User-Network Interface APIs
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1 Introduction

1.1 Overview

This document specifies REpresentational State Transfer (REST) Application Programming Interfaces (APIs) that enable interactions between a User Client (UC) and the Operator Platform (OP).

1.2 Scope

The present specification describes the APIs, sequence flows and the representation of the API and parameters in REST for the User Network Interface (UNI) between a subscriber's User Client (UC) and an Operator Platform. The UNI related stage 1 functional requirements are defined in the GSMA Permanent Reference Document (PRD) OPG.02 [1].

The UNI specification aligns with requirements stated in the GSMA PRD OPG.02 [1].

1.3 Definitions

Term	Description
API Initiator	API Initiator is the entity that originates the first message in the API sequences
Application Client	A specifically developed client component of an application.
Federation	Federation refers to relationship among member OPs who agrees to offer OP defined services and capabilities to the application providers and end users of member OPs
Directed Federation	A Federation between two OP instances A and B, in which edge compute resources are shared by B to A, but not from A to B.
Federation Creation	Refers to the process for the establishment of the federation relationship between originating OP and partner OP on request by originating OP over the E/WBI
Discovery Service	OP service identified by a well-defined FQDN or IP: Port and protocol pair to assist UCs over UNI to discover adequate edge cloud in the current location of the end users
Home OP	The Operator Platform instance belonging to the subscriber's Operator; that is, whose PLMN identity (Mobile Country Code [MCC] and Mobile Network Code [MNC]) matches with the MCC and MNC of the subscriber's International Mobile Subscriber Identity (IMSI), as defined in 3GPP TS 23.122. (from [1])
LCM Service	LifeCycle Management (LCM) Service to enable UCs for requesting dynamic application instantiation or termination
Leading OP	The Operator Platform instance connected to the Application Provider and receiving the onboarding requests, sharing them to the selected federated platforms/operators. (from [1])
Operator Platform Profile	A specification of constraints on the 3GPP EDGE APPlication enablement (EDGEAPP) architecture that matches the semantics of Operator Platform. An example of an element of the Operator Platform Profile is the mapping of Edge Configuration Server (ECS) Provider identifier onto a Home OP identifier.

Term	Description
Originating OP	The Operator Platform instance initiating the federation creation request to selected federated platforms/operators. Both leading OP and Home OP will be acting as Originating OP while creating the federation with Partner OP.
OP Id	Operator Id is a uniquely identifier assigned to each OP instance of the federation to identify the member OP
Mobility Strategy	It refers to defining an application mobility strategy that includes QoE, geographical store and privacy policies intent
User Client	Functionality that manages on the user's side the interaction with the OP. The User Client (UC) represents an endpoint of the UNI and is a component on the User Equipment. NOTE: Different implementations are possible, for example, OS component, separate application software component, software library, SDK toolkit and so on.
Zone	Zone refers to an availability zone as defined in GSMA PRD OPG.02 [1]

1.4 Abbreviations

Term	Description
AAA	Authentication, Authorisation and Accounting
AC	Application Client
ACR	Application Context Relocation
API	Application Programming Interface
CAPIF	(3GPP) Common API Framework
EAS	Edge Application Server
ECS	Edge Configuration Server
EDGEAPP	EDGE APPlication enablement
EEC	Edge Enabler Client
EECID	Edge Enabler Client Identification
EES	Edge Enabler Server
E/WBI	East/West Bound Interface
GPSI	Generic Public Subscription Identifier
HR	Home Routing
HTTP	HyperText Transfer Protocol
ID	IDentifier
IMSI	International Mobile Subscriber Identity
LBO	Local Break Out (also defined in PRD as Local BreakOut)
LCM	LifeCycle Management
MCC	Mobile Country Code
MNC	Mobile Network Code
MSISDN	Mobile Subscriber Integrated Services Digital Network Number
NBI	North Bound Interface

Term	Description
OP	Operator Platform
OPG	Operator Platform Group
OPP	Operator Platform Profile
OS	Operating System
PRD	Permanent Reference Document
QoE	Quality of Experience
QoS	Quality of Service
REST	REpresentational State Transfer
SDK	Software Development Kit
SIM	Subscriber Identity Module
SPR	Subscriber Profile Repository
SRM	Service Resource Management
UC	User Client
UE	User Equipment
UNI	User Network Interface

1.5 References

Ref	Doc Number	Title
[1]	OPG.02	Operator Platform Telco Edge Requirements", Version 2.0 14 April 2022
[2]	RFC 2119	“Key words for use in RFCs to Indicate Requirement Levels”, S. Bradner, March 1997. Available at http://www.ietf.org/rfc/rfc2119.txt
[3]	Telco Edge Cloud	Telco Edge Cloud: Edge Service Description & Commercial Principles Whitepaper, version 1.0, 27 October 2020 https://www.gsma.com/futurenetworks/resources/telco-edge-cloud-october-2020-download/
[4]	TS 23.222	“Functional architecture and information flows to support Common API Framework for 3GPP Northbound APIs; Stage 2 (Release 17)”, 3GPP TS 23.222, V17.6.0 (2022-06)
[5]	TS 23.501	“System architecture for the 5G System (5GS); Stage 2 (Release 17)”, 3GPP TS 23.501 V17.5.0 (2022-06)
[6]	TS 23.558	Architecture for enabling Edge Applications; (Release 17)”, 3GPP TS 23.558 V17.3.0 (2022-03)
[7]	TS 24.558	“Enabling Edge Applications; Protocol specification; (Release 17)”, 3GPP TS 24.558 V1.3.0 (2022-04)
[8]	TS 29.500	“5G System; Technical Realization of Service Based Architecture; Stage 3 (Release 17)”, 3GPP TS 29.500 V17.7.0 (2022-06)
[9]	29.558	“Application Programming Interface (API) specification; stage 3”, 3GPP TS 29.558 version 17.0.0 Release 17 (2022-07)
[10]	29.571	“Common Data Types for Service Based Interfaces; Stage 3”, 3GPP TS 29.571 V17.6.0 (2022-06).

Ref	Doc Number	Title
[11]	TS 33.210	“Network Domain Security (NDS); IP network layer security (Release 17)”, 3GPP TS 33.210 V17.0.0 (2021-12)
[12]	TS 33.535	“Authentication and Key Management for Applications (AKMA) based on 3GPP credentials in the 5G System (5GS) (Release 17)”, 3GPP TS 33.535 V17.5.0 (2022-03)
[13]	TS 33.558	“Security aspects of enhancement of support for enabling edge applications; stage 2 (Release 17)”, 3GPP TS 33.558 V17.0.0 (2022-03)

1.6 Conventions

“The key words “must”, “must not”, “required”, “shall”, “shall not”, “should”, “should not”, “recommended”, “may”, and “optional” in this document are to be interpreted as described in RFC2119 [2].”

2 UNI Operator Platform Requirements

The contents of this section summarizes the requirements and Service flows from GSMA PRD OPG.02 [1]. They are described here for the convenience of the reader.

2.1 General Requirements

General requirements for the UNI are described in GSMA PRD OPG.02 [1] in section 5.1.7 Annotations to these requirements are provided *[in square brackets and in italic font]*.

1. The primary function of the User to Network interface is to enable a User Client to interact with the OP, to enable the matching of an Application Client with an Application Instance on a Cloudlet.
2. The UNI shall allow the communication between the User Client on the user equipment and the Operator Platform.
3. The User Client should be implemented on User Equipment software, e.g., through an SDK or OS add-on.

   [This is described in more detail in GSMA PRD OPG.02 [1], section 3.5.5].

4. The UNI shall allow the User Client to discover the existence of an Edge Cloud service.

   [The functional elements in the User Equipment (UE) are the User Client (UC) and the Application Client (AC). 3GPP specifications define the architecture for enabling Edge Applications (EDGEAPP) [7]. Among other edge related services this architecture allows edge cloud discovery (i.e., the retrieval of edge cloud information) to reach the AC and it allows the AC to be involved in relocation decisions. GSMA PRD OPG.02 [1] is taking the position that the UC, a system component, should oversee edge cloud information.]

5. The OP's UNI shall allow the user client registration process with the Operator Platform's Service Resource Manager (SRM) which entails the following:

   a) It enables the end-user device *[end-user device implies UE, but edge client is used in GSMA PRD OPG.02 [1] specifically to refer to the client-side endpoint*

of the UNI] to establish an encrypted communication channel with the Operator Platform SRM.

b) Authentication and authorisation. In this document [i.e. GSMA PRD OPG.02 [1], the requirements document], we assume that the UE attaches to the 4/5G network so that the OP can rely on Authentication, Authorisation and Accounting (AAA) done by the operator.

[The EDGEAPP standards provide procedures for authentication and authorization, so the APIs described in this document will attempt to elaborate this requirement. GSMA PRD OPG.02 [1] Section 3.5.3.2 requires that a chain of trust be established from the AC to the cloudlet.]

c) It enables the User Client's usage tracking. For example, to support integration with the network operator's billing infrastructure.

[Usage tracking is not fully described yet. Elsewhere in GSMA PRD OPG.02 [1], the requirement to block usage tracking for privacy is described. The appearance of usage tracking behaviour in the UNI API is for further study.]

6. The OP's UNI shall allow the user client to trigger the selection of a Cloudlet by the OP.
7. The OP's UNI shall allow the user client to trigger the instantiation of an application instance on the selected Cloudlet.
8. The OP shall measure network performance metrics for tracking the average latency characteristics of the edge network.
9. Based on metrics and location information, the User Client may request through the UNI that the OP considers a change of Cloudlet.

2.2 Service Flows

In the service flows described here, we refer to the Home Network (to which a UE is a subscriber) and a Visited Network (when a UE is roaming), and a Home OP (an OP owned by the Home Network) and a Visited OP (an OP owned by a network to which a UE is attached while roaming).

Service flows are the message sequences between functional elements of an OP system.

The service flows described in the current edition of GSMA PRD OPG.02 [1] are the most important, but they do not represent a complete list. The service flows are described in the following subsections, but their names do not exactly match the names that appear in GSMA PRD OPG.02 [1] (the annotations point the reader to the corresponding requirements sections). The names appearing here provide a more symmetric taxonomy of the flows.

The UNI-related service flows identified by [1] include:

- UC Registration – Home Network Attachment, Home OP Registration *[GSMA PRD OPG.02 [1], Section 4.1]*
- UC Registration – Visited Network Attachment, Home/Visited OP Registration *[GSMA PRD OPG.02 [1], Section 4.2]*
- Edge Discovery – Home OP Registration, Home OP Cloudlet *[GSMA PRD OPG.02 [1], Section 4.3]*

- Edge Discovery – Home OP Registration, (Edge-Sharing) Partner OP Cloudlet *[GSMA PRD OPG.02 [1], Section 4.4]*
- Edge Discovery – Visited Partner OP, Home/Visited OP Cloudlet *[GSMA PRD OPG.02 [1], Section 4.5]*
- Application Deployment in Home Operator Domain *[GSMA PRD OPG.02 [1], Section 4.6]*
- Application Deployment in Federated Operator Domain *[GSMA PRD OPG.02 [1], Section 4.7]*

Of these flows, high-level sequence diagrams are provided for UC Registration – Home Operator Platform, and Edge Discovery – Edge-Sharing Partner Network.

The service flows are not defined in detail. API specifications that support the required behaviour, and which are not in conflict in OP requirements, are candidates for use as a UNI API.

Note: Federation scenarios like Edge Sharing are still a work in progress from 3GPP specification. Currently there is an analysis and discussion that are part of the 3GPP TR 23700-98. All the input provided from GSMA OPG is being considered within this Technical Report.

2.2.1 UC Registration – Home Network Attachment, Home OP Registration

This service flow is depicted in Figure 1. The UE is assumed to be connected to the Home Network (i.e., the network that hosts the Home OP).

In comparison to section 2.2.2, in which alternatives of Home or Local Break Out (LBO routing are presented as sub-cases, this case implicitly assumes that a UE attached to its Home Network would never register to an OP other than the corresponding Home OP. This is the base case of the Registration service flows.

The Home OP is permitted to accept the authentication credentials of the Home Network.

Note: Detailed requirements for authentication and authorization are left for further study.

Registration is triggered from the UE, possibly from the AC or UC, but the UNI message travels from UC to the Home OP. The requirements imply that the Home OP endpoint is pre-configured in the UC, and that the MNC and MCC of the OP are part of its identity.

The registration message provides identifying information for the UC, because authentication and authorization take place in this step. The functional element Subscriber Profile Repository (SPR) participates in authentication and authorization, but the UC does not need to know its identity. The sequence diagram provided combines authentication and authorization into a single request/response pair, although this is not a requirement (i.e., separation of authentication and authorization into separate request/response pairs is not forbidden).

Other service flows involving redirection to a different entity for registration purposes are not precluded, but not specified.

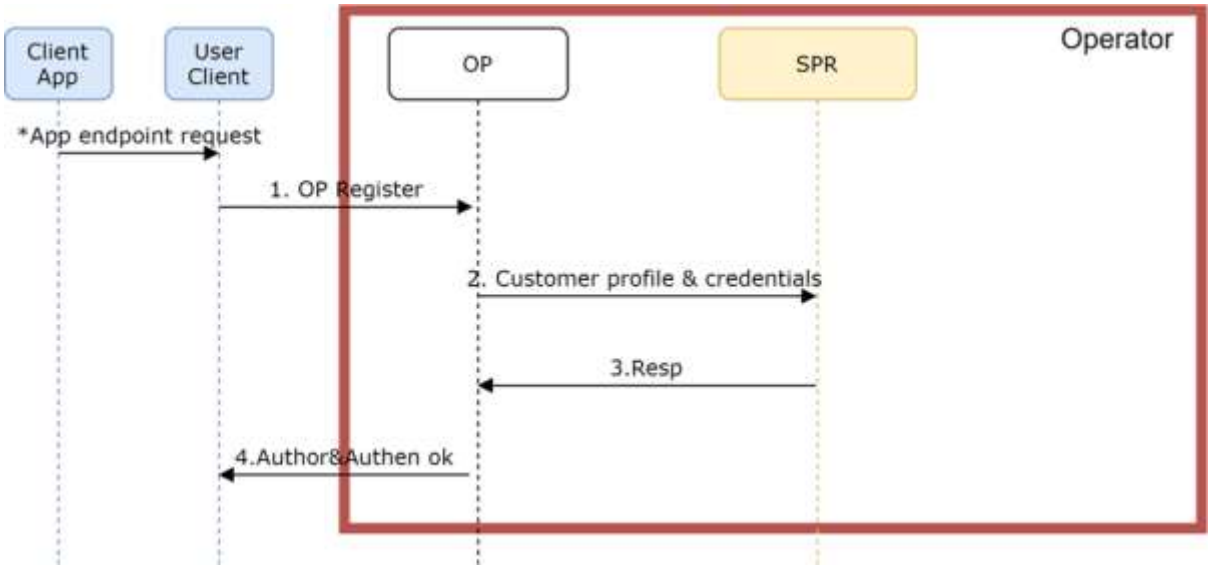

Figure 1: Edge Registration - Home Operator Platform (from [1])

After UC Registration has completed, the UC is able to proceed to an Edge Discovery service flow.

2.2.2 UC Registration – Visited Network Attachment, Home/Visited OP Registration

This case assumes that a UE has previously connected to a Visited Network. The logical choices for Registration are either the UE's Home Network/Home OP (Home Routing, HR, sub-case), or the Visited OP corresponding to the Visited Network (LBO, sub-case). The HR sub-case is applicable when the Visited OP is not federated with the Home OP (or when there is no Visited OP). The LBO sub-case is applicable when the Home and Visited OP are federated with each other and the required authorisation information has been provided.

As in the case described in section 2.2.1, the UC registers on its Home OP (the visited and home networks provide message forwarding as a lower-level service, not visible to the UC).

For Home Routing, all interaction to/from the UC take place with the Home OP, identical with the case of UC Registration – Home OP, except for the extra forwarding step through the visited network. Any edge cloud resources used by the AC are on its Home OP.

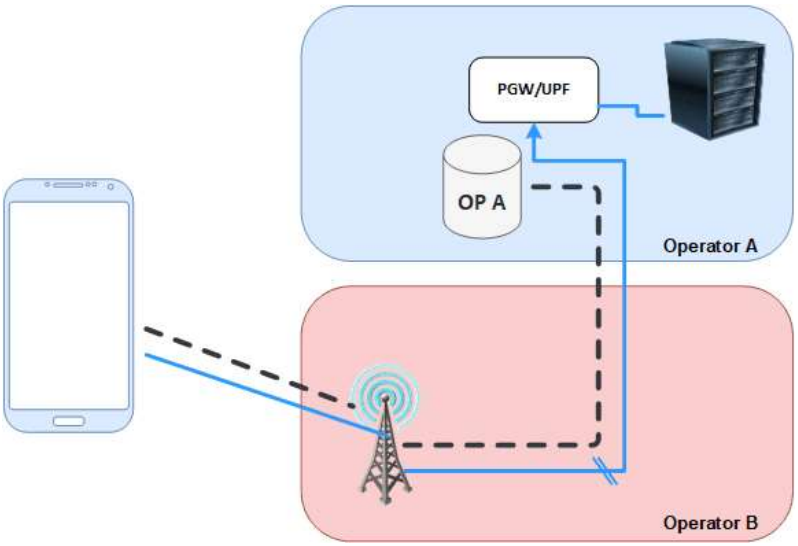

Figure 2: UC Registration on Visited OP - Home Routing (from [1])

For LBO, the UC registration flow is redirected from the Home OP to the OP on the visited network. The UC interacts with the Visited OP as if it were the Home OP.

Note: This implies that a UC Registration service flow must provide a response or a notification event reporting the redirection; the redirection remains in effect during the OP session.

The Home and Visited OPs exchange any information required to allow authorization to take place on the Visited OP. This exchange may take place over the East/WestBound Interface (E/WBI) reference point, or may be implemented in some other manner. It is not visible to the UNI.

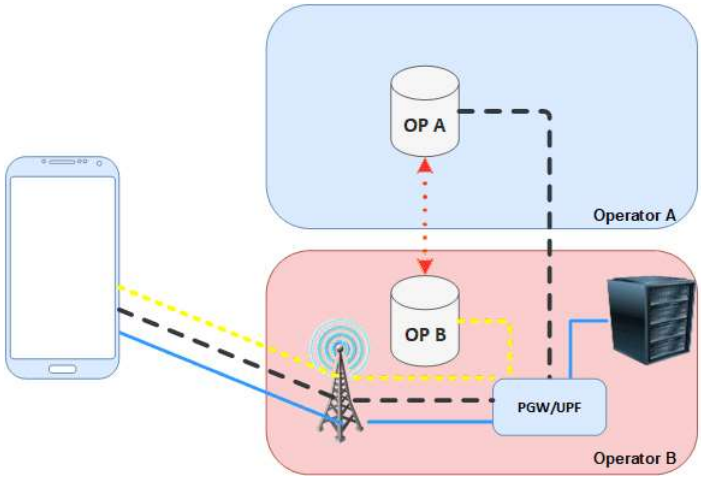

Figure 3: UC Registration on Visited OP - Local Breakout (from [1])

2.2.3 Edge Discovery – Home OP Registration, Home OP Cloudlet

Edge Discovery is the process of finding a cloudlet on which to run an application that interacts with the UE (or its AC). The AC, and its Application Provider, at a minimum specify the QoE requirements; the UE interacts with the OP to which it is registered to discover the suitable cloudlets that meet those requirements.

In this section, the UC is assumed to be registered to its Home OP, and the suitable cloudlet is assumed to be owned by the Home OP.

This use case could be considered to be a subset of the case where the Home OP chooses a suitable cloudlet from itself and all Partner OPs to which it is federated. The next section considers this case.

2.2.4 Edge Discovery – Home OP Registration, (Edge-Sharing) Partner OP Cloudlet

In this service flow, the UC is assumed to be attached to its Home Network and registered to its Home Operator. The flow (shown in Figure 4) assumes that the suitable cloudlet is to be found in a federated Partner OP. The term “Edge-Sharing” in OP refers to a federated relationship between the Home and Partner OPs that allow Home OP customers to use cloudlets on the Visited OP.

The decision-making procedure in which all possible cloudlets, Home or Partner are obtained and compared, is omitted.

In any case, the flows to/from the UC are from/to the Home OP to which it is registered, hence the UNI APIs that derive from this service flow are invariant in terms of messages. The important differences will be in the data elements that describe the cloudlet.

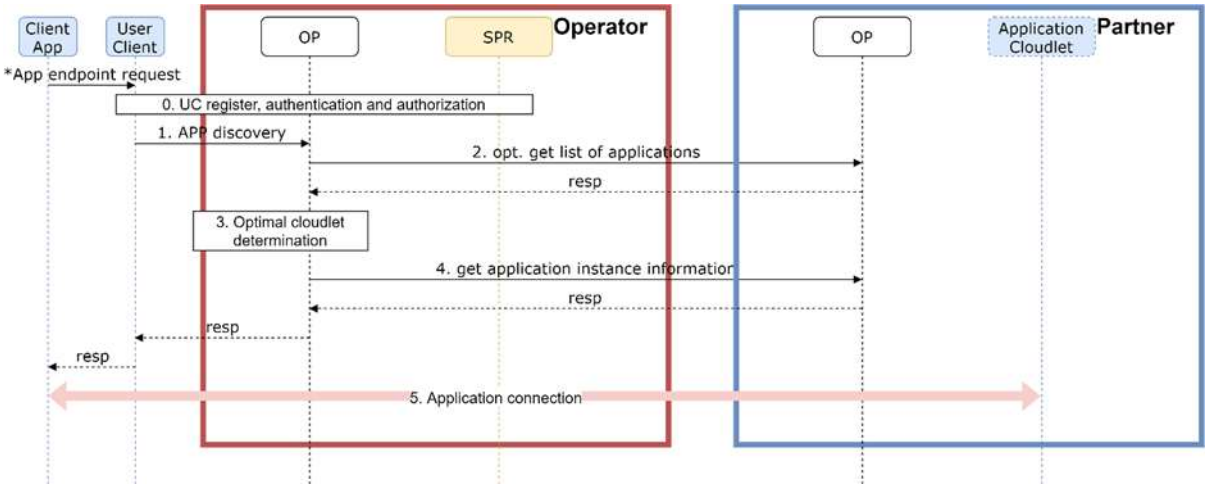

Figure 4: Edge Discovery - Home OP, Edge-Sharing Partner Network Cloudlet (from [1])

NOTE: Like other scenarios related to Federation, Edge Sharing is still a work in progress in 3GPP. Currently it is part of the analysis and discussion in 3GPP where all the input provided from OPG GSMA is being considered and planned to be included as part of new releases.

2.2.5 Edge Discovery – Visited Network Registration, Visited OP Cloudlet

This service flow is meant to be parallel to the Registration cases of section 2.2.2. In other words, the UE is attached to the Visited Network, and has registered via either Home Routing or Local Breakout. It then uses the OP to which it has registered to find a suitable cloudlet in the Visited OP.

2.3 UNI Security/Privacy

According to GSMA PRD OPG.02 [1], section 5.1.6.1, the UNI expects to connect to a trusted network. Additional security requirements that should be supported by the UNI are described in GSMA PRD OPG.02 [1], section 5.1.6.3.

Prior to any of the service flows described above, authentication and authorization are expected to have taken place, and the default expectation is that the operator network is a 4/5G network. Thus, the UNI can reasonably expect the authentication/authorization services of a 4/5G network to be available. In the 3GPP TS 33.558 [13] section 6 defines the procedures related to authentication and authorization.

The information elements shared over the UNI may have security and privacy implications. GSMA PRD OPG.02 [1], section 3.5.5.1, discusses information elements, such as Mobile Subscriber Integrated Services Digital Network Number (MSISDN), Generic Public Subscription Identifier (GPSI), or Subscriber Identity Module (SIM) credentials, that an AC/UC may request when performing edge discovery. The UNI may be required to provide extra access rights to constrain the ability to request such information.

According to GSMA PRD OPG.02 [1], section 5.1.1.3, it should not be possible for an application developer to obtain the exact location of an individual cloudlet, or to request a specific cloudlet. Since an application can be designed to share information with its developer, this constraint applies also to the UNI.

Note: Other means of enabling authentication on the UNI are for further study.

2.4 Mobility Management

OP requirements refer to UE mobility, application mobility, and session mobility.

2.4.1 UE Mobility

UE mobility refers to the relocation of a UE within a mobile network. This may happen because the UE itself moves geographically, or because the mobile network moves the UE for reasons of network load, QoS, or other reasons. UE mobility is largely a feature of the underlying mobile network, not OP, except that both an OP and a UC must be able to send and receive UE mobility events. A UE may issue a UE mobility event if the AC/UC decide that its UE has left a geographic area and needs to inform the OP of the change of state. GSMA PRD OPG.02 [1], Section 5.2.2.3.1, has references to UE mobility.

2.4.2 Application Mobility

Application mobility refers to the ability of OP to select a “new” edge node on which to move an application. It is distinct from provisioning in that application instances are already available on other cloudlets, and the new instance is in support of a session with a UC in order to satisfy, e.g., Quality of Service (QoS) requirements. GSMA PRD OPG.02 [1], section 5.2.2.3.4 provides brief requirements for application mobility.

2.4.3 Session Mobility

Session mobility refers to the ability of a session (between an AC and an application on a cloudlet) to maintain continuity when an application moves between cloudlets Session

mobility implies procedures that send mobility events to a UC. In GSMA PRD OPG.02 [1], section 5.2.2.3.5 provides brief requirements for session mobility.

Note: 3GPP's Application Context Relocation procedures defined in 3GPP TS 23.558 [6] clause 8.1.1.1 cover the three OP requirements described below in this section.

3 3GPP EDGEAPP mapping

3.1 EDGEAPP Functional Element Mapping

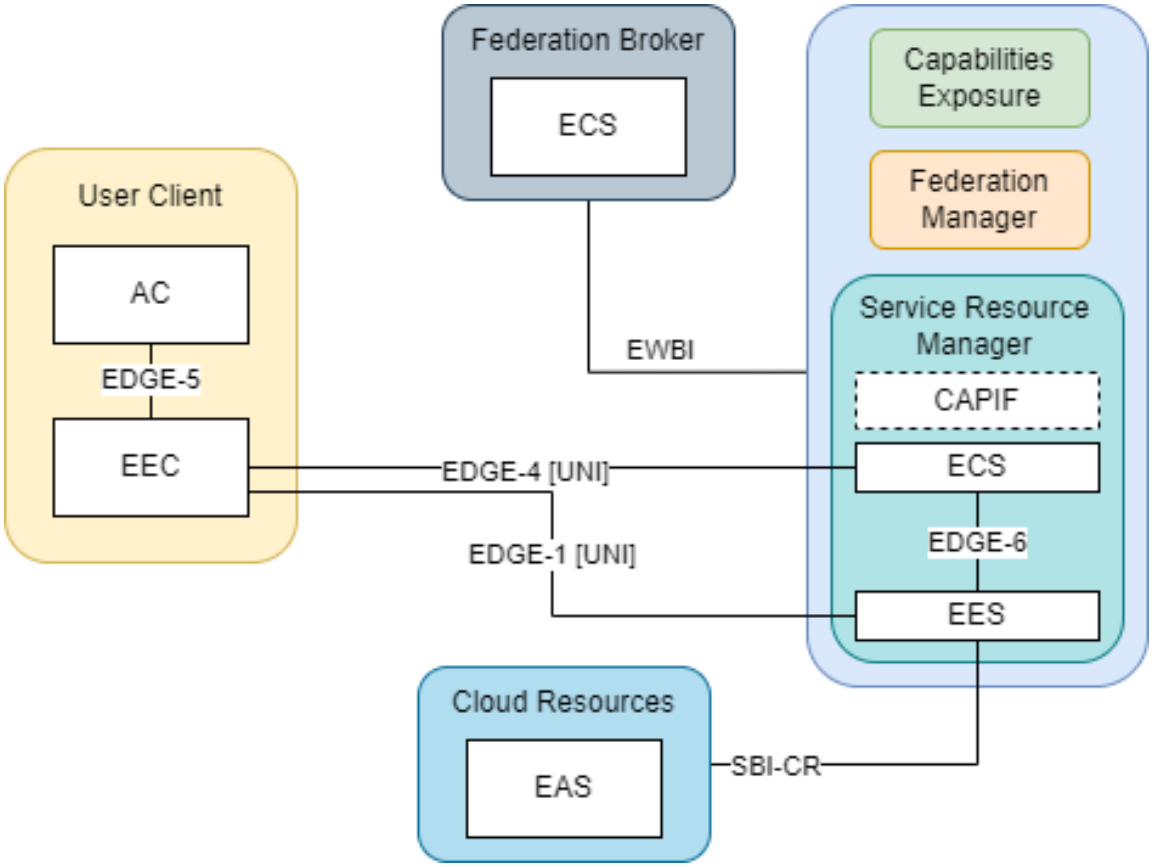

Figure 5: EDGEAPP Functional element mapping to Operator Platform

3.2 OP Profile (OPP) considerations for 3GPP: Edge Enabler Client (EEC), OP: UC, OP: AC, UE

- An EEC maps to a UC. Both are functional elements that exist in a UE, and both contain ACs and UCs.
- Edge Enabler Client Identifications (EECIDs) must be unique; they are used to create access tokens. UC IDs (IDentifiers) map to EECIDs.
- EECIDs are of type string. They can be made unique by tagging an OP ID to a Home OP assigned identifier when user subscribes.
- EECID could be made unique by using UE Identifiers, but there are both scalability and security/privacy reasons for not doing this.
- AC ID is intended to encode an application name. It is supposed to encode an OS ID if the app runs on a mobile OS. The formats for this string are not specified. The

specification is silent about whether version information is to be encoded. This is an area for possible OPP standardisation.

Note: This section may be subject to updates in future based on further discussions with 3GPP SA6.

3.3 OP Profile considerations for 3GPP: ECS, OP: SRM

- One ECS per OP.
- ECS maps to OP: SRM.
- ECS IDs can correspond to OP ID.
- Registering at a Home OP and redirecting to a visiting OP could be simulated by registering with Home OP and getting a FQDN for an Edge Application Server (EAS).
- Multiple Edge Enabler Servers (EESs) per OP (Analysis of scenarios where multiple EESs may be required are still under discussion)
- Edge Computing Service Provider (ECSP) IDs are mapped to OP IDs

Note: This section may be subject to updates in future based on further discussions with 3GPP SA6.

3.4 OP Profile considerations for 3GPP: EES, OP: SRM

In GSMA PRD OPG.02 [1], UE location is defined abstractly, with reference to usage in public clouds. The top-level concept is a Region, and Availability Zones are sub-Regions. They are assumed to cover some geographic area, Cloud and Network Resources are contained in them, and the regions do not overlap in terms of resource coverage. An Application Provider's preferences concerning placement of an application instance in an Availability Zone are taken into consideration, but not enforced. The requirements do not specify if a UC/AC preference for Availability Zone is enforced.

The data model for an Availability Zone is currently defined as:

Data type	Description	Interface Applicability
Availability Zone Name	The name of the availability zone	East/West/North
Region identifier	Geographical identifier	East/West/North
Compute resources	Flavours (e.g., CPU, memory, storage, in/out bandwidth)	East/West/North
Specialized compute offered	Particular compute resources (e.g. GPU, VPU, FPGA, NPU)	East/West/North
QoS	Maximum values of latency, jitter, packet loss ratio	East/West/North
Supported virtualization technology	VMs, containers, both	East/West/North
Costs	Costs associated with the use of the resources	East/West/North

Table 1: Availability Zone data model (from [1], section 3.4.6)

In GSMA PRD OPG.02 [1] section 3.4.7 indicates that a UE has the property of "UE Location", defined as "indicates where the UE connects to the network."

The API serving the E/WBI reference point is expected to provide notifications of changes in Availability Zone information.

When an ECS Service Provisioning operation occurs, a list of EESs is returned that match the AC Profile, and optionally a list of geographical and topological areas that the ECS serves is returned. The list of EESs is not valid to identify availability zones, because there is no restriction that the areas that they serve are mutually exclusive.

An operator could create geo/topology areas to their liking, and assign availability zone IDs to them, and supply them to an ECS, but there is no guarantee that the ECS would accept the definitions.

It is proposed, for an OPP profile, that as a heuristic the EESs be deemed to define availability zones and accept that availability zones may overlap. This is a better choice than using geo/topology information, because the EESs are mandatory in the Eecs_ServiceProvisioning response, whereas the geo/topology information is optional.

Note: This section may be subject to updates in future based on further discussions with 3GPP SA6.

4 OP UNI APIs

This section specifies a collection of service APIs for the UNI. They are primarily derived from the EDGEAPP APIs presented in 3GPP specifications TS 23.558 [6], TS 29.558 [9] and TS 24.558 [7].

The APIs and their information elements maintain their EDGEAPP nomenclature as far as possible. However, even if the APIs maintain the names that imply that they are exposed by EDGEAPP functional elements (e.g., EAS, ECS, EES and EEC), in UNI they are exposed by OP (ECS, EES) or by UC (in the case of EEC).

4.1 Preconditions and Assumptions:

The EDGEAPP APIs have a variety of preconditions and assumptions:

1. Authentication and Authorization of the UC take place during the registration procedure.
2. UC Registration and OP discovery in OP (see the service flows in sections 2.2.1 and 2.2.2) corresponds to EEC Service Provisioning and EEC Registration in 3GPP TS 23.558 [6]. In the service APIs, the name of the endpoint is currently Eecs_ServiceProvisioning and Eees_EECRegistration.
3. UC Registration assumes that a UC, whether in its Home Network or a Visited Network, will register with its Home OP, and thereafter may be redirected to a Partner OP for further interaction. (This is part of section 8.4.2 of TS 23.558)
4. The UC context (derived from EEC context) has been received by the UC from the OP (As described in the 3GPP specifications, for “Initial Register”, EEC context is provided by EES to EEC as part of EEC REGISTER response).
5. An EDGEAPP network may contain a single centralized ECS managing multiple EES elements, and there may be multiple rationales for selecting a particular EES (e.g., Based on OPs and end user location).

6. An EDGEAPP AC is permitted to indicate its preferred ECS providers (in general, there can be multiple). This is based on a model where multiple ECSs, EESs, EASs can interact with each other. The OP model simplifies this scheme, firstly by aggregating functional elements into a Service Resource Manager, and secondly by defining a homogeneous network of OPs. Because the ECS and EES map approximately onto the OP, and EES registers itself to ECS, we conjecture that the ECS ID can map onto the Operator Platform ID. This needs to be part of an Operator Platform Profile (OPP) for EDGEAPP.

4.2 3GPP UNI APIs

Table 2 contains the set of UNI services derived from 3GPP TS 23.558 [6] and 3GPP TS 24.558 [7]. Each service exposed by the OP in this table represents a set of functionalities provided by an OP.

UNI Services	Exposed By	Used By	Description
Eecs_ServiceProvisioning	OP	UC	UC obtains service provisioning info via request/response or subscribe/notify
Eees_EECRegistration	OP	UC	UC registers to an OP via request, update, deregister. This is where OP redirection could occur.
Eees_EASDiscovery	OP	UC	UC obtains cloudlet info via request/response or subscribe/notify
Eees_AppContextRelocation	OP	UC	UC is directed to use a different EAS (different cloudlet) by the OP. (launches application context relocation)
Eees_ACREvents	OP	UC	UC arranges to get application/session mobility events (ACR events in EDGEAPP) via subscribe/notify

Table 2: UNI Services (derived from [6], [7])

These are REST APIs, compatible with the OneAPI standard and with 3GPP's Common API Framework (CAPIF). They each define multiple HTTP methods, which are documented in subsequent subsections. They currently retain the spelling found in 3GPP TS 23.558 [6] and 3GPP TS 24.558 [7].

The services in Table 2 that are exposed by the UC as notification interfaces. Their analogues in EDGEAPP are “NotificationDestination” endpoints that are supplied to EAS/ECS/EES by a Subscribe API. In the UNI services described here, they are supplied to the OP in the same manner, but for clarity are given their own proper names in the table and documentation.

4.3 Registration API

4.3.1 Description

This API is intended to enable the User Client registration process with the Operator Platform.

4.3.2 Requirement and Service Aspects

The requirements from OP point of view are described in GSMA PRD OPG.02 [1] sections 3.5.3.1 and 5.1.7. Item 5 in the section 2.1 “General Requirements” summarise the details related to the registration procedures.

4.3.3 Procedures

The following procedures defined in 3GPP shall apply to the UNI Registration API:

NF	Section	TS	Procedure Name
EEC (UC) ECS (OP)	8.3.3	23.558	Service Provisioning
EEC (UC) ECS (OP)	7.2	24.558	Eecs_ServiceProvisioning Service
EEC (UC) EES (OP)	8.4.2	23.558	EEC Registration
EEC (UC) EES (OP)	5.2	24.558	Eees_EECRegistration Service

Table 3: 3GPP Registration Procedures

NOTE: Aspects related to federation are being analysed as part of the 3GPP TR 23700-98. Agreed solutions will be included as part of the study for 3GPP release 18.

4.3.4 API

The following API as defined in 3GPP shall be endorsed for the Operator Platform UNI.

NF	Section	TS	API name
EEC (UC) EES (OP)	6.2	24.558	Eees_EECRegistration API
EEC (UC) ECS (OP)	8.1	24.558	Eecs_ServiceProvisioning API

Table 4: 3GPP EDGEAPP Registration APIs

4.4 Discovery API

4.4.1 Description

The OP shall be capable of provide relevant configuration information of Edge Nodes to the UC via UNI APIs in order to enable communication between them (e.g., based on UE location provide the list of closest nodes).

4.4.2 Requirement and Service Aspects

The requirements from OP point of view are described in GSMA PRD OPG.02 [1] section 3.5.3.1. Besides, service flows in sections 2.2.3 to 2.2.5 of this document specify different discovery scenarios.

4.4.3 Procedures

The following procedures defined in 3GPP shall apply to the UNI Discovery API:

NF	Section	TS	Procedure Name
EEC (UC) EES (OP)	8.5	23.558	EAS discovery
EEC (UC) EES (OP)	5.3	24.558	Eees_EASDiscovery service

Table 5: 3GPP Procedures for Edge Discovery

NOTE: Aspects related to federation are being analysed as part of the 3GPP TR 23700-98. Agreed solutions will be included as part of the study for 3GPP release 18.

4.4.4 API

The following API as defined in 3GPP shall be endorsed for the Operator Platform UNI.

NF	Section	TS	API name
EEC (UC) EES (OP)	6.3	24.558	Eees_EASDiscovery API

Table 6: 3GPP EDGEAPP Discovery API

4.5 Mobility/QoE API

4.5.1 Description

This API is intended to handle of mobility and Quality of Experience (QoE) reporting.

4.5.2 Requirement and Service Aspects

The requirements from OP point of view are described in the GSMA PRD OPG.02 [1] section 3.5.3.1. Additionally, items 6 to 9 from section 2.1 provide a summary of related requirements.

4.5.3 Procedures

The following procedures defined in 3GPP shall apply to the UNI Mobility/QoE API:

NF	Section	TS	Procedure Name
EEC (UC) EES (OP)	8.8	23.558	Service continuity
EEC (UC) EES (OP)	8.9	23.558	EEC Context and EEC Context relocation
EEC (UC) EES (OP)	5.4	24.558	Eees_ACREvents Service

NF	Section	TS	Procedure Name
EEC (UC) EES (OP)	5.5	24.558	Eees_AppContextRelocation Service

Table 7: 3GPP Mobility Procedures

4.5.4 API

The following API as defined in 3GPP shall be endorsed for the Operator Platform UNI.

NF	Section	TS	API name
EEC (UC) EES (OP)	6.4	24.558	Eees_ACREvents API
EEC (UC) EES (OP)	6.5	24.558	Eees_AppContextRelocation API

Table 8: 3GPP EDGEAPP Mobility APIs

Annex A Additional Information

A.1 EDGEAPP Service Flows

A.1.1 Registration

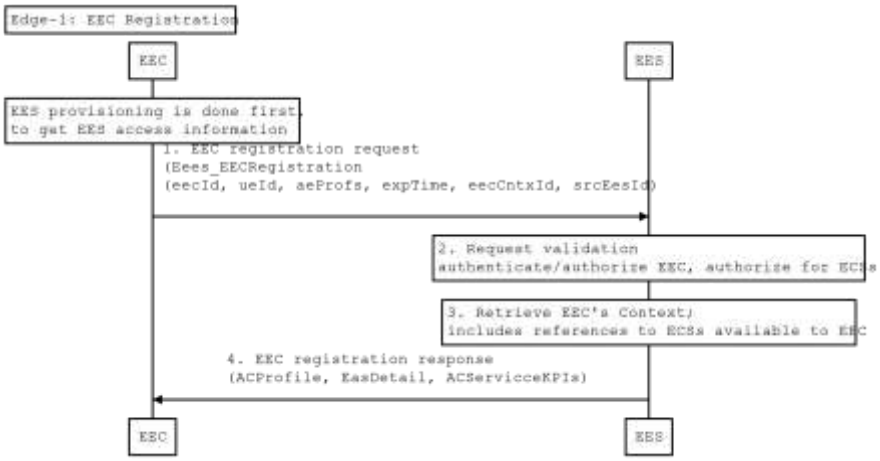

Figure 6: EEC Registration (from 3GPP TS 23.558 [6])

A.1.2 Discovery

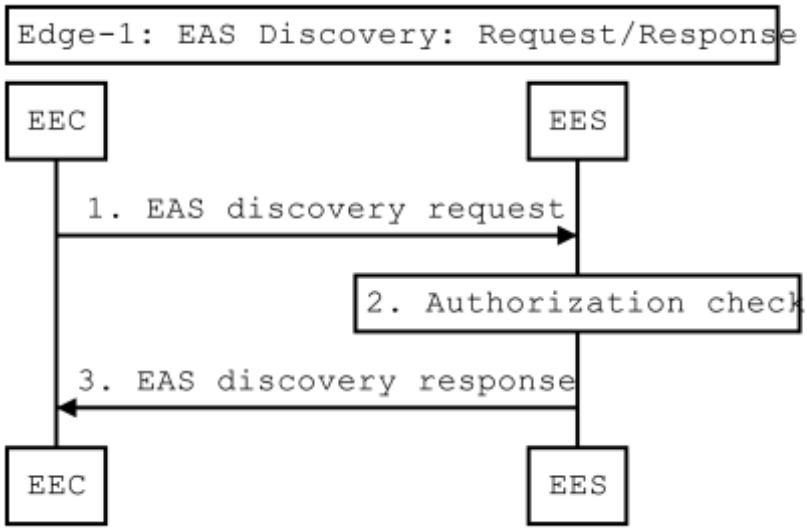

Figure 7: EAS Discovery Request/Response (from 3GPP TS 23.558 [6])

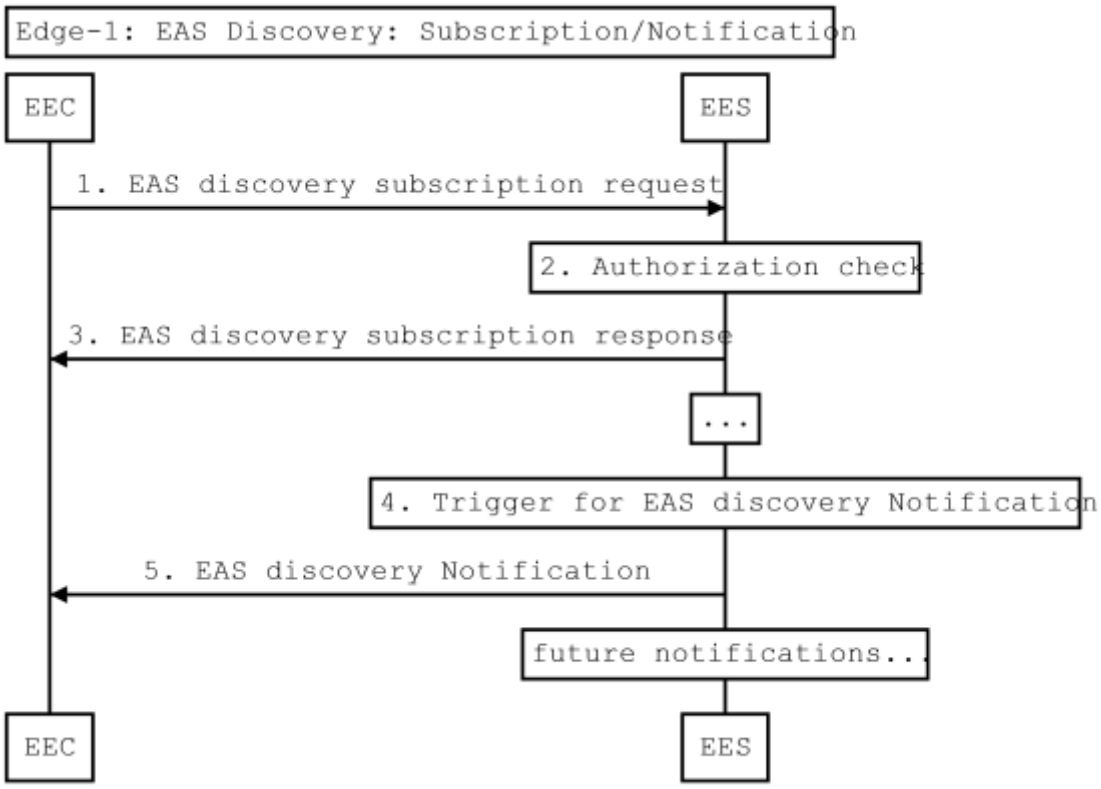

Figure 8: EAS Discovery Subscription/Notification (from 3GPP TS 23.558 [6])

A.1.3 Application Client Relocation

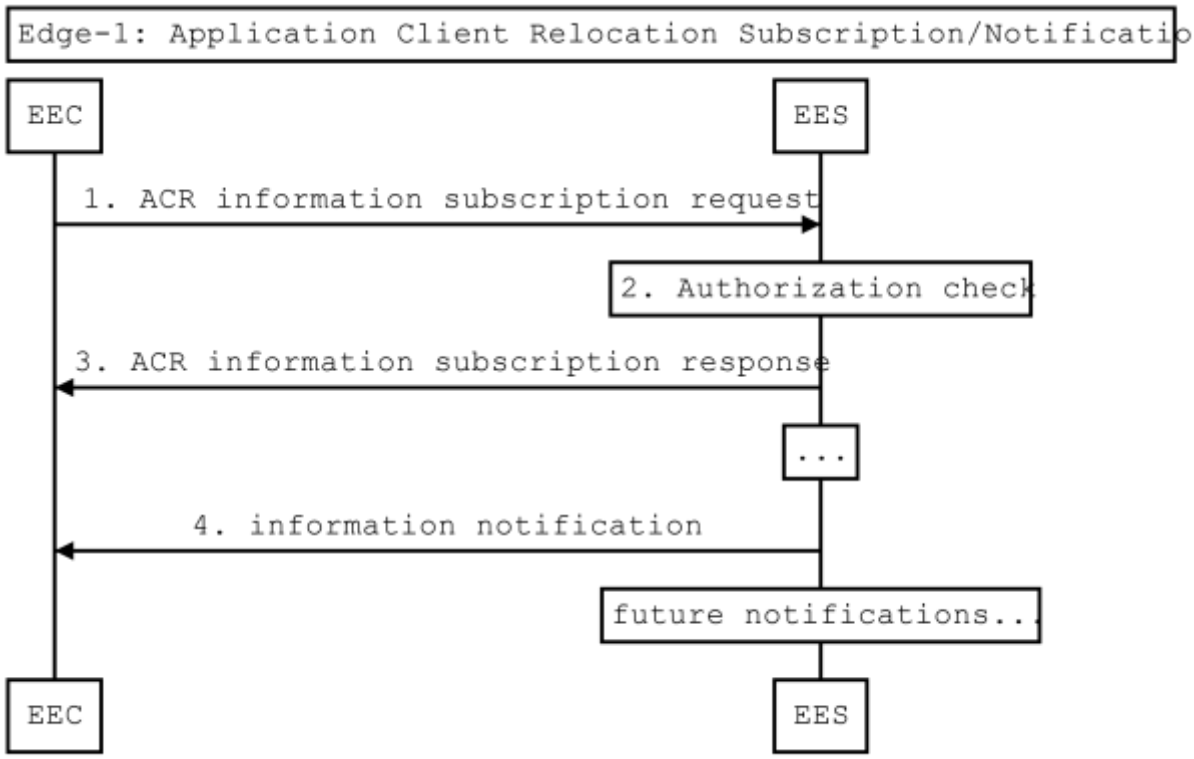

Figure 9: Application Client Relocation (from 3GPP TS 23.558 [6])

Annex B Document Management

B.1 Document History

Version	Date	Brief Description of Change	Approval Authority	Editor / Company
1.0	29 Mar 2023	New PRD defining the User Network Interface of the Operator Platform	ISAG	Miguel Alejandro Hernandez Armengol / Telefonica

B.2 Other Information

Type	Description
Document Owner	Operator Platform Group
Editor / Company	Miguel Alejandro Hernandez Armengol / Telefonica

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