ETSI GS MEC 029 V2.1.1 (2019-07)

Multi-access Edge Computing (MEC); Fixed Access Information API

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

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1 Scope

The present document describes a MEC service on Fixed Access Information for Fibre (e.g. G-PON, XG-PON, NG-PON2, XGS-PON), Cable (DOCSIS 3.1), xDSL, and Point-to-Point Fibre Ethernet access networks. It describes the information flows, required information, and as applicable, specifies the necessary operations, data model and data format.

The present document also specifies the RESTful API.

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 http://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: "Multi-access Edge Computing (MEC); Terminology".

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

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

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

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

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

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

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

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

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

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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] ETSI GS MEC 009: "Multi-access Edge Computing (MEC); General principles for MEC Service APIs".

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[i.2] ETSI GS MEC 011: "Multi-access Edge Computing (MEC); Edge Platform Application Enablement".

[i.3] ETSI GS MEC 012: "Multi-access Edge Computing (MEC); Radio Network Information API".

[i.4] ETSI GS MEC 028: "Multi-access Edge Computing (MEC); WLAN Information API".

[i.5] Broadband Forum TR-106: "Data Model Template for TR-069-Enabled Devices".

[i.6] DOCSIS 3.0, Operations Support System Interface Specification, CM-SP-OSSIv3.0-C01-171207, December 7, 2017, Cable Television Laboratories, Inc.

[i.7] Recommendation ITU-T G.988 (11/2017): "ONU management and control interface (OMCI) specification".

[i.8] Recommendation ITU-T G.989.3 (10/2015): "40-Gigabit-capable passive optical networks (NG-PON2): Transmission convergence layer specification".

[i.9] Recommendation ITU-T G.984.3 (01/2014): "Gigabit-capable passive optical networks (G-PON): Transmission convergence layer specification".

[i.10] Recommendation ITU-T G.987.3 (01/2014): "10-Gigabit-capable passive optical networks (XG-PON): Transmission convergence (TC) layer specification".

[i.11] Recommendation ITU-T G.9807.1 (06/2016): "10-Gigabit-capable symmetric passive optical network (XGS-PON)".

[i.12] OpenAPI Specification.

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

[i.13] Protocol Buffers Language Specification.

NOTE 1: Available at https://developers.google.com/protocol-buffers/.

NOTE 2: Protocol Buffers Version 3 Language Specification is recommended as it is the official release at the time of publication.

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3 Definition of terms, symbols and abbreviations

3.1 Terms

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

3.2 Symbols

Void.

3.3 Abbreviations

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

AC	Alternating Current
ACK	Acknowledgement
ADSL	Asymmetric Digital Subscriber Line
ANI	Access Node Interface
API	Application Programming Interface
AQM	Active Queue Management
ASCII	American Standard Code for Information Interchange
BPI	Baseline Privacy Interface

CM	Cable Modem
CMTS	Cable Modem Termination System
DLS	Digital Subscriber Line
DOCSIS	Data Over Cable Service Interface Specification
EAE	Early Authentication and Encryption
FA	Fixed Access
FAI	Fixed Access Information
FAIS	Fixed Access Information Service
FTP	File Transfer Protocol
GFAST	G.fast (G stands for the ITU-T G series of recommendations)
GPON	Gigabit Passive Optical Network
HTTP	Hypertext Transfer Protocol
HTTPS	Hypertext Transfer Protocol Secure
IETF	Internet Engineering Task Force
IP	Internet Protocol
JSON	JavaScript Object Notation
MAC	Media Access Control
NGPON	Next Generation Passive Optical Network
ONU	Optical Network Unit
OSS	Operations Support System
PD	Powered Device
PoE	Power over Ethernet
PON	Passive Optical Network
RFC	Request for Comments
SID	Service Identifier
TLS	Transport Layer Security
UGS	Unsolicited Grant Service
URI	Universal Resource Identifier
UTC	Universal Time Coordinated
VDSL	Very-high-bit-rate Digital Subscriber Line
WLAN	Wireless Local Area Network
xDSL	x Digital Subscriber Line (of any type)
XGPON	x Generation Passive Optical Network (also known as 10G-PON)
XG-PON	x Generation-Passive Optical Network
XGSPON	x Generation Symmetric Passive Optical Network

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4 Overview

The present document specifies a Fixed Access Information (FAI) API to support the requirements defined for Multi-access Edge Computing in ETSI GS MEC 002 [2].

Clause 5 introduces how the Fixed Access Information Service (FAIS) supporting G-PON, XG-PON1, NG-PON2, XGS-PON and DOCSIS 3.1 may be used by the MEC applications and by the MEC platform. It describes information flows used for each.

The information that can be exchanged over the API is described in clause 6 which provides a detailed description of all the information elements that are used for each Fixed Access Network and how they are mapped into the REST operations.

Clause 7 describes the actual API, providing detailed information how information elements from each Fixed Access Network are mapped into the RESTful API design.

5 Description of the features (informative)

5.1 FAI service introduction

Multi-access Edge Computing allows running the MEC applications at the edge of the network where the environment is characterized by low latency, proximity to the end users, high bandwidth and exposure to location and up-to-date information from the underlying access networks. The information on current conditions from the fixed access is shared via FAIS.

FAIS is a service that provides the fixed access related information to service consumers within a MEC System. The FAIS is available for the authorized MEC applications and is discovered over the Mp1 reference point [i.2].

The FAI may be used by the MEC applications and the MEC platform to optimize the existing services and to provide new type of services that are based on up to date information from the fixed access possibly combined with the information such as Radio Network Information [i.3] or WLAN Information [i.4] from the other access technologies.

The following clauses describe how the service consumers interact with the FAIS over the FAI API to obtain contextual information from the fixed access network. The relevant sequence diagrams are presented.

5.2 Sequence diagrams

5.2.1 Introduction

The service consumers communicate with FAIS over the FAI API to get contextual information from the fixed access network. Both the MEC applications and the MEC platform may consume the FAIS; and both the MEC platform and the MEC applications may be the providers of the FAI.

The FAI API supports both queries and subscriptions (pub/sub mechanism) that are used over the RESTful API or over alternative transports such as message bus. Alternative transports are not specified in detail in the present document. For RESTful architectural style, the present document defines the HTTP protocol bindings.

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5.2.2 Sending a request for the available FAI

Figure 5.2.2-1 shows a scenario where the service consumer (e.g. a MEC application or a MEC platform) sends a request to receive the available FAI that are relevant to the requested MEC application instance or the MEC platform. The response contains information of the available fixed access (e.g. Fibre (PON, XG-PON, NG-PON), Cable (DOCSIS 3.1), xDSL and Point-to-Point Fibre Ethernet access).

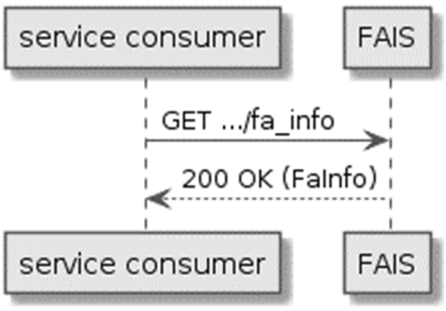

Figure 5.2.2-1: Flow of service consumer requesting the available FAI

A service consumer requesting the available FAI, as illustrated in figure 5.2.2-1, consists of the following steps:

1) Service consumer sends a GET request to the resource representing the available FAI.

2) FAIS responds with "200 OK" with the message body containing the FaInfo.

5.2.3 Sending a request for the device information

Figure 5.2.3-1 shows a scenario where the service consumer (e.g. a MEC application or a MEC platform) sends a request to receive the information of one or more devices connected to a fixed access network. The response contains information of the device(s).

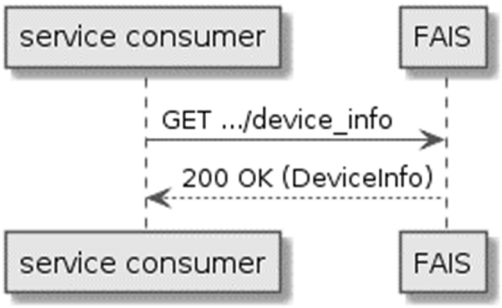

Figure 5.2.3-1: Flow of service consumer requesting the device information

A service consumer requesting the device information, as illustrated in figure 5.2.3-1, consists of the following steps:

1) Service consumer sends a GET request to the resource representing the device information.

2) FAIS responds with "200 OK" with the message body containing the DeviceInfo.

5.2.4 Sending a request for cable line information

Figure 5.2.4-1 shows a scenario where the service consumer (e.g. a MEC application or a MEC platform) sends a request to receive the information of the available cable line of a fixed access network. The response contains information of the line(s).

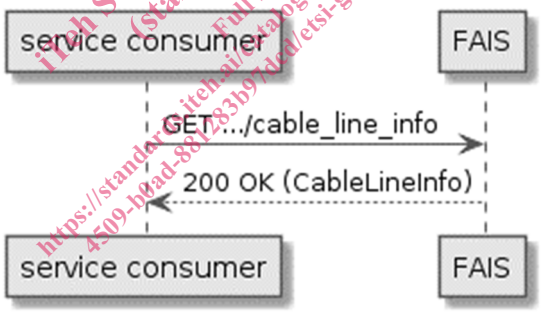

Figure 5.2.4-1: Flow of service consumer requesting the cable line information

A service consumer requesting the line information, as illustrated in figure 5.2.4-1, consists of the following steps:

1) Service consumer sends a GET request to the resource representing the line information.

2) FAIS responds with "200 OK" with the message body containing the LineInfo.

5.2.5 Sending a request for optical network information

Figure 5.2.5-1 shows a scenario where the service consumer (e.g. a MEC application or a MEC platform) sends a request to receive the information of the available information of an optical network (e.g. G-PON, XG-PON, NG-PON2, XGS-PON). The response contains information of the optical network.

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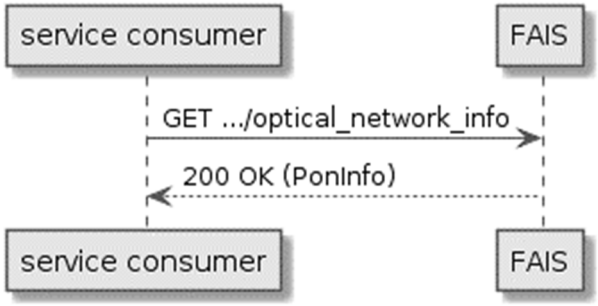

Figure 5.2.5-1: Flow of service consumer requesting the fibre line information

A service consumer requesting the line information, as illustrated in figure 5.2.5-1, consists of the following steps:

1) Service consumer sends a GET request to the resource representing the optical network information.

2) FAIS responds with "200 OK" with the message body containing the PonInfo.

5.2.6 REST based subscribe-notify model

5.2.6.1 Subscribing to event notifications

To receive notifications on selected FAI events, the service consumer creates a subscription to certain specific FAI event that is available at FAIS. Figure 5.2.6.1-1 shows a scenario where the service consumer uses REST based procedures to create a subscription for FAI event notifications.

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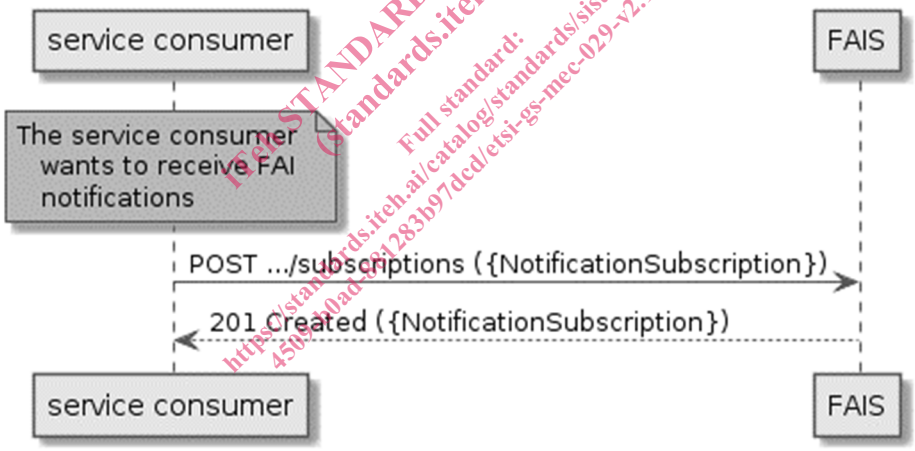

Figure 5.2.6.1-1: Flow of subscribing to the FAI event notifications

Subscribing to the FAI event notifications, as illustrated in figure 5.2.6.1-1, consists of the following steps.

When the service consumer wants to receive notifications about the FAI events, it creates a subscription to the FAI event notifications:

1) The service consumer sends a POST request with the message body containing the {NotificationSubscription} data structure to the resource representing FAI subscription. The variable {NotificationSubscription} is replaced with the data type specified for different FAI event subscriptions, and it defines the subscribed event, the filtering criteria and the address where the service consumer wishes to receive the FAI event notifications.

2) FAIS sends "201 Created" response with the message body containing the data structure specific to that FAI event subscription. The data structure contains the address of the resource created and the subscribed FAI event type. The address of the resource created is also contained in the message header.

5.2.6.2 Receiving notification on expiry of FAI event subscription

FAIS may define an expiry time for the FAI event subscription. In case expiry time is used, the time will be included in the {NotificationSubscription} data structure that is included in the response message to the subscription. Prior to the expiry, FAIS will also send a notification to the service consumer that owns the subscription.

Figure 5.2.6.2-1 shows a scenario where the service consumer receives a subscription expiry notification for the existing subscription.

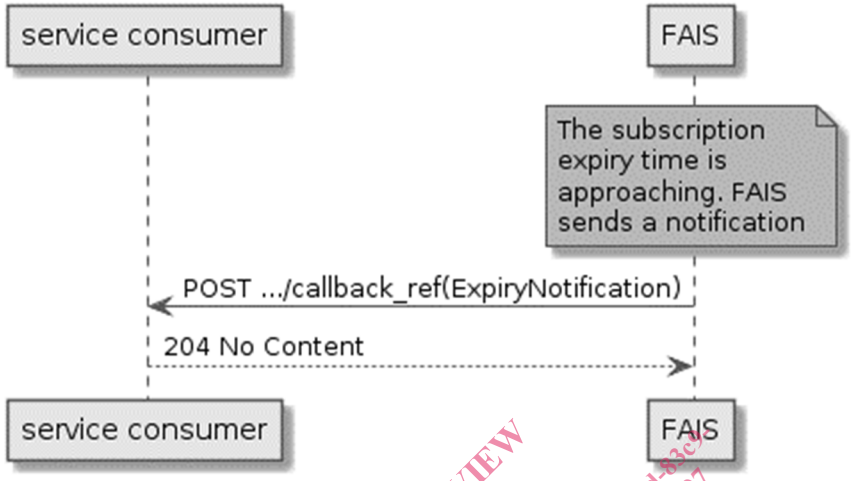

Figure 5.2.6.2-1: Flow of FAIS sending a notification on expiry of the subscription

Sending a notification on expiry of the subscription, as illustrated in figure 5.2.6.2-1 consists of the following steps. If FAIS has defined an expiry time for the subscription, FAIS will send a notification prior to the expiry:

1) FAIS sends a POST request to the callback reference address included by the service consumer in the subscription request. The POST request contains a data structure ExpiryNotification.

2) Service consumer sends a "204 No Content" response.

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5.2.6.3 Updating subscription for FAI event notifications

Figure 5.2.6.3-1 shows a scenario where the service consumer needs to update an existing subscription for a FAI event notification. The subscription update is triggered e.g. by the need to change the existing subscription, or due to the expiry of the subscription.

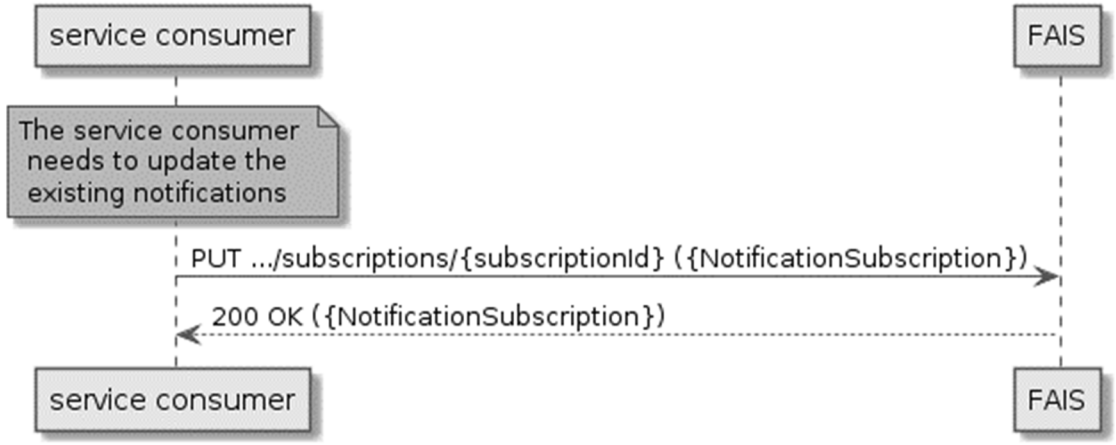

Figure 5.2.6.3-1: Flow of service consumer updating subscription for FAI event notifications