Southbound Interface Network Resources APIs
Version 3.0
26 July 2023

Security Classification: Non-Confidential
Access to and distribution of this document is restricted to the persons permitted by the security classification. This document is subject to copyright protection. This document is to be used only for the purposes for which it has been supplied and information contained in it must not be disclosed or in any other way made available, in whole or in part, to persons other than those permitted under the security classification without the prior written approval of the Association.

Copyright Notice
Copyright © 2023 GSM Association

Disclaimer
The GSMA makes no representation, warranty or undertaking (express or implied) with respect to and does not accept any responsibility for, and hereby disclaims liability for the accuracy or completeness or timeliness of the information contained in this document. The information contained in this document may be subject to change without prior notice.

Compliance Notice
The information contain herein is in full compliance with the GSMA Antitrust Compliance Policy.

This Permanent Reference Document is classified by GSMA as an Industry Specification, as such it has been developed and is maintained by GSMA in accordance with the provisions set out GSMA AA.35 - Procedures for Industry Specifications.
# Table of Contents

## 1 Introduction
- 1.1 Overview ................................................................. 4
- 1.2 Scope ........................................................................ 5
- 1.3 Definitions ................................................................. 5
- 1.4 Abbreviations ............................................................... 5
- 1.5 References ................................................................. 6
- 1.6 Conventions ............................................................... 7
- 1.7 Summary SDO Reference Mapping Table ..................... 7

## 2 Network Integration Support APIs in SBI-NR Interface
- 2.1 Network Events API ..................................................... 7
  - 2.1.1 Description ............................................................ 7
  - 2.1.2 Requirements and Service Aspects ......................... 8
  - 2.1.3 Procedures ........................................................... 8
  - 2.1.4 API ...................................................................... 8
- 2.2 QoS Management API .................................................. 9
  - 2.2.1 Description ............................................................ 9
  - 2.2.2 Requirement and Service Aspects ......................... 9
  - 2.2.3 Procedures ........................................................... 9
  - 2.2.4 API ...................................................................... 10
- 2.3 Traffic Influence API .................................................... 10
  - 2.3.1 Description ............................................................ 10
  - 2.3.2 Requirement and Service Aspects ......................... 10
  - 2.3.3 Procedures ........................................................... 10
  - 2.3.4 API ...................................................................... 11
- 2.4 Application Relocation API .......................................... 11
  - 2.4.1 Description ............................................................ 11
  - 2.4.2 Requirement and Service Aspects ......................... 11
  - 2.4.3 Procedures ........................................................... 12
  - 2.4.4 API ...................................................................... 12
- 2.5 Confirm User Location API .......................................... 12
  - 2.5.1 Description ............................................................ 12
  - 2.5.2 Requirement and Service Aspect .......................... 12
  - 2.5.3 Procedures ........................................................... 13
  - 2.5.4 API ...................................................................... 13
- 2.6 Mobility Triggers API ................................................ 13
  - 2.6.1 Description ............................................................ 13
  - 2.6.2 Requirement and Service Aspects ......................... 13
  - 2.6.3 Procedures ........................................................... 13
  - 2.6.4 API ...................................................................... 14
- 2.7 Mobility Control API .................................................. 14
  - 2.7.1 Description ............................................................ 14
  - 2.7.2 Requirement and Service Aspects ......................... 14
  - 2.7.3 Procedures ........................................................... 15
3 Network key enabling capabilities 18

3.1 End user Public IP address to Subscriber Identifier mapping 18
3.1.1 Introduction 18
3.2 User Info API 20
3.2.1 GET Method: IdentifyUser 20
3.2.2 Data Model 21

Annex A Open API definitions 22
A.1 User Info API 22

Annex B Document Management 29
B.1 Document History 29
B.2 Other Information 29
1 Introduction

1.1 Overview

The Operator Platform's (OP) Network Integration Support Application Programming Interfaces (APIs) are mainly related to the Telco network interfaces, e.g. the Southbound Interface-Network Resources (SBI-NR), but also aiming to provide the end-to-end fulfilment of the specific topic, hence including any other OP Interface as described in GSMA PRD OPG.02 [1].

The list of the topics and the associated APIs in the SBI-NR interface are presented in the Table 1 below. Grey items are still under analysis and will be available in a later release.

<table>
<thead>
<tr>
<th>No</th>
<th>OPAG APIs in SBI-NR Interface (Version 3)</th>
<th>OP Interface</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Network Events</td>
<td>SBI-NR</td>
</tr>
<tr>
<td>2</td>
<td>QoS Management (updated from version 2)</td>
<td>SBI-NR</td>
</tr>
<tr>
<td>3</td>
<td>Traffic Influence</td>
<td>SNI-NR</td>
</tr>
<tr>
<td>4</td>
<td>Application Relocation</td>
<td>SBI-NR</td>
</tr>
<tr>
<td>5</td>
<td>Confirm User Location</td>
<td>SBI-NR</td>
</tr>
<tr>
<td>6</td>
<td>Mobility Triggers</td>
<td>SBI-NR</td>
</tr>
<tr>
<td>7</td>
<td>Mobility Control (updated from version 2)</td>
<td>SBI-NR</td>
</tr>
<tr>
<td>8</td>
<td>Network key enabling capabilities (updated from version 2)</td>
<td>SBI-NR</td>
</tr>
<tr>
<td>9</td>
<td>UE Route Selection Policy (URSP) Rules Management</td>
<td>SBI-NR</td>
</tr>
<tr>
<td>10</td>
<td>Network Analytics</td>
<td>SBI-NR</td>
</tr>
<tr>
<td>11</td>
<td>Change of Chargeable Party</td>
<td>SBI-NR</td>
</tr>
</tbody>
</table>

Table 1: List of APIs in SBI-NR Interface

The purpose of this document is to provide the API requirements and the Standards Developing Organisation (SDO) reference mapping for each API listed.

The structure to document each API consists of:

1. Descriptions: summary of the purpose and expected use of the API
2. Requirements and Service Aspects: References to requirements related to the API identified in GSMA PRD OPG.02 [1].
3. Procedures: References to procedures and flows from an SDO's specifications (e.g. 3GPP) that match with the OP's view for the API.
4. API: References to API (API parameters, HTTP implementation and YAML file) located in SDOs specifications.

The main reference source of the API Requirements is the GSMA PRD OPG.02 [1]. Other sources for the API Requirements are found in the relevant SDO's reference documents definitions.
1.2 Scope
The present document aims to define OP APIs that are related to SBI-NR Interface in the OP architecture. This set of APIs define the Network Integration Support APIs.

1.3 Definitions

<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Network Events</td>
<td>The OP in the role of Application Function (AF) would need to manage network events and notifications over the SBI-NR interface (NEF APIs) and orchestrate edge Application Instances in target Cloudlets and synchronise the associated application states to provide application Session Continuity. [1]</td>
</tr>
<tr>
<td>Application Relocation</td>
<td>The Operator Platform shall be able to consider the application-specific requirements for managing mobility over different edge nodes. [1]</td>
</tr>
<tr>
<td>Mobility Triggers</td>
<td>Many different elements shall monitor and control the end-to-end service delivery for detecting any modification and trigger a change on the path. [1]</td>
</tr>
<tr>
<td>Mobility Control</td>
<td>Because of this User Equipment (UE) mobility, or because of the OP’s measurements or knowledge, or hints from the application about performance degradations, the OP may decide that a different edge compute resource can better host the Edge Application. An OP may be able to negotiate the UE data plane mobility process based on the application instance relocation process. An OP may be able to specify the request for routing, influencing network mobility and routing. [1]</td>
</tr>
<tr>
<td>Traffic Influence</td>
<td>Based on some of the events on the SBI-NR interface, e.g. location monitoring events, QoS status notification events etc., the OP may determine the level of QoS provided by the mobile network to application sessions against the Quality of Service (QoS) level requested by the application. In such cases, the OP may initiate the user plane relocation (e.g., by using Traffic Influence APIs) services on the SBI-NR interface. Possibly this may result in the triggering of session mobility procedures in the mobile network. [1]</td>
</tr>
</tbody>
</table>

1.4 Abbreviations

<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>5GC</td>
<td>5G Core</td>
</tr>
<tr>
<td>5QI</td>
<td>5G QoS Identifiers</td>
</tr>
<tr>
<td>AF</td>
<td>Application Function</td>
</tr>
<tr>
<td>API</td>
<td>Application Programming Interface</td>
</tr>
<tr>
<td>AS</td>
<td>Application Server</td>
</tr>
<tr>
<td>CGNAT</td>
<td>Carrier Grade NAT</td>
</tr>
<tr>
<td>DNN</td>
<td>Data Network Name</td>
</tr>
<tr>
<td>EAC</td>
<td>Edge Application Client</td>
</tr>
<tr>
<td>EAS</td>
<td>Edge Application Server</td>
</tr>
<tr>
<td>EEC</td>
<td>Edge Enabled Client</td>
</tr>
<tr>
<td>EES</td>
<td>Edge Enabled Server</td>
</tr>
<tr>
<td>EWBI</td>
<td>East West Bound Interface</td>
</tr>
<tr>
<td>DDN</td>
<td>Downlink Data Notification</td>
</tr>
<tr>
<td>HTTP</td>
<td>Hypertext Transfer Protocol</td>
</tr>
<tr>
<td>Term</td>
<td>Description</td>
</tr>
<tr>
<td>----------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>IMEI</td>
<td>International Mobile Equipment Identity</td>
</tr>
<tr>
<td>IMEI(SV)</td>
<td>International Mobile Equipment Identity (Software Version)</td>
</tr>
<tr>
<td>IMSI</td>
<td>International Mobile Subscriber Identity</td>
</tr>
<tr>
<td>IP</td>
<td>Internet Protocol</td>
</tr>
<tr>
<td>MSISDN</td>
<td>Mobile Subscriber Integrated Services Digital Network Number</td>
</tr>
<tr>
<td>NAT</td>
<td>Network Address Translation</td>
</tr>
<tr>
<td>NBI</td>
<td>Northbound Interface</td>
</tr>
<tr>
<td>NEF</td>
<td>Network Exposure Function</td>
</tr>
<tr>
<td>NWDAF</td>
<td>Network Data Analytics Function</td>
</tr>
<tr>
<td>OP</td>
<td>Operator Platform</td>
</tr>
<tr>
<td>OPG</td>
<td>Operator Platform Group</td>
</tr>
<tr>
<td>PDN</td>
<td>Packet Data Network</td>
</tr>
<tr>
<td>PRD</td>
<td>Permanent Reference Document</td>
</tr>
<tr>
<td>QoE</td>
<td>Quality of Experience</td>
</tr>
<tr>
<td>QoS</td>
<td>Quality of Service</td>
</tr>
<tr>
<td>SBI-NR</td>
<td>Southbound Interface – Network Resources</td>
</tr>
<tr>
<td>SCEF</td>
<td>Service Capability Exposure Function</td>
</tr>
<tr>
<td>SDO</td>
<td>Standards Developing Organisation</td>
</tr>
<tr>
<td>S-NSSAI</td>
<td>Single Network Slice Selection Assistance Information</td>
</tr>
<tr>
<td>UDM</td>
<td>Unified Data Management</td>
</tr>
<tr>
<td>UE</td>
<td>User Equipment</td>
</tr>
<tr>
<td>UNI</td>
<td>User Network Interface</td>
</tr>
<tr>
<td>URSP</td>
<td>UE Route Selection Policy</td>
</tr>
<tr>
<td>YAML</td>
<td>YAML Ain’t Markup Language. YAML is a human-readable data serialization standard that can be used in conjunction with all programming languages</td>
</tr>
<tr>
<td>V2X</td>
<td>Vehicle to X (anything)</td>
</tr>
</tbody>
</table>

### 1.5 References

<table>
<thead>
<tr>
<th>Ref</th>
<th>Doc Number</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>[1]</td>
<td>OP PRD</td>
<td>GSMA PRD OPG.02, Version 4.0, Issued 29 March 2023</td>
</tr>
<tr>
<td>[3]</td>
<td>3GPP TS 29.522</td>
<td>5GS, Network Exposure Function Northbound APIs, Stage 3, Release 17.6, June 2022</td>
</tr>
</tbody>
</table>
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].

1.7 Summary SDO Reference Mapping Table
The OP’s SBI-NR Interface is linking with the 3GPP 5G Core Network Exposure Function (NEF). Table below summarises the SDO Reference mapping between the OP SBI-NR and 3GPP NEF in its Northbound Interface (NBI) and associated APIs.

<table>
<thead>
<tr>
<th>No</th>
<th>APIs in SBI-NR Interface</th>
<th>OP Interface</th>
<th>SDO Reference Mapping - 3GPP</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Network Events</td>
<td>SBI-NR</td>
<td>3GPP TS 29.522</td>
</tr>
<tr>
<td>2</td>
<td>QoS Management</td>
<td>SBI-NR</td>
<td>3GPP TS 29.522/29.122</td>
</tr>
<tr>
<td>3</td>
<td>Traffic Influence</td>
<td>SNI-NR</td>
<td>3GPP TS 29 522</td>
</tr>
<tr>
<td>4</td>
<td>Application Relocation</td>
<td>SBI-NR</td>
<td>3GPP TS 29 558</td>
</tr>
<tr>
<td>5</td>
<td>Confirm User Location</td>
<td>SBI-NR</td>
<td>3GPP TS 29.522/29.122</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3GPP TS 29.558</td>
</tr>
<tr>
<td>6</td>
<td>Mobility Triggers</td>
<td>SBI-NR</td>
<td>3GPP TS 29.522/29.122</td>
</tr>
<tr>
<td>7</td>
<td>Mobility Control</td>
<td>SBI-NR</td>
<td>3GPP TS 29.522</td>
</tr>
<tr>
<td>8</td>
<td>Network key enabling capabilities (updated)</td>
<td>SBI-NR</td>
<td>N/A</td>
</tr>
<tr>
<td>9</td>
<td>URSP Rules Management</td>
<td>SBI-NR</td>
<td>3GPP TS 29.522</td>
</tr>
<tr>
<td>10</td>
<td>Network Analytics</td>
<td>SBI-NR</td>
<td>3GPP TS 29.522/29.520</td>
</tr>
<tr>
<td>11</td>
<td>Change of Chargeable Party</td>
<td>SBI-NR</td>
<td>3GPP TS 29.522</td>
</tr>
</tbody>
</table>

2 Network Integration Support APIs in SBI-NR Interface

2.1 Network Events API

2.1.1 Description
Goal of the OP’s Network Events service is to provide interface for Operators and Application Providers to support enhanced application-aware exposure for 5G network events including federated topologies. Two interfaces between 5G System, Edge System and Application Client should be described:
- **Collecting Network Status Events SBI-NR** which supports User Plane related notifications (Session Establish, UE IP address allocation, Access and Mobility with Registration, Connection, Reachability and Mobility Management) and other events related to application traffic. Those events are mostly exposed by the 4G Service Capability Exposure Function (SCEF)/5G NEF.

- **Network Events NBI** exposed by an OP to an Application Provider allowing introducing context awareness regarding occurred network events and provide support for quality, performance and security to ensure the required Quality of Experience (QoE) of the OP’s customers.

### 2.1.2 Requirements and Service Aspects

The requirements for the API are specified in the GSMA PRD OPG.02 [1]. in the following sections:

<table>
<thead>
<tr>
<th>Section</th>
<th>Document</th>
<th>Reference Section</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.5.1.7.3</td>
<td>OPG.02</td>
<td>3.5.1.7.3</td>
<td>Network Event Support (*User Equipment (UE) location information and events; * UE network connection events; *Application to UE connection)</td>
</tr>
<tr>
<td>3.5.2.2.1</td>
<td>OPG.02</td>
<td>3.5.2.2.1</td>
<td>Network (*Collecting radio network information, e.g. cell change notification, measurement reports etc. for mobility decisions)</td>
</tr>
</tbody>
</table>

### 2.1.3 Procedures

The following procedures defined in 3GPP shall apply to the OP Network Events capabilities:

<table>
<thead>
<tr>
<th>NF</th>
<th>Section</th>
<th>TS</th>
<th>Procedure Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>NEF/SCEF</td>
<td>4.11.6.3</td>
<td>3GPP 23.502</td>
<td>Nnef_EventExposure_Subscribe (*Configuration of monitoring events for common network exposure)</td>
</tr>
</tbody>
</table>

### 2.1.4 API

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

<table>
<thead>
<tr>
<th>NF</th>
<th>Section</th>
<th>TS</th>
<th>API name</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCEF</td>
<td>4.4.2</td>
<td>29.122</td>
<td>Procedures over T8 reference point / Monitoring Procedures) (*Loss of connectivity; UE reachability; Location Reporting; Change of IMSI-IMEI(SV) Association; Roaming Status; Communication Failure; PDN connectivity status; Availability after DDN Failure; API support capability.)</td>
</tr>
<tr>
<td>SCEF</td>
<td>Annex A (pp. 323)</td>
<td>29.122</td>
<td>Monitoring Event API - YAML</td>
</tr>
</tbody>
</table>
The following API parameters have been identified as missing in 3GPP:

<table>
<thead>
<tr>
<th>NF</th>
<th>Section</th>
<th>TS</th>
<th>API name</th>
</tr>
</thead>
<tbody>
<tr>
<td>NEF</td>
<td>4.4.2</td>
<td>29.522</td>
<td>NEF Northbound Interface / Procedures for Monitoring (*29.122 emphasizes SCEF-T8- Procedures can be applied in the NEF as well)</td>
</tr>
</tbody>
</table>

### 2.2 QoS Management API

#### 2.2.1 Description

The purpose of the Quality of Service (QoS) Management API is to enable an OP the ability to expose the network driven capabilities related to 5G QoS Identifiers (5QI). With this API, the OP provides to 3rd party consumer the capability to adapt the quality and capacity of the network based on its application requirements. This kind of customization can be applied to many Business-to-Business (V2X drone control, etc.) and Business-to-Consumer (immersive communications, gaming, etc.) use cases where the quality can be adapted and configured in the network to guarantee the best user experience.

For this API definition it makes sense to reuse existing 3GPP NEF/SCEF API for QoS management. The corresponding API in the NBI interface will be defined by the Linux Foundation's CAMARA project considering mapping to the references included in the following sections.

#### 2.2.2 Requirement and Service Aspects

The requirements for the API are specified in the GSMA PRD OPG.02 [1], in the following section(s).

<table>
<thead>
<tr>
<th>Section</th>
<th>Document</th>
<th>Reference Section Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.1.4</td>
<td>OPG.02</td>
<td>Southbound Interface to Network Resources</td>
</tr>
</tbody>
</table>

#### 2.2.3 Procedures

The following procedures defined in 3GPP shall apply to the OP's QoS Management capabilities:

<table>
<thead>
<tr>
<th>NF</th>
<th>Section</th>
<th>TS</th>
<th>Procedure Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>NEF</td>
<td>4.15.6.6a</td>
<td>23.502</td>
<td>Setting up an Application Function (AF) session with required QoS procedure</td>
</tr>
<tr>
<td>SCEF</td>
<td>4.4.13</td>
<td>29.122</td>
<td>Procedures for setting up an Application Server (AS) session with required QoS</td>
</tr>
<tr>
<td>NEF</td>
<td>4.4.9</td>
<td>29.522</td>
<td>Procedures for setting up an AF session with required QoS</td>
</tr>
</tbody>
</table>

**NOTE:** The AsSessionWithQoS API is define in the NEF 3GPP spec as a reused API (section 5.3 TS 29.522). It adapts the development and definition from the SCEF API (4G architecture) to the NEF (5G Architecture).
2.2.4 API

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

<table>
<thead>
<tr>
<th>NF</th>
<th>Section</th>
<th>TS</th>
<th>API name</th>
</tr>
</thead>
<tbody>
<tr>
<td>NEF</td>
<td>5.3</td>
<td>29.522</td>
<td>AsSessionWithQoS (Reused APIs Table)</td>
</tr>
<tr>
<td>SCEF</td>
<td>5.14</td>
<td>29.122</td>
<td>AsSessionWithQoS</td>
</tr>
</tbody>
</table>

NOTE: OP requirements [1] have introduced updates that have an impact on the QoS management API. In this case, it is foreseen the support of the functionality of not only requesting a QoS profile but also being able to set and configure alternative QoS profiles. This note is to highlight that setting alternative QoS information is covered already by the references that were provided in the above table in earlier versions of this document. Additionally, the following are a few parameters, which are defined as part of those references, related to support this enhanced functionality:

- AlternativeServiceRequirementsData: Contains alternative QoS related parameters and a reference to them.
- altQosReferences: Identifies an ordered list of pre-defined QoS information. The lower the index of the array for a given entry, the higher the priority.
- altQosReqs: Identifies an ordered list of alternative service requirements that include individual QoS parameter sets. The lower the index of the array for a given entry, the higher the priority.

2.3 Traffic Influence API

2.3.1 Description

The purpose of the Traffic Influence API is to enable OP the ability to expose the network driven capabilities to influence on the traffic transport paths between the UE and the Application Server hosted at the Cloud Resources. The selected API is based on 3GPP definitions. Some modifications the API would be required in the East-West Bound Interface (EWBI) interface to be usable in the federated environment. The corresponding API in the NBI interface will be defined by the Linux Foundation’s CAMARA project’s specifications for the Service APIs in the NBI interface.

2.3.2 Requirement and Service Aspects

The requirements for the API are specified in the GSMA PRD OPG.02 [1] in the following section(s).

<table>
<thead>
<tr>
<th>Section</th>
<th>Document</th>
<th>Reference</th>
<th>Section Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.1.4</td>
<td>OPG.02</td>
<td></td>
<td>Southbound Interface to Network Resources</td>
</tr>
</tbody>
</table>

2.3.3 Procedures

The following procedures defined in 3GPP shall apply to the OP Traffic Influence capabilities.
2.3.4 API

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

<table>
<thead>
<tr>
<th>NF</th>
<th>Section</th>
<th>TS</th>
<th>API name</th>
</tr>
</thead>
<tbody>
<tr>
<td>NEF</td>
<td>5.4</td>
<td>29.522 R 17</td>
<td>TrafficInfluence</td>
</tr>
</tbody>
</table>

2.4 Application Relocation API

2.4.1 Description

The purpose of the Application Relocation API is to enable the OP to manage and maintain inter- and intra-connectivity between applications as they move between different cloud and network resources. This concept is aligned with the architecture and definitions described in 3GPP TS 23.558 [4].

2.4.2 Requirement and Service Aspects

The requirements for the API are specified in the GSMA PRD OPG.02 [1]. in the following section(s).

<table>
<thead>
<tr>
<th>Section</th>
<th>Document</th>
<th>Reference Section Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.7</td>
<td>OPG.02</td>
<td>Applications deployment in the Federated Operator Domain (Figure 15 and text)</td>
</tr>
<tr>
<td>5.1.6.2.6</td>
<td>OPG.02</td>
<td>Service Provisioning</td>
</tr>
<tr>
<td>5.2.2.3.6</td>
<td>OPG.02</td>
<td>Mobility Enforcements</td>
</tr>
<tr>
<td>5.2.2.6.3</td>
<td>OPG.02</td>
<td>Network and OP responsibilities for application session continuity</td>
</tr>
<tr>
<td>5.2.2.6.5</td>
<td>OPG.02</td>
<td>Edge Applications Role in Session Continuity Process</td>
</tr>
<tr>
<td>Annex F</td>
<td>OPG.02</td>
<td>5G Core Network Application Session Continuity Enabler Services</td>
</tr>
</tbody>
</table>
2.4.3 Procedures
The following procedures defined in 3GPP shall apply to the Application Relocation capabilities:

<table>
<thead>
<tr>
<th>NF</th>
<th>Section</th>
<th>TS</th>
<th>Procedure Name</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>8.8</td>
<td>23.558</td>
<td>Service Continuity</td>
</tr>
<tr>
<td>EES</td>
<td>5.8</td>
<td>29.558</td>
<td>Eees_ACRMManagementEvent Service</td>
</tr>
<tr>
<td>EES</td>
<td>5.9</td>
<td>29.558</td>
<td>Eees_AppContextRelocation Service</td>
</tr>
<tr>
<td>EES</td>
<td>5.11</td>
<td>29.558</td>
<td>Eees_EELManagedACR Service</td>
</tr>
<tr>
<td>EES</td>
<td>5.12</td>
<td>29.558</td>
<td>Eees_ACRStatusUpdate Service</td>
</tr>
<tr>
<td>EES</td>
<td>5.8.2.3</td>
<td>29.558</td>
<td>Eees_ACRMManagementEvent_UpdateSubscription</td>
</tr>
<tr>
<td>EES</td>
<td>5.8.2.4</td>
<td>29.558</td>
<td>Eees_ACRMManagementEvent_Unsubscribe</td>
</tr>
<tr>
<td>EES</td>
<td>5.8.2.5</td>
<td>29.558</td>
<td>Eees_ACRMManagementEvent_Notify</td>
</tr>
<tr>
<td>EES</td>
<td>5.9.2.3</td>
<td>29.558</td>
<td>Eees_AppContextRelocation_ACRDetermination_Request</td>
</tr>
<tr>
<td>EES</td>
<td>5.11.2.2</td>
<td>29.558</td>
<td>Eees_EELManagedACR_Request</td>
</tr>
<tr>
<td>EES</td>
<td>5.11.2.3</td>
<td>29.558</td>
<td>Eees_EELManagedACR_Subscribe</td>
</tr>
<tr>
<td>EES</td>
<td>5.11.2.4</td>
<td>29.558</td>
<td>Eees_EELManagedACR_Notify</td>
</tr>
<tr>
<td>EES</td>
<td>5.12.2.2</td>
<td>29.558</td>
<td>Eees_ACRStatusUpdate_Request</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>NF</th>
<th>Section</th>
<th>TS</th>
<th>API name</th>
</tr>
</thead>
<tbody>
<tr>
<td>EES</td>
<td>8.7</td>
<td>29.558</td>
<td>Eees_ACRMManagementEvent API</td>
</tr>
<tr>
<td>EES</td>
<td>8.9</td>
<td>29.558</td>
<td>Eees_EECContextRelocation API</td>
</tr>
<tr>
<td>EES</td>
<td>8.10</td>
<td>29.558</td>
<td>Eees_EELManagedACR API</td>
</tr>
<tr>
<td>EES</td>
<td>8.11</td>
<td>29.558</td>
<td>Eees_ACRStatusUpdate API</td>
</tr>
</tbody>
</table>

2.5 Confirm User Location API

2.5.1 Description
The purpose of the Confirm User Location API is to enable an OP with the ability to provide user location information to consumers. This can be used in combination with other network driven capabilities to trigger configurations within the network to provide services based on the location of the final users (e.g., to deploy resources and applications closer to the user so that latency can be reduced to the minimum and improve the user experience).

2.5.2 Requirement and Service Aspect
The requirements for the API are specified in the GSMA PRD OPG.02 [1]. in the following section(s).
2.5.3 Procedures

The following procedures defined in 3GPP shall apply to the OP's user location information capabilities.

<table>
<thead>
<tr>
<th>NF</th>
<th>Section</th>
<th>TS</th>
<th>Procedure Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>NEF</td>
<td>4.4.2</td>
<td>29.522</td>
<td>Procedures for Monitoring</td>
</tr>
<tr>
<td>SCEF</td>
<td>4.4.2</td>
<td>29.122</td>
<td>Monitoring Procedures</td>
</tr>
<tr>
<td>EES</td>
<td>8.6.2</td>
<td>23.558</td>
<td>UE Location</td>
</tr>
</tbody>
</table>

2.5.4 API

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

<table>
<thead>
<tr>
<th>NF</th>
<th>Section</th>
<th>TS</th>
<th>API Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCEF</td>
<td>5.3</td>
<td>29.122</td>
<td>MonitoringEvent</td>
</tr>
<tr>
<td>NEF</td>
<td>5.3</td>
<td>29.522</td>
<td>MonitoringEvent (Reused APIs Table)</td>
</tr>
<tr>
<td>EES</td>
<td>8.2</td>
<td>29.558</td>
<td>Eees_UELocation</td>
</tr>
</tbody>
</table>

2.6 Mobility Triggers API

2.6.1 Description

This API provides the required support from the network so that the OP can be informed about the need to move an application session to a different anchor point or of the actual move. A possible use case is when the user moves to a new location. By means of this API, the network alerts the OP about the change, so that the OP can perform the required new configurations for the user to access the applications in the new location.

2.6.2 Requirement and Service Aspects

The requirements for the API are specified in the GSMA PRD OPG.02 [1]. in the following section(s).

<table>
<thead>
<tr>
<th>Section</th>
<th>Document</th>
<th>Reference Section Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.2.7</td>
<td>OPG.02</td>
<td>Mobility Requirements (*5G Connectivity Models for Edge; *Roaming Requirements; *Geographic Conditions on Mobility)</td>
</tr>
<tr>
<td>5.2.2.3.2</td>
<td>OPG.02</td>
<td>Mobility Management</td>
</tr>
</tbody>
</table>

2.6.3 Procedures

The following procedures defined in 3GPP shall apply to the Mobility Management capabilities.
The following API as defined in 3GPP shall be endorsed for Operator platform.

<table>
<thead>
<tr>
<th>NF</th>
<th>Section</th>
<th>TS</th>
<th>API name</th>
</tr>
</thead>
<tbody>
<tr>
<td>NEF</td>
<td>4.4.2</td>
<td>29.522</td>
<td>MonitoringEvent API (Reused API Table)</td>
</tr>
<tr>
<td>SCEF</td>
<td>4.4.2</td>
<td>29.122</td>
<td>MonitoringEvent API</td>
</tr>
</tbody>
</table>

These APIs, defined in 3GPP, provides support to retrieve information related to different events related to the OP's Mobility Triggers concept. For instance:

- LOSS_OF_CONNECTIVITY
- UE_REACHABILITY
- LOCATION_REPORTING
- AREA_OF_INTEREST

### 2.7 Mobility Control API

#### 2.7.1 Description

The Mobility Control API is responsible for controlling when an application session is to be moved to a different anchor point. For instance, due to a failure an application relocation occurs. After relocating an application, a change of anchor point may be required, if this is the case, the OP can use this API to adjust in the network the most appropriate configuration to access the application new endpoint.

#### 2.7.2 Requirements and Service Aspects

The requirements for the API are specified in the GSMA PRD OPG.02 [1]. in the following sections:
2.7.3 Procedures
The following procedures defined in 3GPP shall apply to the OP's traffic influence capabilities:

<table>
<thead>
<tr>
<th>NF</th>
<th>Section</th>
<th>TS</th>
<th>Procedure Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>NEF</td>
<td>4.3.6</td>
<td>23.502 R 17</td>
<td>Application Function influence on traffic routing</td>
</tr>
<tr>
<td>NEF</td>
<td>5.2.6.7</td>
<td>23.502 R 17</td>
<td>Nnef_TrafficInfluence Service</td>
</tr>
<tr>
<td>NEF</td>
<td>5.4</td>
<td>23.502 R 17</td>
<td>TrafficInfluence</td>
</tr>
<tr>
<td>NEF</td>
<td>4.4.7</td>
<td>29.522 R 17</td>
<td>Procedures for Traffic Influence</td>
</tr>
</tbody>
</table>

2.7.4 API
The following API as defined in 3GPP shall be endorsed for Operator Platform

<table>
<thead>
<tr>
<th>NF</th>
<th>Section</th>
<th>TS</th>
<th>API name</th>
</tr>
</thead>
<tbody>
<tr>
<td>NEF</td>
<td>5.4</td>
<td>29.522 R 17</td>
<td>TrafficInfluence</td>
</tr>
</tbody>
</table>

2.8 Chargeable Party API

2.8.1 Description
The Chargeable Party API is intended to cover those scenarios where it is needed to change the chargeable party at session setup or during the session usage. This API is used by the OP to request (from the network via the NEF) that a specific external party would be the sponsor of the traffic from the beginning or that they become the chargeable party for that traffic later.

2.8.2 Requirements and Service Aspects
The requirements for the API are specified in the GSMA PRD OPG.02 [1] in the following sections:
2.8.3 Procedures
The following procedures defined in 3GPP shall apply to the OP's Chargeable Party capabilities:

<table>
<thead>
<tr>
<th>NF</th>
<th>Section</th>
<th>TS</th>
<th>Procedure Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>NEF</td>
<td>4.4.8</td>
<td>29.522</td>
<td>Procedures for changing the chargeable party at session set up or during the session</td>
</tr>
<tr>
<td>SCEF</td>
<td>4.4.8</td>
<td>29.122</td>
<td>Procedures for changing the chargeable party at session set up or during the session</td>
</tr>
</tbody>
</table>

2.8.4 API
The following API as defined in 3GPP shall be endorsed for Operator Platform

<table>
<thead>
<tr>
<th>NF</th>
<th>Section</th>
<th>TS</th>
<th>API name</th>
</tr>
</thead>
<tbody>
<tr>
<td>NEF</td>
<td>5.3</td>
<td>29.522</td>
<td>ChargeableParty API (Reused APIs Table)</td>
</tr>
<tr>
<td>SCEF</td>
<td>5.5</td>
<td>29.122</td>
<td>ChargeableParty API</td>
</tr>
</tbody>
</table>

NOTE: It is for further study to define how the parameters to identify the chargeable party are to be used to ensure that there is a consistent identification of that party both on the OP's SBI-CHF and on the equivalent interface(s) from the core network to the charging function.

2.9 Network Analytics API

2.9.1 Description
The Network Analytics API covers scenarios where there is a request for analytical data that would help optimize application service operation, through collection of data analytics and exposing them to the OP through a set of Network Analytics API. The API is used by the OP to consume analytical data request through the Network Data Analytics Functions (NWDAF) and exposed through the NEF.

2.9.2 Requirements and Service Aspects
The requirements for the API are specified in the GSMA PRD OPG.02 [1] in the following sections:
2.9.3 Procedures

The following procedure shall apply to analytics exposures through NEF and the NWDAF defined in 3GPP for an OP to expose:

<table>
<thead>
<tr>
<th>NF</th>
<th>Section</th>
<th>TS</th>
<th>Procedure Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>NEF</td>
<td>29.522</td>
<td>4.4.14</td>
<td>Procedure for analytics information exposure</td>
</tr>
<tr>
<td>NWDAF</td>
<td>23.288</td>
<td>6.1</td>
<td>Procedure for analytics exposure</td>
</tr>
</tbody>
</table>

2.9.4 API

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

<table>
<thead>
<tr>
<th>NF</th>
<th>Section</th>
<th>TS</th>
<th>API name</th>
</tr>
</thead>
<tbody>
<tr>
<td>NWDAF</td>
<td>29.520</td>
<td>5.1.1</td>
<td>API Definitions</td>
</tr>
<tr>
<td>NWDAF</td>
<td>29.520</td>
<td>5.1.6</td>
<td>Data Model</td>
</tr>
<tr>
<td>NWDAF</td>
<td>29.520</td>
<td>5.2</td>
<td>NWDAF analytics info service API</td>
</tr>
<tr>
<td>NEF</td>
<td>29.522</td>
<td>5.6</td>
<td>Analytics Exposure API</td>
</tr>
<tr>
<td>NEF</td>
<td>29.522</td>
<td>A.4</td>
<td>Analytics Exposure API</td>
</tr>
</tbody>
</table>

2.10 URSP API

2.10.1 Description

The purpose of the URSP related API is to allow the OP to provide guidance to the 5G Core (5GC) on how to steer the traffic. The OP can provide an application traffic descriptor, route selection parameters, Data Network Name (DNN) and/or Single Network Slice Selection Assistance Information (S-NSSAI). The selected API is based on the 3GPP definitions.

2.10.2 Requirements and Service Aspects

The requirements for the API are specified in the GSMA PRD OPG.02 [1] in the following sections:

<table>
<thead>
<tr>
<th>Section</th>
<th>Document</th>
<th>Reference Section Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.2.7</td>
<td>OPG.02</td>
<td>Mobility Requirements</td>
</tr>
<tr>
<td>3.3.6.7</td>
<td>OPG.02</td>
<td>UE Provisioning of URSP rules</td>
</tr>
<tr>
<td>5.1.4.2.2</td>
<td>OPG.02</td>
<td>Southbound Interface to Network Resources: General Requirements</td>
</tr>
</tbody>
</table>
2.10.3 Procedures
The following procedures defined in 3GPP shall apply to the URSP determination and provisioning:

<table>
<thead>
<tr>
<th>NF</th>
<th>Section</th>
<th>TS</th>
<th>Procedure Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>NEF</td>
<td>4.15.6.10</td>
<td>23.502</td>
<td>Application guidance for URSP determination</td>
</tr>
<tr>
<td>NEF</td>
<td>4.4.20</td>
<td>29.522</td>
<td>Procedures for service specific parameter provisioning</td>
</tr>
</tbody>
</table>

Clause 4.4.20 in 3GPP TS 29.522 [3] describes the procedures to provision specific parameters such as DNN and S-NSSAI. On top of it, the optional feature AfGuideURSP indicates the support of URSP guidance.

2.10.4 API
The following API as defined in 3GPP shall be endorsed for Operator Platform

<table>
<thead>
<tr>
<th>NF</th>
<th>Section</th>
<th>TS</th>
<th>API name</th>
</tr>
</thead>
<tbody>
<tr>
<td>NEF</td>
<td>5.11</td>
<td>29.522</td>
<td>ServiceParameter</td>
</tr>
</tbody>
</table>

The details of the Service Parameters are in 3GPP TS 29.522 [3] Table 5.11.2.1-1. The following parameters are related to the AfGuideURSP feature:

- ConnectionCapabilities
- GeographicalArea
- RouteSelectionParameterSet
- TrafficDescriptorComponents
- UrspRuleRequest

3 Network key enabling capabilities

3.1 End user Public IP address to Subscriber Identifier mapping

3.1.1 Introduction
Some APIs may need to identify the user to ensure the correct implementation of the end-to-end flow. An example of such identifier could be MSISDN, Private IP, other. Whilst these identifiers are valid as a personal identifier, the end user will unlikely consent to some of this information to be shared with every Application Provider for privacy reasons. Therefore, other identifiers are required to refer to a subscriber in the Northbound API requests. The subscriber’s Public IP address and port as used to communicate with the Application Provider’s Application Backend could be one of those identifiers. If used, the OP should be able to map this Public IP address and port to an identifier that it can use to identify the subscriber on its Southbound Interfaces, e.g., the MSISDN. Because no standardised solutions exist to do this mapping, this section defines a new API that networks can provide for that purpose and suggest ways to realise the functionality exposed by that API based on
enablers that are commonly used in networks. The following figure shows an example of the scope for this APIs.

![Figure 1: Service flow for an API relying on IP address mapping (e.g., to obtain an anonymised subscriber identity)](diagram)

**NOTE:** The proposed solution in this section is just an alternative that could be applied to any API request that relies on the Public IP Address to identify the subscriber. Other alternatives or solutions may exist for the realisation of this API.

**NOTE:** It is important to highlight that IP Address mapping can change over time and that this could lead to API invocations with information that might have expired which could return inaccurate results.

### 3.1.2 Network setup

This section is meant to introduce mechanisms intended to support operators with implementations at the network level that will facilitate to obtain information related to users.

#### 3.1.2.1 Deterministic NAT

Network Address Translation (NAT) is used to map a UE's Private IP address to a Public IP address for communication to services on the public internet. If deterministic NAT is used, each private UE IP is mapped to a specific port range of a public IP address of the Carrier Grade NAT (CGNAT). This allows to use this mapping also in the reverse direction and map a public IP address and port combination back to the Private IP address and thus to the UE for which it would then be possible to determine the MSISDN.

Deterministic NAT requires that the ratio between the range of private IP addresses and public IP addresses available is sufficient to ensure that the port range allocated for each UE Private IP address can satisfy the user's needs in terms of concurrent connections.
3.1.2.2 End user directory
The network can provide a user directory where IP address (and port) mappings will be stored along with the corresponding user MSISDN. This directory could then be populated during the User Equipment’s connectivity to the network and consulted when a public IP address needs to be mapped to an MSISDN. Such directory is not available today within a standard 3GPP core network architecture but could be considered and supported in functions such as the Unified Data Management (UDM).

3.2 User Info API
This API allows to request the operator platform for an identifier for a subscriber based on their public IP address and port.

<table>
<thead>
<tr>
<th>Operation</th>
<th>HTTP Methods</th>
<th>Resource URI</th>
<th>Qualifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>IdentifyUser</td>
<td>GET</td>
<td>/naas/networkresources/v1</td>
<td>M</td>
</tr>
</tbody>
</table>

Table 2: User Info API: Operations

3.2.1 GET Method: IdentifyUser
The GET method enables to retrieve user identifier information from the network, such as the MSISDN by providing a public IP and port.

<table>
<thead>
<tr>
<th>Parameter Name</th>
<th>P</th>
<th>Cardinality</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>publicIPAddress</td>
<td>M</td>
<td>1</td>
<td>Origin public IP address from which the UE is connecting to an application backend.</td>
</tr>
<tr>
<td>port</td>
<td>M</td>
<td>1</td>
<td>Port from which the UE is connecting to an application backend.</td>
</tr>
<tr>
<td>protocol</td>
<td>O</td>
<td>1</td>
<td>Transport protocol (e.g. UDP, TCP, SCTP)</td>
</tr>
<tr>
<td>identityType</td>
<td>O</td>
<td>1</td>
<td>Type of identifiers that need to be retrieve e.g MSISDN, Private IP</td>
</tr>
</tbody>
</table>

Table 3: Request Parameters

NOTE: sourceNATP44 is described in RFC 7857 “Updates to Network Address Translation (NAT) Behavioral Requirements”.

Figure 2: Deterministic NAT Solution
<table>
<thead>
<tr>
<th>Parameter Name</th>
<th>P</th>
<th>Response Codes</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>identifier</td>
<td>M</td>
<td>200</td>
<td>User MSISDN, Private IP, other identifiers</td>
</tr>
<tr>
<td>errorResponse</td>
<td>C</td>
<td>400</td>
<td>Bad Request.</td>
</tr>
<tr>
<td>errorResponse</td>
<td>C</td>
<td>401</td>
<td>Unauthorized</td>
</tr>
<tr>
<td>errorResponse</td>
<td>C</td>
<td>403</td>
<td>Permissions</td>
</tr>
<tr>
<td>errorResponse</td>
<td>C</td>
<td>404</td>
<td>Not Found</td>
</tr>
<tr>
<td>errorResponse</td>
<td>C</td>
<td>405</td>
<td>Method not allowed</td>
</tr>
<tr>
<td>errorResponse</td>
<td>C</td>
<td>406</td>
<td>Not Acceptable</td>
</tr>
<tr>
<td>errorResponse</td>
<td>C</td>
<td>429</td>
<td>Too many requests</td>
</tr>
<tr>
<td>errorResponse</td>
<td>C</td>
<td>500</td>
<td>Internal Server Error</td>
</tr>
<tr>
<td>errorResponse</td>
<td>C</td>
<td>502</td>
<td>Bad Gateway</td>
</tr>
<tr>
<td>errorResponse</td>
<td>C</td>
<td>503</td>
<td>Service Unavailable.</td>
</tr>
<tr>
<td>errorResponse</td>
<td>C</td>
<td>504</td>
<td>Request time exceeded</td>
</tr>
</tbody>
</table>

Table 4: Response Parameters

Note: Responses are for immediate use only and their validity cannot be guaranteed over a longer time.

3.2.2 Data Model

3.2.2.1 Simple data types and enumerations

This subclause defines simple data types and enumerations that can be referenced from data structures defined in the previous subclauses.

<table>
<thead>
<tr>
<th>Attribute Name</th>
<th>Data Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>publicIPAddress</td>
<td>String</td>
<td>Public IP address (IPv4 or IPv6).</td>
</tr>
<tr>
<td>port</td>
<td>Integer</td>
<td>A port number assigned to uniquely identify a connection endpoint and to direct data to a specific service.</td>
</tr>
<tr>
<td>protocol</td>
<td>String</td>
<td>Transport protocol (e.g. UDP, TCP, SCTP)</td>
</tr>
<tr>
<td>identityType</td>
<td>String</td>
<td>Type of identifiers that need to be retrieve e.g MSISDN, Private IP</td>
</tr>
<tr>
<td>identifier</td>
<td>Object</td>
<td>User identity information that contains: type: (e.g MSISDN, Private IP) id: Identifier value. In case of ‘MSISDN’ type, ‘E164 with +’ format must be used.</td>
</tr>
</tbody>
</table>

Table 5: User Info API data types
Annex A  Open API definitions

A.1  User Info API

openapi: 3.0.3
info:
  version: '1.0.0'
  title: 'User Info'
  description: |
  # Introduction
  ---
  RESTful API that allows an OP to map the UE origin Public IP address and port to an identifier that it can use to identify the subscriber on its Southbound Interfaces (e.g. the MSISDN, Private IP)
  ---
  # API Scope
  ---
  APIs defined in this version of the specification can be categorized into the following areas:
  * __UserInfo__ - To retrieve user identifier associated to some origin connection information such as public IP address and port.
  ---
  # Definitions
  ---
  * __publicIPAddress__ - Origin public IP address from which the UE is connecting an application backend.
  * __port__ - Port from which the UE is connecting to an application backend.
  * __protocol__ - Transport protocol (e.g. UDP, TCP, SCTP).
  * __identityType__ - Type of identifiers that need to be retrieve e.g MSISDN, Private IP.
  * __identifier__ - User MSISDN, Private IP or other possible identifiers.
  ---
  # API Operations
  ---
  __UserInfo__
  * __IdentifyUser__ - Retrieve a user identifier associated to some origin connection information.

© 2023 GSM Association.
All rights reserved.

externalDocs:
  description: GSMA, SBI-Network Resources APIs
  url: "https://www.gsma.com/futurenetworks/5g-operator-platform"
servers:
  - url: '{apiRoot}/naas/networkresources/v1'
    variables:
      apiRoot:
        default: https://operatorplatform.com

security:
  - oAuth2ClientCredentials:
    net-resources

components:
  securitySchemes:
    oAuth2ClientCredentials:
      type: oauth2
description: This API uses OAuth 2 with the client credentials grant flow.
flows:
  clientCredentials:
    tokenUrl: '/oauth2/token'
  scopes:
    net-resources: Access to the Network Resources APIs

schemas:
  IdentifierMSISDN:
    type: object
    required:
      - type
      - id
    properties:
      type:
        type: string
        description: Type of the user identifier retrieved (MSISDN).
        example: "msisdn"
      id:
        type: string
        description: MSISDN value. 'E164 with + format must be used [+][country code][subscriber number including area code] and can have a maximum of fifteen digits.'
        example: '+34666778889'
        format: ^\+[1-9]\d{1,14}$

  IdentifierPrivateIP:
    type: object
    required:
      - type
      - id
    properties:
      type:
        type: string
        description: Type of the user identifier retrieved (Private IP address).
        example: "private IP address"
      id:
        type: string
        description: Private IP address of the UE.
        example: '192.168.0.20'
        format: ^\[(127(?:(?:25[0-5]|2\d[0-9]|1\d\d|\d\d)[0-9]|\d)[0-9])|\[(169\.254[0-9])|172\.(16|17|18|19)[0-9]|192\.168\]|200[0-0]|201[0-9]|24[0-0]|25[0-5])\]([0-9]|0\d|1\d\d|2[0-3][0-9]|24[0-0]|25[0-5])(?:\.(25[0-5]|2\d[0-9]|1\d\d|\d\d)[0-9]|\d)\]0$\}

errorResponse:
  type: object
  properties:
    code:
      type: string
      description: A short, human-readable summary of the problem type
    status:
      type: integer
      description: The HTTP status code
    message:
      type: string
      description: This parameter appears when there was an error. Human readable explanation specific to this occurrence of the problem

UserInfoMSISDNResponse:
type: object
required:
- identifier
properties:
  identifier:
    $ref: '#/components/schemas/IdentifierMSISDN'

UserInfoPrivateIPResponse:
type: object
required:
- identifier
properties:
  identifier:
    $ref: '#/components/schemas/IdentifierPrivateIP'

responses:
400BadRequest:
description: Bad Request
content:
  application/json:
    schema:
      $ref: '#/components/schemas/errorResponse'
    examples:
      InvalidIP:
        value:
          
          "code": "INVALID_ARGUMENT",
          "status": 400,
          "message": "Invalid or missing IP header"
        
      InvalidPort:
        value:
          
          "code": "INVALID_ARGUMENT",
          "status": 400,
          "message": "Invalid or missing Port header"
        
401Unauthorized:
description: Unauthorized
content:
  application/json:
    schema:
      $ref: '#/components/schemas/errorResponse'
    examples:
      InvalidCredentials:
        value:
          
          "code": "UNAUTHENTICATED",
          "status": 401,
          "message": "Request not authenticated due to missing, invalid, or expired credentials"
        
403Forbidden:
description: Forbidden
content:
  application/json:
    schema:
      $ref: '#/components/schemas/errorResponse'
examples:
  InsufficientPermissions:
    value:
      {
        "code": "PERMISSION_DENIED",
        "status": 403,
        "message": "Client does not have sufficient permissions to perform this action"
      }

404NotFound:
  description: Subscriber Not Found
  content:
    application/json:
      schema:
        $ref: '#/components/schemas/errorResponse'
      examples:
        SubscriberNotFound:
          description: The specified IP address and port are not currently associated with any customers of this service
          value:
            {
              "code": "NOT_FOUND",
              "status": 404,
              "message": "No subscriber found with the specified IP address and port"
            }

405MethodNotAllowed:
  description: Method Not Allowed
  content:
    application/json:
      schema:
        $ref: '#/components/schemas/errorResponse'
      examples:
        MethodNotAllowed:
          description: An HTTP verb other than GET has been used to try and access the resource
          value:
            {
              "code": "METHOD_NOT_ALLOWED",
              "status": 405,
              "message": "The request method is not supported by this resource"
            }

406Unacceptable:
  description: Not Acceptable
  content:
    application/json:
      schema:
        $ref: '#/components/schemas/errorResponse'
      examples:
        NotAcceptable:
          description: A response format other than JSON has been requested
          value:
            {
              "code": "NOT_ACCEPTABLE",
              "status": 406,
              "message": "The server cannot produce a response matching the content requested by the client through Accept-* headers"
            }
429 TooManyRequests:
   description: Too Many Requests
   content:
      application/json:
         schema:
            $ref: '#/components/schemas/errorResponse'
   examples:
      TooManyRequests:
         description: Access to the API has been temporarily blocked due to quota or spike arrest limits being reached
         value:
            
            "code": "TOO_MANY_REQUESTS",
            "status": 429,
            "message": "Either out of resource quota or reaching rate limiting"

500 InternalServerError:
   description: Internal Server Error
   content:
      application/json:
         schema:
            $ref: '#/components/schemas/errorResponse'
   example:
      
      "code": "INTERNAL",
      "status": 500,
      "message": "The service is currently not available"

502 BadGateway:
   description: Bad Gateway
   content:
      application/json:
         schema:
            $ref: '#/components/schemas/errorResponse'
   example:
      
      "code": "BAD_GATEWAY",
      "status": 502,
      "message": "The service is currently not available"

503 ServiceUnavailable:
   description: Service Unavailable
   content:
      application/json:
         schema:
            $ref: '#/components/schemas/errorResponse'
   example:
      
      "code": "UNAVAILABLE",
      "status": 503,
      "message": "The service is currently not available"

504 GatewayTimeout:
description: Gateway Time-Out
content:
  application/json:
    schema:
      $ref: '#/components/schemas/errorResponse'
    example:
      {  
        "code": "TIMEOUT",
        "status": 504,
        "message": "The service is currently not available"
      }

paths:
  /identifyUser:
    get:
      summary: Retrieve a user identifier given a public IP and Port
      tags:
        - UserInfo
      parameters:
        - in: header
          name: publicIPAddress
          description: Origin public IP address from which the UE is connecting to an application backend.
          required: true
          examples:
            ipv4:
              value: "84.125.93.10"
            ipv6:
            schema:
              type: string
              format: ipv4/ipv6
        - in: header
          name: port
          description: Port from which the UE is connecting to an application backend.
          required: true
          example: 20000
          schema:
            type: integer
            minimum: 1024
            maximum: 65535
        - in: header
          name: protocol
          description: The transport protocol in use.
          required: false
          example:
            TCP:
              value: "tcp"
            UDP:
              value: "udp"
            SCTP:
              value: "sctp"
schema:
  type: string
  default: tcp

- in: header
  name: identityType
  description: Type of identifiers that need to be retrieve.
  required: false
  examples:
    MSISDN:
      value: "msisdn"
    Private IP address:
      value: "private ip"

responses:
  "200":
    description: User identified successfully
    content:
      application/json:
        schema:
          oneOf:
          - $ref: '#/components/schemas/UserInfoMSISDNResponse'
          - $ref: '#/components/schemas/UserInfoPrivateIPResponse'

  "400":
    $ref: '#/components/responses/400BadRequest'

  "401":
    $ref: '#/components/responses/401Unauthorized'

  "403":
    $ref: '#/components/responses/403Forbidden'

  "404":
    $ref: '#/components/responses/404NotFound'

  "405":
    $ref: '#/components/responses/405MethodNotAllowed'

  "406":
    $ref: '#/components/responses/406Unacceptable'

  "429":
    $ref: '#/components/responses/429TooManyRequests'

  "500":
    $ref: '#/components/responses/500InternalServerError'

  "502":
    $ref: '#/components/responses/502BadGateway'

  "503":
    $ref: '#/components/responses/503ServiceUnavailable'

  "504":
    $ref: '#/components/responses/504GatewayTimeout'
Annex B  Document Management

B.1  Document History

<table>
<thead>
<tr>
<th>Version</th>
<th>Date</th>
<th>Brief Description of Change</th>
<th>Approval Authority</th>
<th>Editor / Company</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0</td>
<td>03 Oct 2022</td>
<td>New PRD defining the Southbound Interface of the Operator Platform to the network resources</td>
<td>ISAG</td>
<td>Milan Lalovic / British Telecom</td>
</tr>
<tr>
<td>2.0</td>
<td>29 Mar 2023</td>
<td>Update implementing OPG.03 CR1002 introducing Public IP address mapping</td>
<td>ISAG</td>
<td>Tom Van Pelt / GSMA</td>
</tr>
<tr>
<td>3.0</td>
<td>26 Jul 2024</td>
<td>Update implementing OPG.03 CR1003 introducing API mappings for URSP, chargeable party and network analytics</td>
<td>ISAG</td>
<td>Milan Lalovic / British Telecom</td>
</tr>
</tbody>
</table>

B.2  Other Information

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Document Owner</td>
<td>Operator Platform Group</td>
</tr>
<tr>
<td>Editor / Company</td>
<td>Milan Lalovic / British Telecom</td>
</tr>
</tbody>
</table>

It is our intention to provide a quality product for your use. If you find any errors or omissions, please contact us with your comments. You may notify us at prd@gsma.com

Your comments or suggestions & questions are always welcome.