

# ETSI GS MEC 002 V2.1.1 (2018-10)



## Multi-access Edge Computing (MEC); Phase 2: Use Cases and Requirements

**ITeH STANDARDS PREVIEW**  
(standards.iteh.ai)  
Full standard:  
<https://standards.iteh.ai/catalog/standards/sist/bba-22b4-4b18-ba96-0e22822ec4f7/etsi-gs-mec-002-v2.1.1-2018-10>

### *Disclaimer*

---

The present document has been produced and approved by the Multi-access Edge Computing (MEC) ETSI Industry Specification Group (ISG) and represents the views of those members who participated in this ISG. It does not necessarily represent the views of the entire ETSI membership.

---

Reference

RGS/MEC-0002v211TechReq

---

Keywords

MEC, requirements

**ETSI**

650 Route des Lucioles  
F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - NAF 742 C  
Association à but non lucratif enregistrée à la  
Sous-Préfecture de Grasse (06) N° 7803/88

---

**Important notice**

The present document can be downloaded from:

<http://www.etsi.org/standards-search>

The present document may be made available in electronic versions and/or in print. The content of any electronic and/or print versions of the present document shall not be modified without the prior written authorization of ETSI. In case of any existing or perceived difference in contents between such versions and/or in print, the only prevailing document is the print of the Portable Document Format (PDF) version kept on a specific network drive within ETSI Secretariat.

Users of the present document should be aware that the document may be subject to revision or change of status.

Information on the current status of this and other ETSI documents is available at

<https://portal.etsi.org/TB/ETSIDeliverableStatus.aspx>

If you find errors in the present document, please send your comment to one of the following services:

<https://portal.etsi.org/People/CommiteeSupportStaff.aspx>

---

**Copyright Notification**

No part may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm except as authorized by written permission of ETSI.

The content of the PDF version shall not be modified without the written authorization of ETSI.

The copyright and the foregoing restriction extend to reproduction in all media.

© ETSI 2018.

All rights reserved.

**DECT™**, **PLUGTESTS™**, **UMTS™** and the ETSI logo are trademarks of ETSI registered for the benefit of its Members.

**3GPP™** and **LTE™** are trademarks of ETSI registered for the benefit of its Members and of the 3GPP Organizational Partners.

**oneM2M** logo is protected for the benefit of its Members.

**GSM®** and the GSM logo are trademarks registered and owned by the GSM Association.

# Contents

Intellectual Property Rights .....	7
Foreword.....	7
Modal verbs terminology.....	7
1 Scope .....	8
2 References .....	8
2.1 Normative references .....	8
2.2 Informative references.....	8
3 Definition of terms and abbreviations.....	10
3.1 Terms.....	10
3.2 Abbreviations .....	10
4 Generic principles .....	12
4.1 Introduction .....	12
4.2 NFV alignment.....	12
4.3 Mobility support.....	12
4.4 Deployment independence .....	12
4.5 Simple and controllable APIs.....	13
4.6 Smart application location.....	13
4.7 Application mobility to/from an external system .....	13
4.8 Representation of features .....	14
5 Generic requirements .....	14
5.1 Requirements on the framework .....	14
5.2 Application lifecycle .....	15
5.3 Applications environment .....	15
5.4 Support of mobility .....	16
6 Services requirements.....	16
6.1 General .....	16
6.2 Platform essential functionality.....	16
6.2.1 MEC services.....	16
6.2.2 Connectivity.....	17
6.2.3 Storage .....	17
6.2.4 Traffic routing.....	17
6.2.5 DNS support .....	18
6.2.6 Timing .....	18
6.3 Features .....	19
6.3.1 Feature <i>UserApps</i> .....	19
6.3.2 Feature <i>SmartRelocation</i> .....	19
6.3.3 Feature <i>RadioNetworkInformation</i> .....	20
6.3.4 Feature <i>LocationService</i> .....	20
6.3.5 Feature <i>BandwidthManager</i> .....	21
6.3.6 Feature <i>UEIdentity</i> .....	21
6.3.7 Feature <i>WLANInformation</i> .....	21
6.3.8 Feature <i>V2XService</i> .....	21
6.3.9 Feature <i>5GCoreConnect</i> .....	22
7 Operation and management requirements .....	22
8 Security, regulation and charging requirements .....	23
8.1 Security .....	23
8.2 Regulation .....	23
8.3 Charging.....	23
<b>Annex A (informative): Use cases .....</b>	<b>25</b>
A.0 Labelling of related requirements.....	25

A.1	Use case categorization .....	25
A.2	Mobile video delivery optimization using throughput guidance for TCP .....	26
A.2.1	Description .....	26
A.2.2	Use of MEC .....	26
A.2.3	Related requirements .....	27
A.3	Local content caching at the mobile edge .....	27
A.3.1	Description .....	27
A.3.2	Use of MEC .....	27
A.3.3	Related requirements .....	28
A.4	Security, safety, data analytics .....	28
A.4.1	Description .....	28
A.4.2	Use of MEC .....	28
A.4.3	Related requirements .....	29
A.5	Augmented reality, assisted reality, virtual reality, cognitive assistance .....	29
A.5.1	Description .....	29
A.5.2	Use of MEC .....	30
A.5.3	Related requirements .....	30
A.6	Gaming and low latency cloud applications .....	30
A.6.1	Description .....	30
A.6.2	Use of MEC .....	31
A.6.3	Related requirements .....	32
A.7	Active device location tracking .....	32
A.7.1	Description .....	32
A.7.2	Use of MEC .....	32
A.7.3	Related requirements .....	32
A.8	Application portability .....	33
A.8.1	Description .....	33
A.8.2	Use of MEC .....	33
A.8.3	Related requirements .....	33
A.9	SLA management .....	33
A.9.1	Description .....	33
A.9.2	Related requirements .....	33
A.10	MEC edge video orchestration .....	33
A.10.1	Description .....	33
A.10.2	Use of MEC .....	34
A.10.3	Related requirements .....	34
A.11	Mobile backhaul optimization .....	34
A.11.1	Description .....	34
A.11.2	Use of MEC .....	35
A.11.3	Related requirements .....	35
A.12	Direct interaction with MEC application .....	35
A.12.1	Description .....	35
A.12.2	Use of MEC .....	36
A.12.3	Related requirements .....	36
A.13	Traffic deduplication .....	36
A.13.1	Description .....	36
A.13.2	Use of MEC .....	36
A.13.3	Related requirements .....	37
A.14	Vehicle-to-infrastructure communication .....	37
A.14.1	Description .....	37
A.14.2	Use of MEC .....	37
A.14.3	Related requirements .....	38
A.15	Location-based service recommendation .....	38

A.15.1	Description .....	38
A.15.2	Use of MEC.....	38
A.15.3	Related requirements .....	38
A.16	Bandwidth allocation manager for applications .....	39
A.16.1	Description .....	39
A.16.2	Use of MEC.....	39
A.16.3	Related requirements .....	39
A.17	MEC platform consuming information from operator trusted MEC application .....	39
A.17.1	Description .....	39
A.17.2	Use of MEC.....	40
A.17.3	Related requirements .....	40
A.18	Video caching, compression and analytics service chaining.....	41
A.18.1	Description .....	41
A.18.2	Use of MEC.....	41
A.18.3	Related requirements .....	41
A.19	Radio access bearer monitoring .....	42
A.19.1	Description .....	42
A.19.2	Use of MEC.....	42
A.19.3	Related requirements .....	42
A.20	MEC host deployment in dense-network environment .....	42
A.20.1	Description .....	42
A.20.2	Use of MEC.....	42
A.20.3	Related requirements .....	43
A.21	Radio network information generation in aggregation point .....	43
A.21.1	Description .....	43
A.21.2	Use of MEC.....	43
A.21.3	Related requirements .....	43
A.22	Unified enterprise communications .....	44
A.22.1	Description .....	44
A.22.2	Use of MEC.....	45
A.22.3	Related requirements .....	45
A.23	Application computation off-loading .....	45
A.23.1	Description .....	45
A.23.2	Value proposition .....	46
A.23.3	Use of MEC.....	46
A.23.4	Related requirements .....	46
A.24	Optimizing QoE and resource utilization in multi-access network.....	46
A.24.1	Description .....	46
A.24.2	Use of MEC.....	47
A.24.3	Related requirements .....	47
A.25	Camera as a service .....	48
A.25.1	Description .....	48
A.25.2	Use of MEC.....	49
A.25.3	Related requirements .....	49
A.26	Video production and delivery in a stadium environment .....	49
A.26.1	Description .....	49
A.26.2	Use of MEC.....	51
A.26.3	Related requirements .....	51
A.27	Media Delivery Optimizations at the Edge .....	52
A.27.1	Description .....	52
A.27.2	Use of MEC.....	52
A.27.3	Related requirements .....	53
A.28	Factories of the Future.....	53
A.28.1	Description .....	53

A.28.2	Use of MEC.....	54
A.29	Flexible development with Containers.....	54
A.29.1	Description .....	54
A.29.2	Use of Multi-access Edge Computing.....	55
A.30	Third Party Cloud Provider .....	56
A.30.1	Description .....	56
A.30.2	Use Of MEC.....	57
A.30.3	Related requirements .....	57
A.31	Multi user, multi network applications.....	58
A.31.1	Description .....	58
A.31.2	Use of MEC.....	59
A.31.3	Related requirements .....	59
A.32	Indoor Precise Positioning and Content Pushing .....	59
A.32.1	Description .....	59
A.32.2	Use of MEC.....	59
A.32.3	Related requirements .....	60
A.33	Multi-RAT application computation offloading .....	60
A.33.1	Description .....	60
A.33.2	Use of MEC.....	60
A.33.3	Related requirements .....	60
A.34	IPTV over WTTx .....	61
A.34.1	Description .....	61
A.34.2	Use of MEC.....	61
A.34.3	Related requirements .....	62
A.35	MEC System deployment in 5G environment.....	62
A.35.1	Description .....	62
A.35.2	Use of Multi-access Edge Computing.....	63
A.35.3	Related requirements .....	63
A.36	In-vehicle MEC hosts supporting automotive workloads .....	63
A.36.1	Description .....	63
A.36.2	Use of MEC.....	64
A.36.3	Related requirements .....	64
<b>Annex B (informative):</b>	<b>Operator trusted MEC applications .....</b>	<b>65</b>
History .....		66

---

# Intellectual Property Rights

## Essential patents

IPRs essential or potentially essential to normative deliverables may have been declared to ETSI. The information pertaining to these essential IPRs, if any, is publicly available for **ETSI members and non-members**, and can be found in ETSI SR 000 314: *"Intellectual Property Rights (IPRs); Essential, or potentially Essential, IPRs notified to ETSI in respect of ETSI standards"*, which is available from the ETSI Secretariat. Latest updates are available on the ETSI Web server (<https://ipr.etsi.org/>).

Pursuant to the ETSI IPR Policy, no investigation, including IPR searches, has been carried out by ETSI. No guarantee can be given as to the existence of other IPRs not referenced in ETSI SR 000 314 (or the updates on the ETSI Web server) which are, or may be, or may become, essential to the present document.

## Trademarks

The present document may include trademarks and/or tradenames which are asserted and/or registered by their owners. ETSI claims no ownership of these except for any which are indicated as being the property of ETSI, and conveys no right to use or reproduce any trademark and/or tradename. Mention of those trademarks in the present document does not constitute an endorsement by ETSI of products, services or organizations associated with those trademarks.

---

# Foreword

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

"**must**" and "**must not**" are **NOT** allowed in ETSI deliverables except when used in direct citation.

---

# 1 Scope

The present document specifies the requirements for Multi-access Edge Computing with the aim of promoting interoperability and deployments. It contains normative and informative parts.

The present document also contains an annex describing example use cases and their technical benefits, for the purpose of deriving requirements.

---

## 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.

Not applicable.

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

[i.2] Mobile-Edge Computing - Introductory Technical White Paper, September 2014.

NOTE: Available at [https://portal.etsi.org/Portals/0/TBpages/MEC/Docs/Mobile-edge\\_Computing\\_-\\_Introductory\\_Technical\\_White\\_Paper\\_V1%2018-09-14.pdf](https://portal.etsi.org/Portals/0/TBpages/MEC/Docs/Mobile-edge_Computing_-_Introductory_Technical_White_Paper_V1%2018-09-14.pdf).

[i.3] IETF draft-flinck-mobile-throughput-guidance-03.txt: "Mobile Throughput Guidance Inband Signaling Protocol".

NOTE: Available at <https://tools.ietf.org/html/draft-flinck-mobile-throughput-guidance-03>.

[i.4] ETSI GS NFV 002: "Network Functions Virtualisation (NFV); Architectural Framework".

[i.5] IBM Research: "Byte Caching in Wireless Networks".

NOTE: Available at <http://researcher.ibm.com/researcher/files/us-aruni/ByteCachingicdcs2012.pdf>.

[i.6] Computer Science and Engineering, 352350 University of Washington: "A Protocol-Independent Technique for Eliminating Redundant Network Traffic".

NOTE: Available at <https://djw.cs.washington.edu/papers/spring-sigcomm00.pdf>.



- [i.7] IETF draft-sprecher-mobile-tg-exposure-req-arch-02.txt: "Requirements and reference architecture for Mobile Throughput Guidance Exposure".
- NOTE: Available at <https://tools.ietf.org/html/draft-sprecher-mobile-tg-exposure-req-arch-02>.
- [i.8] Small Cells Forum White Paper SCF081: "Enterprise unified communications services with small cells".
- NOTE: Available at [http://www.scf.io/en/documents/081-Enterprise\\_unified\\_communications\\_services\\_with\\_small\\_cells.php](http://www.scf.io/en/documents/081-Enterprise_unified_communications_services_with_small_cells.php).
- [i.9] IEEE 1588™: "IEEE Standard for a Precision Clock Synchronization Protocol for Networked Measurement and Control Systems".
- [i.10] IETF draft-kanugovi-intarea-mams-protocol-04: "Multiple Access Management Services".
- NOTE: Available at <https://tools.ietf.org/html/draft-kanugovi-intarea-mams-protocol-04>. (Work in progress).
- [i.11] IETF draft-zhu-intarea-mams-control-protocol-01: "Control Plane Protocols and Procedures for Multiple Access Management Services".
- NOTE: Available at <https://tools.ietf.org/html/draft-zhu-intarea-mams-control-protocol-01>.
- [i.12] IETF draft-zhu-intarea-mams-user-protocol-01: "User-Plane Protocols for Multiple Access Management Services".
- NOTE: Available at <https://tools.ietf.org/html/draft-zhu-intarea-mams-user-protocol-01>.
- [i.13] ETSI GS MEC 012: "Mobile Edge Computing (MEC); Radio Network Information API".
- [i.14] NGMN: "5G security - Package 3- Mobile Edge Computing / Low Latency / Consistent User Experience".
- [i.15] ETSI TS 101 331: "Lawful Interception (LI); Requirements of Law Enforcement Agencies".
- [i.16] ETSI TS 102 656: "Lawful Interception (LI); Retained Data; Requirements of Law Enforcement Agencies for handling Retained Data".
- [i.17] ETSI TR 126 957: "Universal Mobile Telecommunications System (UMTS); LTE; Study on Server And Network-assisted Dynamic Adaptive Streaming over HTTP (DASH) (SAND) for 3GPP multimedia services (3GPP TR 26.957)".
- [i.18] ETSI TS 126 247: "Universal Mobile Telecommunications System (UMTS); LTE; Transparent end-to-end Packet-switched Streaming Service (PSS); Progressive Download and Dynamic Adaptive Streaming over HTTP (3GP-DASH) (3GPP TS 26.247)".
- [i.19] ISO/IEC 23009-5: "Information technology - Dynamic adaptive streaming over HTTP (DASH) - Part 5: Server and network assisted DASH (SAND)".
- [i.20] H. Kagermann, W. Wahlster, and J. Helbig: "Recommendations for implementing the strategic initiative INDUSTRIE 4.0", Final report of the Industrie 4.0 working group, acatech - National Academy of Science and Engineering, Munich, April 2013.
- [i.21] UK NIC (National Infrastructure Committee): "5G Infrastructure Requirements in the UK" final report.
- NOTE: Available at [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/577940/5G\\_Infrastructure\\_requirements\\_for\\_the\\_UK\\_-\\_LS\\_Telcom\\_report\\_for\\_the\\_NIC.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/577940/5G_Infrastructure_requirements_for_the_UK_-_LS_Telcom_report_for_the_NIC.pdf).
- [i.22] ETSI TS 123 501: "5G; System Architecture for the 5G System (3GPP TS 23.501)".
- [i.23] ETSI TS 123 502: "5G; Procedures for the 5G System (3GPP TS 23.502 Release 15)".
- [i.24] ETSI GR MEC 022: "Multi-access Edge Computing (MEC); Study on MEC Support for V2X Use Cases".

## 3 Definition of terms and abbreviations

### 3.1 Terms

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

### 3.2 Abbreviations

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

5G	Fifth Generation
AI	Artificial Intelligence
API	Application Programming Interface
AR	Augmented Reality
BYO	Bring Your Own
CAPEX	Capital Expenditure
CCM	Client Connection Manager
CI/CD	Continuous Iteration/Continuous Delivery
CFS	Customer Facing Service
CP	Control Plane
CPE	Customer Premises Equipment
DANE	DASH-Aware Network Element
DASH	Dynamic Adaptive Streaming over HTTP
DN	Domain Name
DNS	Domain Name System
DSL	Digital Subscriber Line
DSRC	Digital Short-Range Communications
EAB	Edge Accelerated Browser
ECU	Engine Control Unit
EPC	Evolved Packet Core
EPG	Electronic Programme Guide
FQDN	Fully Qualified Domain Name
GNSS	Global Navigation Satellite System
GPRS	General Packet Radio Service
GPS	Global Positioning System
GTP	GPRS Tunnelling Protocol
GW	Gateway
HTTP	Hyper Text Transfer Protocol
HW	Hardware
IGMP	Internet Group Multicast Protocol
IM	Instant Messaging
IP	Internet Protocol
IPTV	Internet Protocol Television
ISP	Internet Service Provider
IT	Information Technology
LAN	Local Area Network
LI	Lawful Interception
LOS	Line Of Sight
LTE	Long Term Evolution
MADP	Multiple Access Data Proxy
MAMS	Multiple Access Management Services
MANO	Management And Orchestration
ME	Mobile Equipment
MIMO	Multiple Input Multiple Output
ML	Machine Learning
MNO	Mobile Network Operator
MPEG	Moving Pictures Experts Group
NCM	Network Connection Manager
NEF	Network Exposure Function

NGMN	Next Generation Mobile Network
NTP	Network Time Protocol
OBU	On Board Unit
OPEX	Operating Expenditure
OSS	Operations Sub-System
OTT	Over-The-Top
PBX	Private Branch Exchange
PCC	Policy Control and Charging
PCF	Policy Control Function
PER	Packet Error Rate
PIM	Protocol-Independent-Multicast
PSS	Packet Switched Streaming Service
PTP	Precision Time Protocol
QCI	Quality Class Indicator
QoE	Quality of Experience
RAN	Radio Access Network
RAT	Radio Access Technology
RD	Retained Data
RNC	Radio Network Controller
RNI	Radio Network Information
SAND	Server And Network assisted DASH
SLA	Service Level Agreement
SMF	Session Management Function
SMS	Short Message Service
SPID	Subscriber Profile ID
SRS	Sounding Reference Signal
STB	Set Top Box
TCP	Transmission Control Protocol
TEID	Tunnel Endpoint ID
TEO	Third-party Edge Owner
TV	Television
UE	User Equipment
UP	User Plane
UPF	User Plane Function
UTC	Universal Time (Co-ordinated)
UX	User Experience
V2X	Vehicle-to-Everything
VM	Virtual Machine
VNF	Virtualised Network Function
VOD	Video On Demand
VR	Virtual Reality
WLAN	Wireless Local Area Network

<https://standards.iteh.ai/catalog/standards/sist/cbffa4ba-22b4-4a18-ba96-0e22822ec4f7/etsi-gs-mec-002-v2.1.1-2018-10>  
 Full standard:  
 (standards.iteh.ai)

---

## 4 Generic principles

### 4.1 Introduction

The following principles are important to understand in the context of Multi-access Edge Computing.

### 4.2 NFV alignment

Multi-access Edge Computing uses a virtualisation platform for running applications at the mobile network edge. Network Functions Virtualisation (NFV) provides a virtualisation platform to network functions. The infrastructure that hosts their respective applications or network functions is quite similar.

In order to allow operators to benefit as much as possible from their investment, it would be beneficial to reuse the infrastructure and infrastructure management of NFV to the largest extent possible, by hosting both VNFs (Virtual Network Functions) and MEC applications on the same or similar infrastructure. Subject to gap analysis, this might require a number of enhancements (e.g. regarding the sharing of resources with NFV Management and Orchestration, etc.).

### 4.3 Mobility support

Mobility is an essential functionality of 3GPP networks. Most devices connected to a 3GPP network are moving around within the mobile network. Even fixed devices can "move", especially when located at cell edge, but also when changing RATs, etc., or during exceptional events (e.g. power cut from a base station, etc.).

Some MEC applications are state-independent and do not need to keep state information related to the UEs they are serving. For example, an application in the category "network performance and QoE improvements" will only improve the performance of the UE traffic when the traffic goes through that MEC host. When the UE moves to a different location covered by another MEC host, it will be the application hosted on that MEC host that will take care of the UE after a brief transition period. Past interaction is not useful for the application.

Other MEC applications, notably in the category "consumer-oriented services", are specifically related to the user activity. Either the whole application is specific to the user, or at least it needs to maintain some application-specific user-related information that needs to be provided to the instance of that application running on another MEC host.

As a consequence of UE mobility, the MEC system needs to support the following:

- continuity of the service;
- mobility of application (VM); and
- mobility of application-specific user-related information.

### 4.4 Deployment independence

For reasons of performance, costs, scalability, operator preferred deployments, etc., different deployment scenarios need to be supported:

- deployment at the radio node;
- deployment at an aggregation point;
- deployment at the edge of the Core Network (e.g. in a distributed data centre, at a gateway);
- etc.

In order to fulfil all these deployment options, the framework of the MEC architecture needs to allow all these scenarios and the requirements need to be able to address all these deployment options. Requirements that cannot be fulfilled for all deployment options cannot be made mandatory, but might be conditional or optional.

When a MEC platform is deployed on a host located in a cell aggregation site, MEC services running on that platform might need to retrieve information from the radio node(s), for instance, to readout the traffic load and resource block usage of a specific cell.

In order to prevent the illegal access from dishonest terminals and MEC application developers, authentication and secure tunnel communication are necessary between the radio node(s) and the MEC service.

NOTE: The interface between the radio node(s) and the MEC service is not specified in Multi-access Edge Computing Group Specifications.

## 4.5 Simple and controllable APIs

In order to enable the development of a strong ecosystem for Multi-access Edge Computing, it is very important to develop APIs that are as simple as possible and are directly answering the needs of applications. To the extent this is possible, Multi-access Edge Computing specifications need to reuse existing APIs that fulfil the requirements.

In particular circumstances, operators might need to be able to control dynamically the access to certain APIs by a MEC application. Examples include the mitigation of high load of a radio node or MEC host, or when the information of a specific radio node or cell cannot be provided.

## 4.6 Smart application location

MEC applications have a number of requirements, in terms of computing, storage and network resources. More importantly, some applications might have requirements in terms of latency (including latency fairness), etc.

For a certain number of MEC applications, the conditions might evolve over time and require the MEC system to change the location of the application, e.g. as the UEs are moving from cell to cell.

Also, different locations may have different "costs" (in terms of resource availability, energy consumption, etc.), and it might not be always the best choice to run a MEC application at the "best" location (to the detriment of other applications).

For these reasons, MEC applications need to run "at the right place" at the right moment, and might have to move when the conditions evolve. In order to support this, the MEC system needs to provide a system-wide lifecycle management of applications.

## 4.7 Application mobility to/from an external system

In order to support service continuity when the user context and/or application instance is relocated, the system shall be able to relocate a mobile edge application running in an external cloud environment to a MEC host fulfilling the requirements of the MEC application and relocate a MEC application from a MEC host to an external cloud environment outside the MEC system.

NOTE: The scenario of application relocation from a MEC host to an external cloud environment outside the MEC system is for further study.

Two different aspects of application mobility need to be supported to enable user context and/or application instance relocation from an external cloud environment to a MEC host. Firstly, how to transfer files running in the external cloud to the source MEC host, and secondly how to relocate an application instance and the user context to the target MEC host.

For the file transfer there is a possible scenario: For OTT vendors that already have operations in the cloud, files running in the cloud can be uploaded to a functional unit at the MEC host via a portal, such as a customer facing service portal, where the cloud file template can be converted to an image file that can be instantiated in the MEC hosts.