

ETSI GS MEC 016 V1.1.1 (2017-09)



GROUP SPECIFICATION

Mobile Edge Computing (MEC); UE application interface

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ReferenceDGS/MEC-0016UEappInterface

KeywordsAPI, MEC

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Foreword

This Group Specification (GS) has been produced by ETSI Industry Specification Group (ISG) Mobile Edge Computing (MEC).

Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the [ETSI Drafting Rules](#) (Verbal forms for the expression of provisions).

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1 Scope

The present document contains the specification for the lifecycle management of the user applications over the UE application interface. This interface is over the Mx2 reference point between the UE application in the UE and the user application lifecycle management proxy in the mobile edge system.

The present document covers the following lifecycle management operations: user application look-up, request for the user application instantiation, and the request for the user application termination. In addition, a mechanism is specified for the exchange of lifecycle management related information between the mobile edge system and the UE application.

The intended key audience of the present document are the application developers for the mobile edge system.

NOTE: User application mobility related lifecycle management operations are not covered by the present document.

2 References

2.1 Normative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

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

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

The following referenced documents are necessary for the application of the present document.

[1] ETSI GS MEC 010-2: "Mobile Edge Computing (MEC); Mobile Edge Management; Part 2: Application lifecycle, rules and requirements management".

[2] IETF RFC 2818: "HTTP Over TLS".

NOTE: Available at <https://tools.ietf.org/html/rfc2818>.

[3] IETF RFC 5246: "The Transport Layer Security (TLS) Protocol Version 1.2".

NOTE: Available at <https://tools.ietf.org/html/rfc5246>.

[4] ETSI GS MEC 009: "Mobile Edge Computing (MEC); General principles for Mobile Edge Service APIs".

[5] IETF RFC 6749: "The OAuth 2.0 Authorization Framework".

NOTE: Available at <https://tools.ietf.org/html/rfc6749>.

[6] IETF RFC 6750: "The OAuth 2.0 Authorization Framework: Bearer Token Usage".

NOTE: Available at <https://tools.ietf.org/html/rfc6750>.

2.2 Informative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

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The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

[i.1] ETSI GS MEC 001: "Mobile Edge Computing (MEC); Terminology".

[i.2] ETSI GS MEC 002: "Mobile Edge Computing (MEC); Technical Requirements".

[i.3] OpenAPI Specification.

NOTE 1: Available at <https://github.com/OAI/OpenAPI-Specification>.

NOTE 2: OpenAPI Specification version 2.0 is recommended as it is the official release at the time of publication.

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in ETSI GS MEC 001 [i.1] and the following apply:

user application lifecycle management proxy: system level functional element that allows specific and authorized requests from the UE application for the user application lifecycle management

3.2 Abbreviations

For the purposes of the present document, the abbreviations given in ETSI GS MEC 001 [i.1] apply.

4 Overview

The present document specifies the API for the UE application interface to support the corresponding requirements defined for the Mobile Edge Computing in ETSI GS MEC 002 [i.2].

Clause 5 describes how the UE application interface can be used by the UE application and by the mobile edge system. It describes the information flows for the procedures over the UE application interface.

The information that is exchanged over the UE application interface is described in clause 6, providing detailed description of all information elements available on that interface.

Clause 7 describes the actual API of the UE application interface, providing detailed information how the information elements map into the RESTful API design of the interface.

Clause 8 describes the authentication, authorization and access control for the UE application interface.

5 Description of the service (informative)

5.1 Sequence diagrams

5.1.1 Introduction

The following clauses describe how the UE application interacts with the user application lifecycle management proxy over the UE application interface. The sequence diagrams that are relevant for the UE application interface are presented.

5.1.2 User application look-up

The user application look-up is the procedure for requesting the list of available user applications in the mobile edge system to the requesting UE application. The user application look-up procedure is illustrated in figure 5.1.2-1.

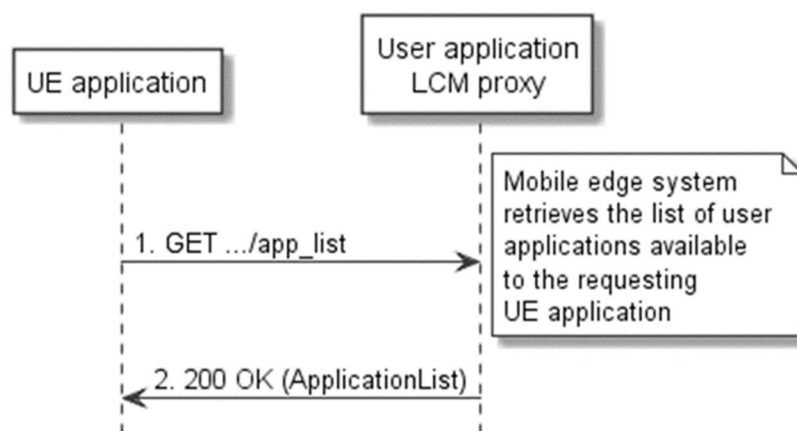


Figure 5.1.2-1: User application look-up

- 1) The UE application submits the GET request to the user application lifecycle management proxy. The user application lifecycle management proxy authorizes the request from UE application. The mobile edge system retrieves the list of user applications available to the requesting UE application.
- 2) The user application lifecycle management proxy returns the 200 OK response to the UE application, with the message body containing the data structure for the list of available user applications.

5.1.3 Application context create

The application context create is the procedure to request either to join with an available user application or to instantiate a new user application. The application context create procedure is illustrated in figure 5.1.3-1.

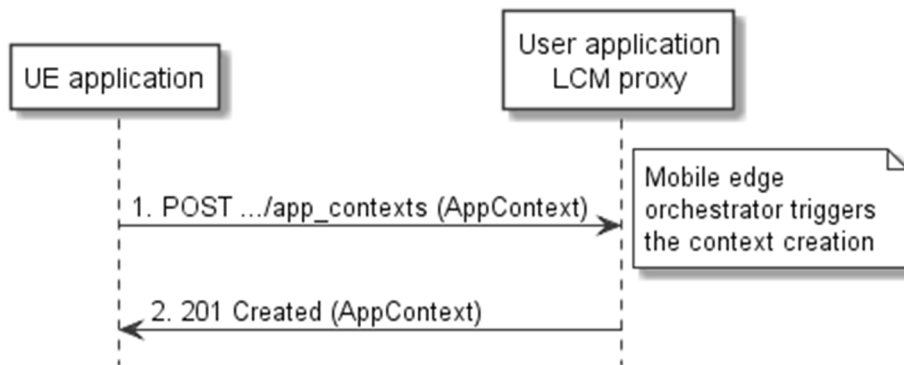


Figure 5.1.3-1: Application context create

- 1) The UE application submits the POST request to the user application lifecycle management proxy. The message body contains the data structure for the application context to be created.

The user application lifecycle management proxy authorizes the request from the UE application. The request is forwarded to the OSS. The OSS makes the decision on granting the context creation request. The mobile edge orchestrator triggers the creation of the application context in the mobile edge system.

- 2) The user application lifecycle management proxy returns the 201 Created response to the UE application with the message body containing the data structure of the created application context.

5.1.4 Application context delete

The application context delete is a procedure in which the UE application requests the deletion of the application context. The application context delete procedure is illustrated in figure 5.1.4-1.

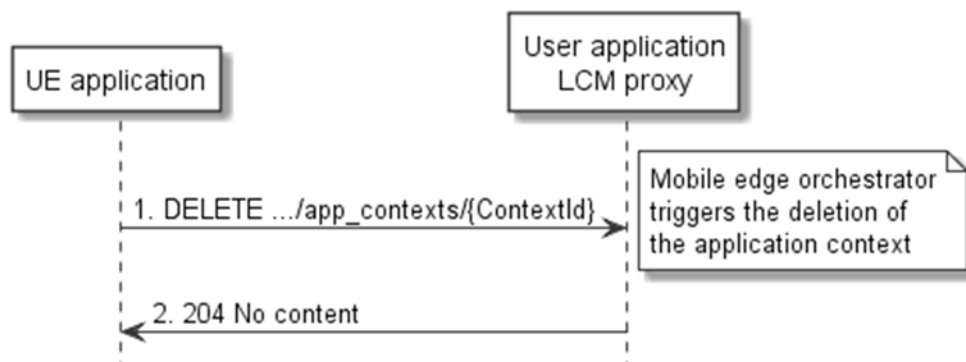


Figure 5.1.4-1: Application context delete

- 1) The UE application submits the DELETE request to the user application lifecycle management proxy for the resource to be deleted.

The user application lifecycle management proxy authorizes the request from UE application. The request is forwarded to the OSS. The OSS makes the decision on granting the deletion. The mobile edge orchestrator triggers the deletion of the application context.

- 2) The user application lifecycle management proxy returns "204 No content" response.

5.1.5 Application context update

The user application lifecycle management proxy receives an update of the ueAppContext. The procedure is illustrated in figure 5.1.5-1.

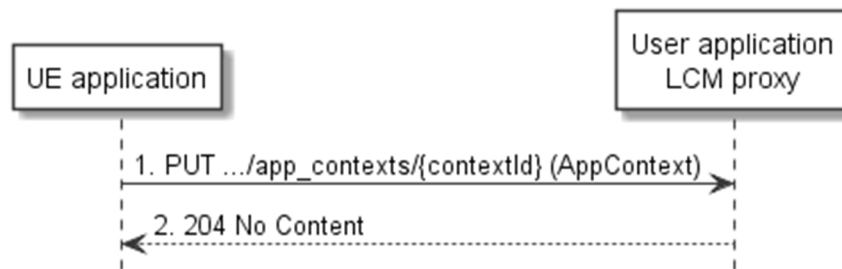


Figure 5.1.5-1: Application context update

- 1) The UE application updates the ueAppContext. The request includes the contextId with the modified data structure of AppContext where only the callback reference is allowed to be updated by the UE application.
- 2) The user application lifecycle management proxy returns a "204 No Content" response.

5.1.6 Receiving notification events

Figure 5.1.6-1 presents the scenario where the user application lifecycle management proxy sends notification events to the UE application.

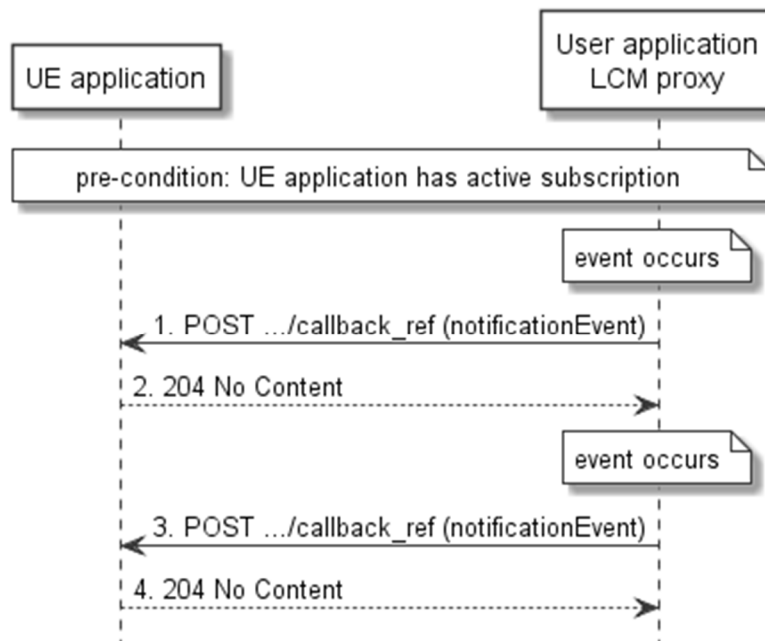


Figure 5.1.6-1: Flow of receiving notification events

Receiving notification events, as illustrated in figure 5.1.6-1, consists of the following steps:

- 1) The user application lifecycle management proxy sends a POST message to the callback reference address provided within the AppContext with the message body containing the notification event.
- 2) The UE application sends a "204 No Content" response to the user application lifecycle management proxy.

6 Data model

6.1 Introduction

The following clauses provide the description of the data model.

6.2 Resource data types

6.2.1 Introduction

This clause defines data structures to be used in resource representations.

6.2.2 Type: ApplicationList

This type represents the information on available applications. The UE application can acquire this information by user application look-up procedure described in clause 5.1.2.

The elements of the ApplicationList shall follow the notations provided in table 6.2.2-1.

Table 6.2.2-1: Definition of type ApplicationList

Attribute name	Data type	Cardinality	Description
applInfo	Structure (inlined)	0..N	User applications available for the UE application. As defined below.
>appName	String	1	Name of the mobile edge application. The length of the value shall not exceed 32 characters.
>appProvider	String	1	Provider of the mobile edge application. The length of the value shall not exceed 32 characters.
>appSoftVersion	String	0..1	Software version of the mobile edge application. The length of the value shall not exceed 32 characters.
>appDescription	String	1	Human readable description of the mobile edge application (see note 2).
>appCharcs	Structure (inlined)	0..1	Characteristics of the application. As defined below. The application characteristics relate to the system resources consumed by the application. UE application can use this information e.g. for estimating the cost of use of the application or for the expected user experience.
>>memory	uint32	0..1	The maximum size in Mbytes of the memory resource expected to be used by the mobile edge application instance in the mobile edge system.
>>storage	uint32	0..1	The maximum size in Mbytes of the storage resource expected to be used by the mobile edge application instance in the mobile edge system.
>>latency	uint32	0..1	The target round trip time in milliseconds supported by the mobile edge system for the mobile edge application instance.
>>bandwidth	uint32	0..1	The required connection bandwidth in kbit/s for the use of the mobile edge application instance.
>>serviceCont	Enum	0..1	Required service continuity mode for this application. Permitted values: 0 = SERVICE_CONTINUITY_NOT_REQUIRED. 1 = SERVICE_CONTINUITY_REQUIRED.
vendorSpecificExt	Structure (inlined)	0..N	Extension for vendor specific information.
>vendorId	String	1	Vendor identifier. The length of the value shall not exceed 32 characters. The rest of the structure of vendor specific extension is not defined.
NOTE 1: The vendor specific extension allows submitting information on the application lists that have been made available to the UE application of the corresponding vendor.			
NOTE 2: The language support may be limited. The length of the value shall not exceed 128 characters.			

6.2.3 Type: AppContext

This type represents the information on application context created by the mobile edge system.

The elements of the AppContext shall follow the notations provided in table 6.2.3-1.

Table 6.2.3-1: Definition of type AppContext

Attribute name	Data type	Cardinality	Description
contextId	String	1	Uniquely identifies the application context in the mobile edge system. Assigned by the mobile edge system and included in the response. The length of the value shall not exceed 32 characters.
associateUeAppId	String	1	Uniquely identifies the UE application. Included in the request. The length of the value shall not exceed 32 characters.
callbackReference	URI	0..1	URI assigned by the UE application to receive application lifecycle related notifications. Included in the request. This subscription stays alive for the lifetime of the application context.
appInfo	Structure (inlined)	1	Included in the request. As defined below.
>appName	String	1	Name of the mobile edge application. The length of the value shall not exceed 32 characters.
>appProvider	String	1	Provider of the mobile edge application. The length of the value shall not exceed 32 characters.
>appSoftVersion	String	0..1	Software version of the mobile edge application. The length of the value shall not exceed 32 characters.
>appDescription	String	0..1	Human readable description of the mobile edge application. The length of the value shall not exceed 128 characters.
>referenceURI	URI	1	Address of the user application. Used as the reference URI for the application. Assigned by the mobile edge system and included in the response.
>appPackageSource	URI	0..1	URI of the application package. Included in the request if the application is not one in the ApplicationList. appPackageSource enables on-boarding of the application package into the mobile edge system. The application package shall comply with the definitions in clause 6.2.1.2 of ETSI GS MEC 010-2 [1].
NOTE 1: If a value of the attribute is included in the request, the same value shall be included in the response.			
NOTE 2: The design of the current operation with callback reference assumes no web proxy between the entity that originates the notification and the entity that receives it.			
NOTE 3: The language support for the application description may be limited.			

6.3 Subscription data types

In the present document, no subscription data types are defined.

6.4 Notification data types

6.4.1 Introduction

This clause defines data structures for notifications.

6.4.2 Type: NotificationEvent

This type defines the parameters used in the method "Receiving notification events".

Table 6.4.2-1: Definition of type NotificationEvent

Attribute name	Data type	Cardinality	Description
referenceURI	URI	1	Address of the user application. Used as the reference URI for the application. Assigned by the mobile edge system.

6.5 Referenced structured data types

In the present document, no referenced structured data types are defined.

7 API definition

7.1 Introduction

This clause defines the resources and operations of the UE application interface API on the Mx2 reference point.

7.2 Global definitions and resource structure

All resource URIs of this API shall have the following root:

{apiRoot}/{apiName}/{apiVersion}/

The "apiName" shall be set to "mx2" and the "apiVersion" shall be set to "v1" for the present document. It includes the scheme ("https"), host and optional port, and an optional prefix string. The API shall support HTTP over TLS (also known as HTTPS, see IETF RFC 2818 [2]). TLS version 1.2 as defined by IETF RFC 5246 [3] shall be supported. HTTP without TLS is not recommended. All resource URIs in the sub-clauses below are defined relative to the above root URI.

The content format of JSON shall be supported. The JSON format is signalled by the content type "application/json".

This API supports additional application-related error information to be provided in the HTTP response when an error occurs. See clause 7.15 of ETSI GS MEC 009 [4] for more information.

Figure 7.2-1 illustrates the resource URI structure of this API.

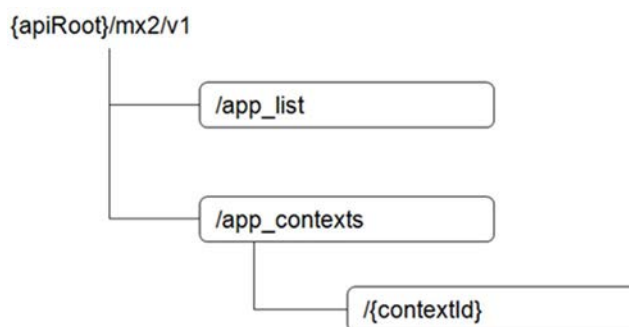


Figure 7.2-1: Resource URI structure of the mx2 API

Table 7.2-1 provides an overview of the resources defined by the present specification, and the applicable HTTP methods.

Table 7.2-1: Resources and methods overview

Resource name	Resource URI	HTTP method	Meaning
meAppList	/app_list	GET	Retrieve current available application information.
Parent resource of all ueAppContexts	/app_contexts	POST	Create a new ueAppContext resource.
Individual ueAppContext	/app_contexts/{contextId}	PUT	Update the callbackReference of the existing ueAppContext resource.
		DELETE	Delete an existing ueAppContext resource.

7.3 Resource: meAppList

7.3.1 Description

This resource can be queried to retrieve information on available application information.

7.3.2 Resource definition

Resource URI: **{apiRoot}/mx2/v1/app_list**

Resource URI variables for this resource are defined in table 7.3.2-1.

Table 7.3.2-1: Resource URI Variables for resource "meAppList"

Name	Definition
apiRoot	See clause 8.2

7.3.3 Resource Methods

7.3.3.1 GET

The GET method is used to query information about the available mobile edge applications.

This method shall comply with URI query parameters, request and response data structures, and response codes, as specified in the tables 7.3.3.1-1 and 7.3.3.1-2.

Table 7.3.3.1-1: URI query parameters supported by the GET method on this resource

Name	Data type	Cardinality	Remarks
appName	String	0..N	Name to identify the mobile edge application.
appProvider	String	0..N	Provider of the mobile edge application.
appSoftVersion	String	0..N	Software version of the mobile edge application.
serviceCont	Enum (inlined)	0..1	Required service continuity mode for this application. Permitted values: 0 = SERVICE_CONTINUITY_NOT_REQUIRED. 1 = SERVICE_CONTINUITY_REQUIRED.
vendorId	String	0..N	Vendor identifier

NOTE: The value of the attribute of the type String shall not exceed the length of 32 characters.

Table 7.3.3.1-2: Data structures supported by the GET request/response on this resource

Request body	Data type	Cardinality	Remarks	
	n/a			
Response body	Data type	Cardinality	Response codes	Remarks
	ApplicationList	1	200 OK	The response body contains the ApplicationList resource available for the querying UE application.
	ProblemDetails	0..1	400 Bad Request	Incorrect parameters were passed in the request. More information should be provided in the "detail" attribute of the "ProblemDetails" structure.
	ProblemDetails	0..1	401 Unauthorized	An erroneous or missing bearer token. More information should be provided in the "detail" attribute of the "ProblemDetails" structure.
	ProblemDetails	0..1	404 Not Found	The client provided a URI that cannot be mapped to a valid resource URI. More information should be provided in the "detail" attribute of the "ProblemDetails" structure.
	ProblemDetails	1	403 Forbidden	The operation is not allowed given the current status of the resource. More information shall be provided in the "detail" attribute of the "ProblemDetails" structure.

7.3.3.2 PUT

Not applicable.

7.3.3.3 PATCH

Not applicable.

7.3.3.4 POST

Not applicable.

7.3.3.5 DELETE

Not applicable.

7.4 Resource: all ueAppContexts

7.4.1 Description

This resource represents the parent for all individual application contexts.

7.4.2 Resource definition

Resource URI: **{apiRoot}/mx2/v1/app_contexts**

Resource URI variables for this resource are defined in table 7.4.2-1.

Table 7.4.2-1: Resource URI Variables for resource "all ueAppContexts"

Name	Definition
apiRoot	See clause 7.2

7.4.3 Resource Methods

7.4.3.1 GET

Not applicable.

7.4.3.2 PUT

Not applicable.

7.4.3.3 PATCH

Not applicable.

7.4.3.4 POST

The POST method is used to create a new application context. Upon success, the response contains entity body describing the created application context.

This method shall comply with the URI query parameters, the request and response data structures, and response codes, as specified in table 7.4.3.4-1.

Table 7.4.3.4-1: Data structures supported by the POST request/response on this resource

Request body	Data type	Cardinality	Remarks	
	AppContext	1	Entity body in the request contains the Application Context as requested by the UE application.	
Response body	Data type	Cardinality	Response codes	Remarks
	AppContext	1	201 Created	The response body contains the Application Context as it was created by the mobile edge system.
	ProblemDetails	0..1	400 Bad Request	Incorrect parameters were passed in the request. More information should be provided in the "detail" attribute of the "ProblemDetails" structure.
	ProblemDetails	0..1	401 Unauthorized	An erroneous or missing bearer token. More information should be provided in the "detail" attribute of the "ProblemDetails" structure.
	ProblemDetails	0..1	404 Not Found	The client provided a URI that cannot be mapped to a valid resource URI. More information should be provided in the "detail" attribute of the "ProblemDetails" structure.
	ProblemDetails	1	403 Forbidden	The operation is not allowed given the current status of the resource. More information shall be provided in the "detail" attribute of the "ProblemDetails" structure.

7.4.3.5 DELETE

Not applicable.

7.5 Resource: individual ueAppContext

7.5.1 Description

This resource represents one application context the mobile edge system has created.

7.5.2 Resource definition

Resource URI: {apiRoot}/mx2/v1/app_contexts/{contextId}

Resource URI variables for this resource are defined in table 7.5.2-1.

Table 7.5.2-1: Resource URI Variables for resource " individual ueAppContext"

Name	Definition
apiRoot	See clause 7.2.
contextId	Uniquely identifies the application context in the mobile edge system. It is assigned by the mobile edge system and included in the response.

7.5.3 Resource Methods

7.5.3.1 GET

Not applicable.

7.5.3.2 PUT

The PUT method is used to update the callback reference of the existing application context. Upon successful operation, the target resource is updated with new callback reference.

This method shall comply with the URI query parameters, request and response data structures, and response codes, as specified in tables 7.5.3.2-1 and 7.5.3.2-2.

Table 7.5.3.2-1: URI query parameters supported by the PUT method on this resource

Name	Data type	Cardinality	Remarks
n/a			

Table 7.5.3.2-2: Data structures supported by the PUT request/response on this resource

Request body	Data type	Cardinality	Remarks	
	AppContext	1	Only the attribute callbackReference is allowed to be updated. Other attributes and their values shall remain untouched.	
Response body	Data type	Cardinality	Response codes	Remarks
	n/a		204 No Content	Upon success, a response 204 No Content without any response body is returned.
	ProblemDetails	0..1	400 Bad Request	Incorrect parameters were passed in the request. More information should be provided in the "detail" attribute of the "ProblemDetails" structure.
	ProblemDetails	0..1	401 Unauthorized	An erroneous or missing bearer token. More information should be provided in the "detail" attribute of the "ProblemDetails" structure.
	ProblemDetails	0..1	404 Not Found	The client provided a URI that cannot be mapped to a valid resource URI. More information should be provided in the "detail" attribute of the "ProblemDetails" structure.
	ProblemDetails	1	403 Forbidden	The operation is not allowed given the current status of the resource. More information shall be provided in the "detail" attribute of the "ProblemDetails" structure.

7.5.3.3 PATCH

Not applicable.

7.5.3.4 POST

Not applicable.

7.5.3.5 DELETE

The DELETE method is used to delete the resource that represents the existing application context.

This method shall comply with the URI query parameters, request and response data structures, and response codes, as specified in tables 7.5.3.5-1 and 7.5.3.5-2.

Table 7.5.3.5-1: URI query parameters supported by the DELETE method on this resource

Name	Data type	Cardinality	Remarks
n/a			

Table 7.5.3.5-2: Data structures supported by the DELETE request/response on this resource

Request body	Data type	Cardinality	Remarks	
n/a				
Response body	Data type	Cardinality	Response codes	Remarks
	n/a		204 No Content	Upon success, a response 204 No Content without any response body is returned.
	ProblemDetails	0..1	400 Bad Request	Incorrect parameters were passed in the request. More information should be provided in the "detail" attribute of the "ProblemDetails" structure.
	ProblemDetails	0..1	401 Unauthorized	An erroneous or missing bearer token. More information should be provided in the "detail" attribute of the "ProblemDetails" structure.
	ProblemDetails	0..1	404 Not Found	The client provided a URI that cannot be mapped to a valid resource URI. More information should be provided in the "detail" attribute of the "ProblemDetails" structure.
	ProblemDetails	1	403 Forbidden	The operation is not allowed given the current status of the resource. More information shall be provided in the "detail" attribute of the "ProblemDetails" structure.

8 Authentication, authorization and access control

8.1 Introduction

OAuth 2.0 is applied on UE application interface as defined in clause 8.2.

8.2 Description

An authentication and authorization entity is assumed to be available for both the REST client, i.e. the UE application, and the REST server represented by the user application lifecycle management proxy (UALCMP). The AA entity exposes the token endpoint for the UE application as defined by OAuth 2.0. In the present document, the client credentials flow of OAuth 2.0 (see IETF RFC 6749 [5]) shall be supported by the AA entity, and it may be used by the UE application to obtain the access token. The AA entity performs the authentication for the credentials of the UE application. Other means for the UE application to obtain the access token are outside the scope of the present document. The AA entity, and the communication between it and the UALCMP are out of scope of the present document.

The UE application shall present the access token to the UALCMP with every request in order to assert that it is allowed to access the resource with the particular method it invokes. The access token shall be included as a bearer token according to IETF RFC 6750 [6].

On UE application interface the access rights of the UE application are bound to its access token. Additional policies can also be bound to access token, such as the maximum frequency of API calls. An access token has a lifetime after which it is invalid. An AA entity may revoke an access token before it expires.

Annex A (informative): Complementary material for API utilization

To complement the definitions for each method and resource defined in the interface clauses of the present document, ETSI MEC ISG is providing for the UE application interface API a supplementary description file compliant to the OpenAPI Specification [i.3].

In case of discrepancies between the supplementary description file and the related data structure definitions in the present document, the data structure definitions take precedence.

The supplementary description file, relating to the present document, is located at https://forge.etsi.org/rep/gitweb.cgi/MEC.GS_016.git.

History

Document History		
V1.1.1	September 2017	Publication