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Representational state transfer over xMB reference point between content provider and BM-SC
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Contents

Foreword

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1 Scope

The present document describes the REST-based protocol for the xMB reference point between the Content Provider and the BM-SC. The xMB reference point and related stage 2 protocol procedures are defined in 3GPP TS 23.246 [2] and in 3GPP TS 26.346 [3].

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*.

[1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[2] 3GPP TS 23.246: "Multimedia Broadcast/Multicast Service (MBMS) Architecture and Functional Description".

[3] 3GPP TS 26.346: "Multimedia Broadcast/Multicast Service (MBMS); Protocols and Codecs".

[4] IETF RFC 5246: "The Transport Layer Security (TLS) Protocol".

[5] Void.

[6] IETF RFC 7231: "Hypertext transfer protocol (HTTP/1.1): Semantics and Content".

[7] 3GPP TS 33.210: "3G security; Network Domain Security (NDS); IP network layer security".

[8] IETF RFC 7235: "Hypertext Transfer Protocol (HTTP/1.1): Authentication"

[9] IETF RFC 4918, "HTTP Extensions for Web Distributed Authoring and Versioning (WebDAV)".

[10] 3GPP TS 26.234, "Transparent end-to-end Packet-switched Streaming Service (PSS); Protocols and codecs".

[11] IETF RFC 3711, "The Secure Real-time Transport Protocol (SRTP)".

[12] IETF RFC 4347, "Datagram Transport Layer Security".

[13] Void

[14] Void.

[15] Void.

[16] Void.

[17] Void.

[18] 3GPP TS 26.247: "Transparent end-to-end Packet-switched Streaming Service (PSS); Progressive Download and Dynamic Adaptive Streaming over HTTP (3GP-DASH)".

[19] IETF RFC 3926: "FLUTE - File Delivery over Unidirectional Transport".

[20] 3GPP TS 29.061: "Interworking between the Public Land Mobile Network (PLMN) supporting packet based services and Packet Data Networks (PDN)".

[21] 3GPP TS 26.347: "MBMS URLs and APIs".

[22] Open API Initiative, "OpenAPI 2.0 Specification", https://github.com/OAI/OpenAPI-Specification/blob/master/versions/2.0.md.

[23] 3GPP TS 23.285: "Architecture Enhancements for V2X services".

[24] 3GPP TS 33.246:"3G Security; Security of Multimedia Broadcast/Multicast Service (MBMS)".

[25] 3GPP TS 24.116: "Stage 3 aspects of system architecture enhancements for TV services".

[26] IETF RFC 2617: "HTTP Authentication: Basic and Digest Access Authentication".

[27] IETF RFC 5795: "The Robust Header Compression (ROHC) Framework".

[28] IETF RFC 3095, "Robust Header Compression (ROHC): Framework and four profiles: RTP, UDP, ESP, and uncompressed"

[29] IETF RFC 6363: "Forward Error Correction (FEC) Framework,".

[30] Void.

[31] IETF RFC 1166: "Internet Numbers".

[32] IETF RFC 5952: "A recommendation for IPv6 address text representation".

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in 3GPP TR 21.905 [1] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in 3GPP TR 21.905 [1].

Content Provider: Entity/Entities which supplies/supply content in the form of streaming media or non-real-time (NRT) files to be delivered to UEs over the 3GPP network, via MBMS Bearer and/or unicast bearer services. Also referred to in this document as the Multicast Broadcast Source. The Content Provider may reside either inside or outside the operator's network.

Service: One of the resource types exposed by the RESTful xMB API and operated on by a Content Provider using HTTP methods. It corresponds to a Content Provider's service offering for delivery over the MBMS network to UEs. Each service instance created over the xMB API maps to an MBMS User Service as specified by 3GPP TS 26.346 [3]. The delivery of the contents of a created service is performed during one or more sessions associated with that service.

Session: One of the resource types exposed by the RESTful xMB API and operated on by a Content Provider using HTTP methods. It represents one or more time intervals during which the MBMS Bearer is active for the transmission of service contents from the BM-SC to the UE. Each session instance, besides the activity times, may contain various properties pertaining to transport, media and application level information (session type, session state, data rate, permitted delay, user plane ingestion mode, targeted delivery area, reporting parameters, identification of content components delivered during the session, etc.).

3.2 Abbreviations

For the purposes of the present document, the abbreviations given in 3GPP TR 21.905 [1] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in 3GPP TR 21.905 [1].

API	Application Programming Interface
BM-SC	Broadcast Multicast Service Center
CDN	Content Delivery Network
CP	Content Provider

DASH	Dynamic Adaptive Streaming over HTTP
FEC	Forward Error Correction
FLUTE	File Delivery over Unidirectional Transport
HTTP	HyperText Transfer Protocol
IS	Initialization Segment
JSON	JavaScript Object Notation
MPD	Media Presentation Description
MSA	MBMS Service Area
REST	Representational State Transfer
ROHC	Robust Header Compression
SACH	Service Announcement Channel
SAF	Service Announcement Function
SLA	Service Level Agreement
TLS	Transport Layer Security
TMGI	Temporarily Mobile Group Identity
TSI	Transport Session Identifier
URI	Universal Resource Identifier
WebDAV	Web Distributed Authoring and Versioning
V2X	Vehicle-to-Everything

4 xMB reference point

4.1 Overview

4.2 Reference model

The xMB reference point resides between the BM-SC and the Content Provider as depicted in Figure 4.2.1. Control- and user-plane procedures are operated over the xMB-C and xMB-U reference points, respectively. The overall xMB reference model is depicted in subclause 5.4A of 3GPP TS 26.346 [3].

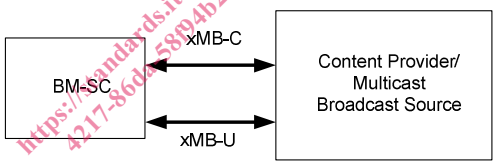

Figure 4.2.1 xMB reference point

For the V2X Localized User Plane supported feature, the reference model in Annex B.3 of 3GPP TS 23.285 [23] applies.

4.3 Functional elements

4.3.1 BM-SC

The complete functionality of the BM-SC is defined in 3GPP TS 26.346 [3]. In the context of the xMB reference point, the BM-SC represents the peer endpoint to the Content Provider in supporting all procedures on the xMB interface.

In addition to the functions defined in 3GPP TS 26.346 [3], the BM-SC may support, for V2X services, the V2X Localized User Plane procedures as defined in 3GPP TS 23.285 [23] subclause 5.4.2.2 for receiving Local MBMS information from the Content Provider acting as a V2X Application Server.

4.3.2 Content Provider / Multicast Broadcast Source

The functional role of the Content Provider is defined in subclause 4.4.1a of 3GPP TS 26.346 [3]. Using the xMB reference point, a Content Provider/Multicast Broadcast Source may provide media, as well as service descriptions and control data, to the BM-SC to set up and manage MBMS User Service(s) from the BM-SC to MBMS clients (the latter is not depicted in Figure 4.2.1).

In addition, the Content Provider which acts as a V2X Application Server may support V2X Localized User Plane procedures as defined in 3GPP TS 23.285 [23] subclause 5.4.2.2 for requesting the BM-SC to activate an MBMS bearer for Local MBMS based MBMS data delivery.

4.4 Procedures over xMB reference point

4.4.1 Introduction

All procedures that operate across the xMB reference point, as specified in subclause 5.4A of 3GPP TS 26.346 [3], are summarized in the following subclauses.

4.4.2 Authentication Procedures

Authentication procedures shall be performed via (D)TLS as specified by 3GPP TS 33.246 [24]. The Content Provider shall act as the (D)TLS client and the BM-SC as the (D)TLS server when the Content Provider wants to provision new services or manage existing services. Similarly, the BM-SC shall act as the client when the BM-SC wishes to send reports and notifications to the Content Provider. All of the following procedures require the authentication procedure to be completed successfully.

4.4.3 Authorization Procedures

The authorization procedure of the Content Provider towards the BM-SC may be based on the (D)TLS connection established as part of the authentication procedure (see subclause 4.4.2). In that case, the BM-SC shall check if the Content Provider who sent a request over an authenticated (D)TLS connection is authorized to send that specific request. See subclause 7.2 for further details.

The authorization procedure of the BM-SC towards the Content Provider to allow pushing notifications to the Content Provider may be based on the (D)TLS connection established as part of the authentication procedure (see subclause 4.4.2). In that case, the Content Provider shall check if the BM-SC who sent the notification over an authenticated (See subclause 7.2 for further details)(D)TLS connection is authorized to send that specific notification.

4.4.4 Service Management Procedures

4.4.4.1 Create Service

This procedure is used by the Content Provider to create a service at the BM-SC and negotiate the supported features for the created service. The Content Provider shall use HTTP POST for this purpose. A successfully created service is associated with a resource identifier which is used by the Content Provider to discover, update and delete the service.

4.4.4.2 Get Service Properties

This procedure is used by the Content Provider to obtain the service properties from the BM-SC. The Content Provider shall use HTTP GET for this purpose.

4.4.4.3 Update Service Properties

This procedure is used by the Content Provider for updating the service properties at the BM-SC. The Content Provider shall use HTTP PUT or HTTP PATCH, corresponding to complete or partial update of service properties, respectively, for this purpose.

4.4.4.4 Delete Service

This procedure is used by the Content Provider to terminate the service at the BM-SC. The Content Provider shall use HTTP DELETE for this purpose.

4.4.4.5 Service Notifications

This procedure is used by the BM-SC to send service related notifications to the Content Provider.

4.4.5 Session Management Procedures

4.4.5.1 Create Session

This procedure is used by the Content Provider to create a session for a previously created service at the BM-SC. The Content Provider shall use HTTP POST for this purpose. A successfully created session is associated with a resource identifier which is used by the Content Provider to discover, update and delete the session.

4.4.5.2 Get Session Properties

This procedure is used by the Content Provider to obtain the session properties of a service from the BM-SC. The Content Provider shall use HTTP GET for this purpose.

4.4.5.3 Update Session Properties

This procedure is used by the Content Provider for updating the session properties of a session at the BM-SC. The Content Provider shall use HTTP PUT or HTTP PATCH, corresponding to complete or partial update of session properties, respectively, for this purpose.
If the V2X Localized User Plane feature is supported, the Content Provider may wish to update the session properties for Local MBMS based MBMS data delivery. If so, and the BM-SC decides to use the Local MBMS information, the BM-SC shall use the received BM-SC IP address and port for user plane data delivery.

NOTE: The Local MBMS information is pre-configured in the Content Provider. At reception of such information, the BM-SC will further send the M1 interface information (e.g. MBMS eNB multicast address and GW source specific multicast address) to the MBMS-GW as specified in 3GPP TS 29.061 [20].

4.4.5.4 Delete Session

This procedure is used by the Content Provider to terminate a session of a service at the BM-SC. The Content Provider shall use HTTP DELETE for this purpose.

5 xMB API

5.1 Overview

The xMB API is a RESTful API that allows Content Providers to provision broadcast services over 3GPP networks and subsequent ingestion of service content for distribution using eMBMS. The xMB API defines a set of resources and the related procedures for the creation and management of broadcast services and sessions are described in subclause 5.2. The corresponding JSON schema for the representation of the resources and operations defined by the xMB API is provided in its complete form in Annex B. The syntax follows the rules defined by the OpenAPI specification [22].

5.1.1 Supported Methods

The xMB API follows the RESTful design principles. All operations SHALL be performed using HTTP 1.1 (IETF RFC 7231 [6]) over TLS (3GPP TS 33.246[24]).

Table 5.1.1-1 gives a summary of the supported HTTP methods and their applicability on a per resource basis.

Table 5.1.1-1: Summary of supported HTTP methods of xMB API

HTTP Method	CRUD	Resource	PATH
POST	Create	Service	/xmb/v1.0/services
		Session	/xmb/v1.0/services/{service-res-id}/sessions
GET	Read	Service	/xmb/v1.0/services/{service-res-id}/sessions/{session-res-id}
		Session	/xmb/v1.0/services/{service-res-id}/sessions/{session-res-id}
		Report	/xmb/v1.0/reports?query or /xmb/v1.0/reports/{report-res-id}
		Notification	/xmb/v1.0/notifications?query or /xmb/v1.0/notifications/{notification-res-id}
PUT	Replace	Service	/xmb/v1.0/services/{service-res-id}
		Session	/xmb/v1.0/services/{service-res-id}/sessions/{session-res-id}
PATCH	Modify	Service	/xmb/v1.0/services/{service-res-id}
		Session	/xmb/v1.0/services/{service-res-id}/sessions/{session-res-id}
DELETE	Delete	Service	/xmb/v1.0/services/{service-res-id}
		Session	/xmb/v1.0/services/{service-res-id}/sessions/{session-res-id}

5.1.2 Error Handling

The xMB API shall use the HTTP status codes to indicate any errors that might occur in the processing of operations on xMB resources. Unless defined otherwise, the HTTP status codes shall be interpreted as specified in IETF RFC 7231 [6]. API operations that are not successfully handled shall not leave the resource at an undefined state. The response should provide sufficient information for a human operator to understand and locate the error.

API operations that do not follow the security procedures defined in section 7 shall be rejected without any impact on the resources.

Errors may also happen during the content ingestion and shall be notified to the Content Provider in a timely manner depending on the severity of the error.

5.1.3 xMB Entry Point Discovery

The Content Provider shall be able to discover the entry point to the xMB interface by one of the following methods:

a) It is provided with the URL that serves as the entry point for the xMB-C interface;

b) It acquires that entry point URL from DNS resolution of the following Fully Qualified Domain Name (FQDN):

http://mbmsbs.mnc<MNC>.mcc<MCC>.pub.3gppnetwork.org,

in which case the Content Provider shall build the following URL for the entry point of the xMB interface:

http://mbmsbs.mnc<MNC>.mcc<MCC>.pub.3gppnetwork.org/xmb/v1.0/.

5.2 Resources

5.2.1 Services

The Content Provider shall configure services at the BM-SC using the REST API methods over two resources managed at the BM-SC.

Table 5.2.1-1 summarizes different resources for provisioning and managing services at the BM-SC.

Table 5.2.1-1: Resources for managing services at BM-SC

Resource Name	Resource Type	Description
service	Instance resource	Represents a single service resource. The Content Provider can provision or modify a single service at the BM-SC by invoking REST API requests to this service resource at the BM-SC.
services	Collection Resource	Represents a collection of service resources.

5.2.1.1 Properties

Each service resource described in Table 5.2.1-1 has the set of properties described in Table 5.2.1.1-1. The Content Provider shall modify one or more of the properties of the service resource using the API operations described in subclause 5.2.1.2.

Table 5.2.1.1-1 summarizes different service properties of a service resource.

Table 5.2.1.1-1: Properties of service resource

Property Token	JSON Value Type	Defaults			Property Description	A
		Child Parameter	Units	Values		
service-id	string		None	N/A	Identifies the MBMS User Service as defined in subclause 11.2.1.1 of 3GPP TS 26.346 [3]	
service-class	string		None	(operator defined default)	The service class that service belongs to. (see *serviceClass* element in subclause 11.2.1.2 of 3GPP TS 26.346 [3]).	
service-languages	array		None	Empty list	List of language of the service content. (see *serviceLanguage* element in subclause 11.2.1.1 of 3GPP TS 26.346 [3]).	
service-names	array		None	Empty list	List of Service Names. (see *name* element in subclause 11.2.1.1 of 3GPP TS 26.346 [3])	