurs="0" maxOccurs="unbounded"/>  </xs:sequence>  <xs:attribute name="offsetTime" type="xs:unsignedInt"/>  <xs:attribute name="randomTimePeriod" type="xs:unsignedInt"/>  <xs:attribute name="repairLimitPercentage" type="xs:unsignedInt"/>  <xs:anyAttribute processContents="skip"/>  </xs:complexType>  </xs:schema> |

## ===== CHANGE =====

## L.6.1 Profiled FLUTE FDT syntax

The profiled FLUTE FDT schema, consolidating all schema extensions specified in clause 7.2.10.2 relevant to annex L of the present document, is specified in listing L.6.1‑1. The name of the file is "TS26346\_FLUTE-FDT\_Profiled.xsd".

Listing L.6.1‑1: Consolidated FLUTE FDT schema

|  |
| --- |
| <?xml version="1.0" encoding="UTF-8"?>  <xs:schema targetNamespace="urn:3GPP:metadata:2022:FLUTE:FDT" version="3"  xmlns="urn:3GPP:metadata:2022:FLUTE:FDT"  xmlns:xs="http://www.w3.org/2001/XMLSchema"  elementFormDefault="qualified">  <xs:annotation>  <xs:documentation>Consolidated MBMS FLUTE File Delivery Table schema</xs:documentation>  <xs:documentation>3GPP TS 26.346 clause L.6.1</xs:documentation>  <xs:documentation>Copyright © 2025, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC). All rights reserved.</xs:documentation>  </xs:annotation>  <xs:element name="FDT-Instance" type="FDT-InstanceType"/>  <xs:complexType name="FDT-InstanceType">  <xs:sequence>  <xs:element name="File" type="FileType" maxOccurs="unbounded"/>  <xs:element name="schemaVersion" type="xs:unsignedInt"/>  <xs:any namespace="##other" processContents="skip" minOccurs="0" maxOccurs="unbounded"/>  </xs:sequence>  <xs:attribute name="Expires" type="xs:string" use="required"/>  <xs:attribute name="Complete" type="xs:boolean" use="optional"/>  <xs:attribute name="Content-Type" type="xs:string" use="optional"/>  <xs:attribute name="Content-Encoding" type="xs:string" use="optional"/>  <xs:attribute name="FEC-OTI-FEC-Encoding-ID" type="xs:unsignedLong" use="optional"/>  <xs:attribute name="FEC-OTI-FEC-Instance-ID" type="xs:unsignedLong" use="optional"/>  <xs:attribute name="FEC-OTI-Maximum-Source-Block-Length" type="xs:unsignedLong" use="optional"/>  <xs:attribute name="FEC-OTI-Encoding-Symbol-Length" type="xs:unsignedLong" use="optional"/>  <xs:attribute name="FEC-OTI-Max-Number-of-Encoding-Symbols" type="xs:unsignedLong" use="optional"/>  <xs:attribute name="FEC-OTI-Scheme-Specific-Info" type="xs:base64Binary" use="optional"/>  <xs:anyAttribute processContents="skip"/>  </xs:complexType>  <xs:complexType name="FileType">  <xs:sequence>  <xs:element name="Cache-Control" type="CacheControlType" minOccurs="0"/>  <xs:any namespace="##other" processContents="skip" minOccurs="0" maxOccurs="unbounded"/>  </xs:sequence>  <xs:attribute name="Content-Location" type="xs:anyURI" use="required"/>  <xs:attribute name="TOI" type="xs:positiveInteger" use="required"/>  <xs:attribute name="Content-Length" type="xs:unsignedLong" use="optional"/>  <xs:attribute name="Transfer-Length" type="xs:unsignedLong" use="optional"/>  <xs:attribute name="Content-Type" type="xs:string" use="optional"/>  <xs:attribute name="Content-Encoding" type="xs:string" use="optional"/>  <xs:attribute name="Content-MD5" type="xs:base64Binary" use="optional"/>  <xs:attribute name="FEC-OTI-FEC-Encoding-ID" type="xs:unsignedLong" use="optional"/>  <xs:attribute name="FEC-OTI-FEC-Instance-ID" type="xs:unsignedLong" use="optional"/>  <xs:attribute name="FEC-OTI-Maximum-Source-Block-Length" type="xs:unsignedLong" use="optional"/>  <xs:attribute name="FEC-OTI-Encoding-Symbol-Length" type="xs:unsignedLong" use="optional"/>  <xs:attribute name="FEC-OTI-Max-Number-of-Encoding-Symbols" type="xs:unsignedLong" use="optional"/>  <xs:attribute name="FEC-OTI-Scheme-Specific-Info" type="xs:base64Binary" use="optional"/>  <xs:attribute name="FEC-Redundancy-Level" type="xs:unsignedInt" use="optional"/>  <xs:attribute name="File-ETag" type="xs:string" use="optional"/>  <xs:attribute name="Repair-Start" type="xs:dateTime"/>  <xs:attribute name="Repair-Limit-Percentage" type="xs:unsignedInt"/>  <xs:anyAttribute processContents="skip"/>  </xs:complexType>  <xs:complexType name="CacheControlType">  <xs:choice>  <xs:element name="no-cache" type="xs:boolean" fixed="true"/>  <xs:element name="max-stale" type="xs:boolean" fixed="true"/>  <xs:element name="Expires" type="xs:unsignedInt"/>  </xs:choice>  <xs:anyAttribute processContents="skip"/>  </xs:complexType>  </xs:schema> |

The syntax defined by the above schema is illustrated in figure L.6.1‑1 below.

A screenshot of a computer

AI-generated content may be incorrect.

Figure L.6.1‑1: Visualisation of consolidated FLUTE FDT schema

## L.6.2 Profiled FLUTE FDT semantics

The semantics of the elements and attributes defined in the schema at clause L.6.1 are as follows:

- Usage of the *schemaVersion* element is specified in clause L.6.3.

- The child elements of the *Cache-Control* element are defined in clause 7.2.13.

- The attribute *FEC-Redundancy-Level* is defined in clause 7.2.10.6.

- The *File-ETag* represents the value of the entity tag as specified in section 8.8.3 of RFC 9110 [155] which may also serve as the version identifier of the file object described by the FDT Instance.

- The *Repair-Start* and *Repair-Limit-Percentage* elements are specified in clause 7.2.9.

NOTE: The signalling of post-session object repair within the FDT Instance is for further study.

## L.6.3 Schema version

To maintain forward and backward compatibility between the sender and the receiver, the schema defines the *schemaVersion* element. The BM-SC shall set the *schemaVersion* element to 3 in all instance documents that comply with the FDT schema specified in clause 6.1.

NOTE: The value of the *schemaVersion* element and *version* attribute is intended to be increased by 1 in every future release where new element(s) or attribute(s) are added to the schema definition.

When an MBMS Client receives an FDT instance document compliant with this schema, it shall determine the schema version required to parse the instantiation as follows:

- If the MBMS Client supports one or more versions of the FDT schema with the schema *version* attribute, then it shall use the schema that has the highest schema *version* attribute value that is equal to or less than the value in the received *schemaVersion* element;

- The *delimiter* element shall be set by the network to a value of 0, and the element content shall be ignored by the receiver.

## L.6.4 Example of FDT

Listing L.6.4‑1: Example FDT Instance compliant with clause L.6.2

|  |
| --- |
| <?xml version="1.0" encoding="UTF-8"?>  <FDT-Instance xmlns="urn:3GPP:metadata:2022:FLUTE:FDT"  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"  xsi:schemaLocation="urn:3GPP:metadata:2022:FLUTE:FDT TS26346\_FLUTE-FDT\_Profiled.xsd"  Expires="331129600">  <File TOI="2"  Content-Type="application/sdp"  Content-Length="7543"  FEC-OTI-FEC-Encoding-ID="1"  FEC-OTI-Maximum-Source-Block-Length="8192"  FEC-OTI-Encoding-Symbol-Length="16"  FEC-OTI-Scheme-Specific-Info="AAECCA=="  Content-Location="<http://www.example.com/fancy-session/main.sdp>">  <Cache-Control>  <Expires>331129630</Expires>  </Cache-Control>  </File>  <File TOI="3"  Content-Type="video/3gp"  Content-Length="161934"  FEC-OTI-FEC-Encoding-ID="1"  FEC-OTI-Maximum-Source-Block-Length="8192"  FEC-OTI-Encoding-Symbol-Length="200"  FEC-OTI-Scheme-Specific-Info="AAECCA=="  Repair-Start="331129590"  Repair-Limit-Percentage="5"  Content-Location="http://www.example.com/fancy-session/trailer.3gp">  </File>  <schemaVersion>3</schemaVersion>  </FDT-Instance> |