ETSI GS MEC 011 V3.1.1 (2022-09)

Multi-access Edge Computing (MEC); Edge Platform Application Enablement

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Reference
RGS/MEC-0011v311Plat.App.Enab

Keywords
API, MEC

ETSI

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Foreword

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

Modal verbs terminology

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1 Scope

The present document focuses on the functionalities enabled via the Mp1 reference point between MEC applications and MEC platform, which allows these applications to interact with the MEC system. Service management functionality includes registration/deregistration, discovery and event notifications. Application support functionality includes application start-up, registration and termination, traffic rules, DNS and time of day. It describes the information flows, required information, and specifies the necessary operations, data models and API definitions.

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] Void.

[2] ETSI GS MEC 002: "Multi-access Edge Computing (MEC); Phase 2: Use Cases and Requirements".

[3] ETSI GS MEC 003: "Multi-access Edge Computing (MEC); Framework and Reference Architecture".

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

[5] ETSI GS MEC 009: "Multi-access Edge Computing (MEC); General principles, patterns and common aspects of MEC Service APIs".

[6] Void.

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

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

[8] IETF RFC 3986: "Uniform Resource Identifier (URI): Generic Syntax".

NOTE: Available at https://tools.ietf.org/html/rfc3986.

[9] IETF RFC 7159: "The JavaScript Object Notation (JSON) Data Interchange Format".

NOTE: Available at https://tools.ietf.org/html/rfc7159.

[10] W3C® Recommendation (16 August 2006): "Extensible Markup Language (XML) 1.1 (Second Edition)".

NOTE: Available at https://www.w3.org/TR/xml11/.

[11] IETF RFC 9110: "HTTP Semantics".

NOTE: Available at https://tools.ietf.org/html/rfc9110.

[12] IETF RFC 6455: "The WebSocket Protocol".

NOTE: Available at https://tools.ietf.org/html/rfc6455.

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

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

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

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

[15] ETSI GS NFV-IFA 007: "Network Functions Virtualisation (NFV) Release 3; Management and Orchestration; Or-Vnfm reference point - Interface and Information Model Specification".

[16] IETF RFC 5789: "PATCH Method for HTTP".

NOTE: Available at https://tools.ietf.org/html/rfc5789.

[17] IETF RFC 7386: "JSON Merge Patch".

NOTE: Available at https://tools.ietf.org/html/rfc7386.

[18] IETF RFC 8446: "The Transport Layer Security (TLS) Protocol Version 1.3".

NOTE: Available at https://tools.ietf.org/html/rfc8446.

[19] ETSI TS 129 558: "5G; Enabling Edge Applications; Application Programming Interface (API) specification; Stage 3 (3GPP TS 29.558 version 17.0.0 Release 17)".

[20] ETSI GS MEC 016: "Multi-access Edge Computing (MEC); Device application interface".

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.

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

[i.1] IETF RFC 5905: "Network Time Protocol Version 4: Protocol and Algorithms Specification".

[i.2] IEEE 1588-2019™: "IEEE Standard for a Precision Clock Synchronization Protocol for Networked Measurement and Control Systems".

[i.3] Protocol buffers, version 3.

NOTE: Available at https://developers.google.com/protocol-buffers/docs/proto3.

[i.4] OASIS Standard: "MQTT Version 3.1.1", 29 October 2014.

NOTE: Available at http://docs.oasis-open.org/mqtt/mqtt/v3.1.1/os/mqtt-v3.1.1-os.html.

[i.5] gRPC™.

NOTE: Available at http://www.grpc.io/.

[i.6] OpenAPI™ Specification.

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

[i.7] IETF RFC 4122: "A Universally Unique IDentifier (UUID) URN Namespace".

NOTE: Available at https://tools.ietf.org/html/rfc4122.

[i.8] ETSI TS 123 222: "LTE; 5G; Common API Framework for 3GPP Northbound APIs (3GPP TS 23.222 Release 16)".

[i.9] ETSI TS 129 222: "5G; LTE; Common API Framework for 3GPP Northbound APIs (3GPP TS 29.222 Release 16)".

[i.10] ETSI GR MEC 001: "Multi-access Edge Computing (MEC) Terminology".

3 Definition of terms, symbols and abbreviations

3.1 Terms

For the purposes of the present document, the terms given in ETSI GR MEC 001 [i.10] apply.

3.2 Symbols

Void.

3.3 Abbreviations

For the purposes of the present document, the abbreviations given in ETSI GR MEC 001 [i.10] and the following apply:

5GS	5G System
DSCP	Differentiated Services Code Point
E-UTRA	Evolved Universal Terrestrial Radio Access
EPS	Evolved Packet System
FQDN	Fully Qualified Domain Name
GRE	Generic Routing Encapsulation
MQTT	Message Queue Telemetry Transport
NR	New Radio
NTP	Network Time Protocol
PoP	Point of Presence
PTP	Precision Time Protocol
RPC	Remote Procedure Call
TC	Traffic Class
ToD	Time of Day
XML	eXtensible Markup Language

4 Overview

The present document specifies two MEC Platform Application Enablement APIs that support the requirements defined for Multi-access Edge Computing in ETSI GS MEC 002 [2], namely the MEC application support API and the MEC service management API.

Clause 5 introduces the functionalities enabled via the Mp1 reference point between MEC applications and MEC platform. It provides the high level information flows and describes the necessary operations.

The common data types are defined in clause 6, while the corresponding data models and API definitions are specified in clause 7 for the MEC application support API and clause 8 for the MEC service management API.

5 Description of the services (informative)

5.1 Introduction

The MEC platform, as defined in ETSI GS MEC 003 [3], offers an environment where MEC applications may discover, advertise, consume and offer MEC services. Upon receipt of update, activation or deactivation of traffic rules from the MEC platform manager, applications or services, the MEC platform instructs the data plane accordingly. The MEC platform also receives DNS records from the MEC platform manager and uses them to configure a DNS proxy/server.

Via Mp1 reference point between the MEC platform and the MEC applications, as defined in ETSI GS MEC 003 [3], the basic functions are enabled, such as:

- MEC service management:
  - authentication and authorization of producing and consuming MEC services;
  - a means for service producing MEC applications to register/deregister towards the MEC platform the MEC services they provide, and to update the MEC platform about changes of the MEC service availability;
  - a means to notify the changes of the MEC service availability to the relevant MEC application;
  - discovery of available MEC services;
- MEC application support:
  - MEC application start-up procedure;
  - MEC application graceful termination/stop;
  - MEC application registration;
- traffic routing:
  - traffic rules update, activation and deactivation;
- DNS rules:
  - DNS rules activation and deactivation;
- timing:
  - providing access to time of day information;
- transport information:
  - providing information about available transports.

These functions are grouped into those considered to provide MEC application support (i.e. application specific traffic routing, DNS rules and timing, as well as graceful termination/stop) and those that provide MEC service management (i.e. MEC service assistance and associated service transport information).

5.2 Sequence diagrams

5.2.1 General

The following clauses describe how MEC applications and/or MEC services may be supported by the MEC platform via Mp1 reference point. The related sequence diagrams are presented.

5.2.2 MEC application start-up

Figure 5.2.2-1 shows three alternative messages that a MEC application can use to communicate with a MEC platform during the start-up phase of the application instantiation process, steps 5 to 7 in clause 5.3.1 of ETSI GS MEC 010-2 [4].

In this flow, the MEC platform can verify the authenticity of the MEC application with the aid of an AA entity that contains the registration related information about the MEC application in question. For actual authentication, the MEC application uses access token based on Oauth2.0.

MEC platform also has possibility to verify the correctness of the service registration or services query of the MEC application, as it is assumed that MEC platform has received the valid configuration for service consuming and service producing MEC applications. The related information about this MEC application instance (including the required and the optional services, the services to be offered by this application instance and the associated transport dependency, the traffic rules and DNS rules associated with this application instance, etc.) can be compared to those included in the service registration or services query messages, which can be used to determine whether to accept or reject the request.

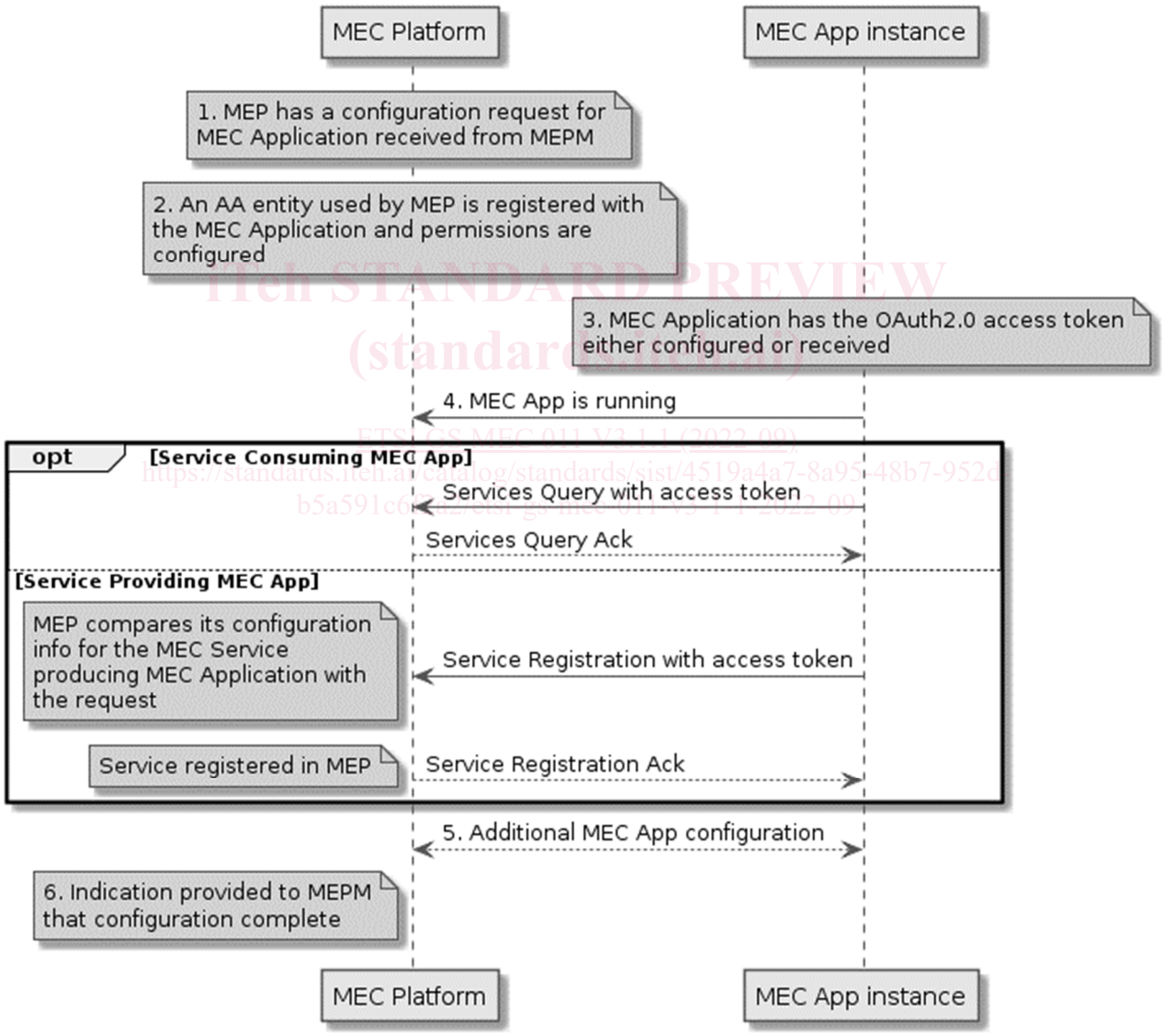

Figure 5.2.2-1: Flow of MEC application start up

MEC application start up procedure, following the MEC application instantiation procedure (as defined in ETSI GS MEC 010-2 [4]), consists of the following steps:

1) MEC platform has received a configuration request from MEC Platform Manager. The configuration request contains detailed information about the parameters related to the MEC application, including the required and the optional services, the services to be offered by this application instance and the associated transport dependency, the traffic rules and DNS rules associated with this application instance, etc.

2) An AA entity associated with the MEC platform has been configured with the MEC application related identity and permissions.

3) MEC application that intends to communicate with MEC platform has the Oauth2.0 access token either received or configured.

4) The MEC application that intends to communicate with MEC sends a "MEC App is running" message towards the MEC platform to confirm that the instantiation and the start-up phase have been successfully completed. If the application receives an error response with 409 status code from the platform, it should retry sending such message for a configurable period of time. This behaviour increases robustness to race-conditions in the instantiation process, in particular when the MEC platform has not yet received the configuration request from MEC Platform Manager, or the MEC platform is still processing the configuration request.

   Depending on the nature of the MEC application and its intended use of MEC services, after the successful response received the MEC application may apply one or both of the following options:

   a) Option 1:

      Send services query to the MEC platform (MEC Application that consumes MEC Services). The services query request contains the access token.

   b) Option 2:

      Send a service registration request to the MEC platform (MEC application that provides MEC service(s)). The service registration request contains the access token. The MEC platform then compares the configuration it has for the service producing MEC application with the request, and if acceptable, registers the MEC service and returns a service registration acknowledgement.

NOTE 1: It is out of scope how a MEC application instance discovers a MEC platform. In practise, this may be statically configured or dynamically discovered via e.g. DNS.

5) If applicable, additional configuration on the MEC services may be performed between the MEC platform and MEC application.

   The MEC system may also pre-configure (not through Mp1) the MEC application instance with necessary parameters, for example:

   - the information needed to access the required services;
   - the availability of the optional services;
   - the information needed to access the available optional services.

   The additional procedures via Mp1 that are related to this step include, when required, "Traffic rule activation/deactivation/update" as defined in clause 5.2.7, and "DNS rule activation/deactivation" as defined in clause 5.2.8. And the MEC application instance may update the MEC platform with the information about the available produced MEC services as defined in clause 5.2.4.

6) MEC platform sends an indication to MEC Platform Manager once the configuration is complete. This message is not further specified in the present document.

NOTE 2: The options 4a) and 4b) present different messages that can be sent by a MEC application. As MEC application can both consume and provide MEC service(s), it is possible that such MEC application performs both services query and service registration steps, in any order.