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GROUP SPECIFICATION

Mobile Edge Computing (MEC);
Mobile Edge Platform Application Enablement

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1 Scope

The present document focuses on the Mp1 reference point between mobile edge applications and mobile edge platform, which allows these applications to interact with the mobile edge system. Service related functionality includes registration, discovery, and event notifications. Other functionality includes application availability, traffic rules and DNS, and time of day. It describes the information flows, required information, and specifies the necessary operations, data model and API definition.

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.

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

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

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

[3] ETSI GS MEC 003: "Mobile Edge Computing (MEC) Framework and reference architecture".

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

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

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

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

[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] Extensible Markup Language (XML) 1.1 (Second Edition), W3C Recommendation 16 August 2006, edited in place 29 September 2006.

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

[11] IETF RFC 7230: "HTTP/1.1 Message Syntax and Routing".

NOTE: Available at https://tools.ietf.org/html/rfc7230.

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[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.

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

[i.2] IEEE 1588™ (Version 2): "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] MQTT Version 3.1.1, OASIS Standard, 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 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.

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3 Definitions and abbreviations

3.1 Definitions

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

3.2 Abbreviations

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

API	Application Programming Interface
DSCP	Differentiated Services Code Point
FQDN	Fully Qualified Domain Name
GRE	Generic Routing Encapsulation

GTP	GPRS Tunnelling Protocol
HTTP	HyperText Transfer Protocol
IETF	Internet Engineering Task Force
JSON	Javascript Object Notation
MAC	Media Access Control
MEPM	Mobile Edge Platform Manager
MQTT	Message Queue Telemetry Transport
NTP	Network Time Protocol
PTP	Precision Time Protocol
QCI	Quality Class Indicator
REST	Representational State Transfer
RFC	Request For Comments
RNI	Radio Network Information
RPC	Remote Procedure Call
TC	Traffic Class
TLS	Transport Layer Security
TOD	Time of Day
URI	Uniform Resource Indicator
UTC	Coordinated Universal Time
XML	eXtensible Markup Language

4 Overview

The present document specifies the Mobile Edge Platform Application Enablement API to support the requirements defined for Mobile Edge Computing in ETSI GS MEC 002 [2].

Clause 5 introduces the Mp1 reference point between mobile edge applications and mobile edge platform. It provides the high level information flows and describes the necessary operations.

The information that may be exchanged over the Application Enablement API is described in clause 6 which provides detailed description on all attributes that are used.

Clause 7 describes the actual Application Enablement API providing detailed information on how the attributes are mapped into a RESTful API design.

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5 Description of the services (informative)

5.1 Introduction

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

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

- mobile edge service assistance:
  - authentication and authorization of producing and consuming mobile edge services;
  - a means for service producing mobile edge applications to register towards the mobile edge platform the mobile edge services they provide, and to update the mobile edge platform about changes of the mobile edge service availability;
  - a means to notify the changes of the mobile edge service availability to the relevant mobile edge application;

- discovery of available mobile edge services;

- mobile edge application assistance:
  - mobile edge application start-up procedure;
  - mobile edge application graceful termination/stop;
- 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.

5.2 Sequence diagrams

5.2.1 General

Clauses 5.2.2 to 5.2.10 describe how mobile edge applications may be supported by the mobile edge platform via Mp1 reference point. The related sequence diagrams are presented.

5.2.2 Mobile edge application start-up

Figure 5.2.2-1 shows a scenario where after a mobile edge application is instantiated the mobile edge platform configures the mobile edge application and registers it internally. The related information about this mobile edge application instance is then stored in the mobile edge platform, 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. Additional authorization and authentication of the mobile edge application instance may take place based on operator's policies and/or 3rd party service providers' requirements. For example, the 3rd party service provider may need to be sure that the app is running on a legitimate/permitted host in a correct physical territory (e.g. for video content copyright issues).

NOTE 1: This procedure applies to the mobile edge application that either producing mobile edge services, or consuming mobile edge services, or both.

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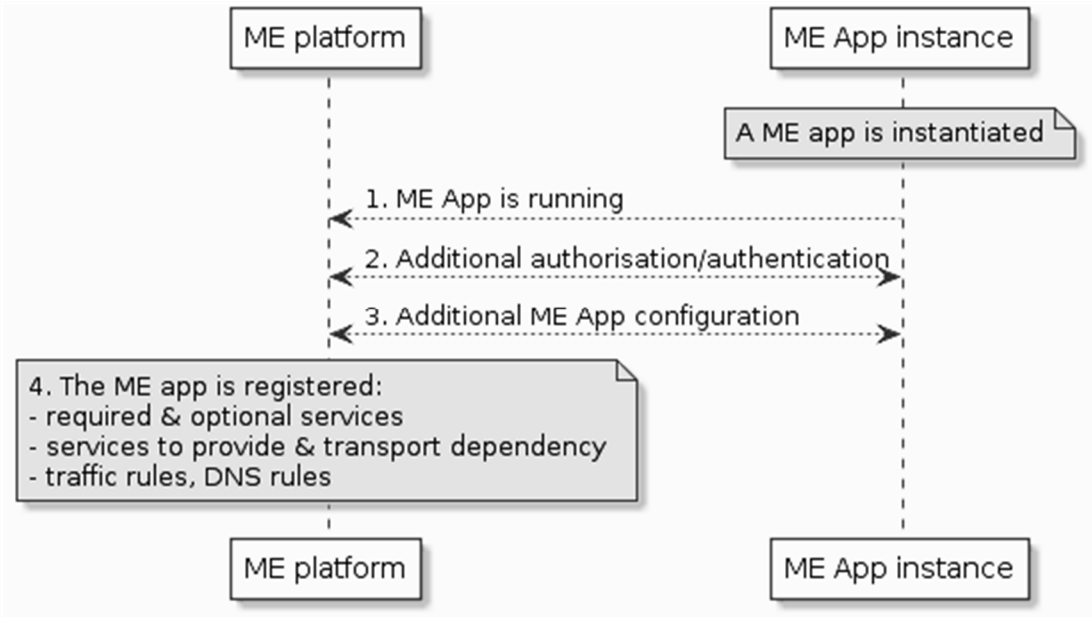

Figure 5.2.2-1: Flow of Mobile Edge application start up

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

1) After instantiation, the mobile edge application instance informs the mobile edge platform that it is up-running. This step is not to be further specified in the present document.

NOTE 2: It is out of scope how an APP instance discovers a ME platform. In practise, this may be statically configured or dynamically discovered via e.g. DNS.

2) When required, the mobile edge platform provide necessary information to authorize and authenticate this application instance based on operator's policies and/or 3rd party service providers' requirements. This step is not to be further specified in the present document.

NOTE 3: As an example, when additional authorization and authentication of the ME application is required by the 3rd party service provider, the needed information may be provided via Mp1 from the ME platform to the ME application.

3) It is assumed that the mobile edge system pre-configures (not through Mp1) the mobile edge 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 mobile edge application instance may update the mobile edge platform with the information about the available produced mobile edge services as defined in clause 5.2.4.

4) Mobile edge platform then registers this application instance internally with related information including the required and 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. This step is not to be further specified in the present document.

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5.2.3 Mobile edge application graceful termination/stop

Figure 5.2.3-1 shows a flow for mobile edge application graceful termination/stop (as defined in ETSI GS MEC 010-2 [4]). After the mobile edge platform receives a request to terminate or stop a mobile edge application instance the mobile edge platform notifies the mobile edge application instance that it will be terminated or stopped soon if graceful termination/stop is required. The mobile edge platform may also indicate to the mobile edge application instance the length of a time interval during which the application may perform application-specific termination/stop. When the timer expires, the mobile edge platform continues the termination flow of the mobile edge application instance or stop application instance flow by, e.g. deactivating the traffic rules and DNS rules, removing the application instance from the list of instances to be notified about service availability, removing the services provided by the application instance from the service registry, sending service availability notification to the mobile edge applications that consumes the services produced by the terminating mobile edge application instance, etc.

Figure 5.2.3-1: Flow of Mobile Edge application graceful termination/stop

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5.2.4 Service availability update and new service registration

When a mobile edge service is registered by the service producing mobile edge application, the authorized relevant applications (e.g. the applications that indicate the service as "optional" or "required") will be notified about the newly available service. Moreover, the authorized relevant applications will also be notified about the service availability changes of that service.

Figure 5.2.4-1 shows two cases. In the 1st case a mobile edge application instance informs the mobile edge platform that the service(s) provided by this application instance become available for the first time (service registration); and then the mobile edge platform notifies the authorized relevant application instances (e.g. the applications that indicate the service(s) as "optional" or "required") about the newly available service(s). As part of service registration, the relevant information about the service is provided to the platform, and the service is bound to a transport that is either provided by the mobile edge platform, or by the application itself.

In the 2nd case the service producing mobile edge application instance updates the mobile edge platform about the status change of the produced mobile edge services; and the mobile edge platform notify the authorized relevant application instances about the service availability changes.

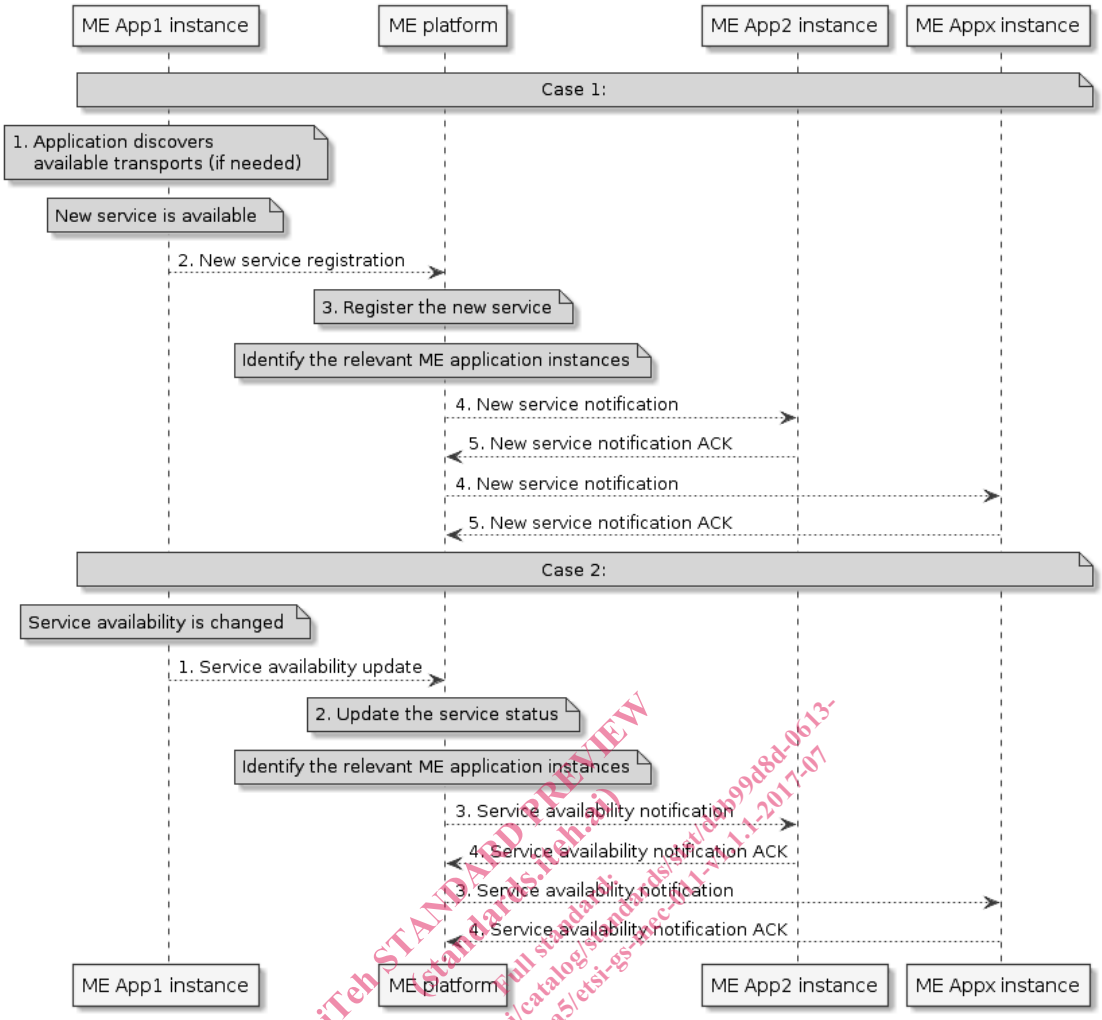

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Figure 5.2.4-1: Flow of new service registration and service availability update

In the 1st case the new service registration procedure consists of the following steps:

1) If the application intends to use a transport that is provided by the mobile edge platform, it discovers the available transports first, and selects one (or more) for use with the new service.

2) After a new mobile edge service becomes available, the service producing mobile edge application instance sends new service registration message to the mobile edge platform.

3) Mobile edge platform registers the new service with the service registry. This step is not to be further specified.

4) Mobile edge platform then identifies the relevant mobile edge application instance for this update (e.g. the applications that indicate the service as "optional" or "required"), and sends new service notifications to the relevant application instances.

5) The mobile edge application instances, optionally, acknowledge the notification.

In the 2nd case mobile edge service availability update procedure consists of the following steps:

1) When a mobile edge service changes its availability, the service producing mobile edge application instance sends service availability update message to the mobile edge platform.

2) Mobile edge platform updates the service registry. This step is not to be further specified.

3) Mobile edge platform then identifies the relevant mobile edge application instance for this update (e.g. the applications that indicate the service as "optional" or "required"), and sends service availability notifications to the relevant application instances.