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| EU Roaming regulation III  Structural Solutions  Processes  Version 1.2  Last Update 05/03/2014 |

Document History

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| History | |
| V 0.1 | Skeleton with first inputs on all process to be included in scope of work. |
| V 0.2 | Updates following Face to face meeting 7th and 8th Feb |
| V 0.3 | Added first versions of processes received prior to conf call 19/2/13 |
| V 0.4 | Updates following Face to face meeting 5th and 6th March |
| V 0.5 | Updates following face to face meeting 25th and 26th March plus input from GSMA Fraud Forum |
| V 0.6 | Includes input collected prior to face to face meeting 8th and 9th April, and updates during the face to face itself |
| V 0.7 | Major editorial revision for consistency of terminology, removal of redundant text and alignment of style. |
| V 0.8 | Updates following face to face meeting 25th and 26th April |
| V 0.9 | Changes during and following face to face meeting 13th and 14th May. |
| V 1,0 | Final version following review and comments from Process Subgroup, and with alignment to other subgroup work, HL spec and BEREC Guidelines. |
| V 1.1 | Update to include LBO-IF2 |
| V 1.2 | Revision after comments collected from Process group on introduction of LBO-IF2. |

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# Scope

The objective of this document is to describe the Processes that will be used between the various parties involved in the implementation and operation of roaming unbundling for EU roaming regulation III. The document will specify the processes needed for;-

* the establishment of a relationship between a DSP and ARP for Single IMSI service.
* the actions required by a subscriber and bill payer to contract for Single IMSI or LBO-based services and the actions this will trigger within the service providers involved.
* exchanging information for correct operation and billing of service for a subscriber using Single IMSI or LBO.
* subscribers to return to their DSP for roaming service either at the end of contract, or in the situation of premature termination of an ARP or LBO contract.
* error cases and any processes to recover such situations.

The processes included vary in nature with some being business processes between service providers to establish relationships between themselves to enable service to be offered to the subscriber base, while others being processes that relate to an individual subscriber or bill payer and enabling that specific subscriber to receive Roaming services from a party other than their DSP.

Each process will be specified as a series of steps, which will be drawn out as a diagram and then described step-by-step. In some processes, references will be made to the interfaces defined in High Level Technical Specifications [1]. The interface definitions used within [1] will be referred to where relevant in association with the processes where such interfaces are used.

*Out of Scope*

No processes are described between subscriber or bill payer and ARP, or between subscriber or bill payer and LBO provider.

No assumption is made on revenue model, contracts, applicable tax, product and price structure, payment methods, distribution channel etc., on the parties offering ARP or LBO services.

## References

1. EU Roaming Regulation III Structural Solution High Level Technical specifications.
2. Regulation (EU) No 531/2012 of the European Parliament and the Council of 13 June 2012 on roaming on public mobile communications networks within the Union
3. Regulations, Commission Implementing Regulation (EU) No 1203/2012 of 14 December 2012 on the separate sale of regulated roaming services within the Union
4. REGULATION (EC) No 717/2007 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 27 June 2007

Following documents are for information only (given for supporting the consultation).

No binding requirements should be derived from there.

1. BoR (12) 68: ROAMING REGULATION - CHOICE OF DECOUPLING METHOD: A consultation to assist BEREC in preparing advice to the Commission on its forthcoming Implementing Act, June 2012, 72 pages.
2. BoR (12) 109: ROAMING REGULATION - CHOICE OF DECOUPLING METHOD, BEREC opinion on article 5 implementing act, 27 Sept 2012, 7 pages
3. 3GPP TS 32.240
4. GSMA PRD BA.20

## Definitions

Some of the below mentioned definitions are adopted by 3GPP TS 32.240 [7] “Charging architecture and principles” and draft “Implementation Act”.

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| **alternative roaming provider (ARP)**: a roaming provider different from the domestic provider;  **anti-bill shock:** measures that are taken by an operator to ensure that the subscriber is always aware of the extent of their spending on a particular aspect of service. Anti-bill shock measures became an obligation for roaming service providers following regulation introduced by The European Union in 2007.  **Authorisation credentials:** parameters used to identify the subscriber and to verify the validity of a request for use of Single IMSI service from a specific subscriber. Authorisation credentials are set on a per country basis and guidance on selection of authorisation credentials can be found in Annex A. |
| **billing:** function whereby CDRs generated by the charging function(s) are transformed into bills requiring payment; |
| **Bill Payer:** the individual or entity that maintains the contract for one or more subscribers. In domestic retail service, the subscriber and the bill payer are often the same individual. However, in corporate subscriptions for example, the bill payer will hold this role for multiple subscribers. The bill payer is responsible for determining specific subscriber’s eligibility for Single IMSI and LBO services. |
| **CAMEL:** network feature that provides the mechanisms to support operator specific services even when roaming outside HPMN; |
| **charging data record (CDR):** formatted collection of information about a chargeable event (e.g. time of call set-up, duration of the call, amount of data transferred, etc) for use in billing and accounting. For each party to be charged for parts of or all charges of a chargeable event a separate CDR shall be generated, i.e. more than one CDR may be generated for a single chargeable event, e.g. because of its long duration, or because more than one charged party is to be charged; |
| **charging:** function within the telecommunications network and the associated OCS/BD components whereby information related to a chargeable event is collected, formatted, transferred and evaluated in order to make it possible to determine usage for which the charged party may be billed (offline charging) or the subscriber’s account balance may be debited (online charging); |
| **circuit switched domain:** domain within GSM / UMTS in which information is transferred in circuit switched mode; |
| **domestic service provider (DSP)**: an undertaking that provides a roaming subscriber with domestic mobile communications services. This includes Mobile operators, MVNOs and their agents. See the High Level Spec [1] for details of the definition of DSP, and the split of roles and responsibilities where MVNO is in the role of DSP. |
| **donor roaming provider:** the roaming provider, that is currently providing roaming services to a subscriber; |
| **EU-Internet access point name (APN):** a common identifier set, manually or automatically, in the roaming subscriber's mobile device and recognised by the home network and visited network to indicate the roaming subscriber's choice to use local data roaming services; |
| **home network**: a public communications network located within a Member State and used by the roaming provider for the provision of regulated retail roaming services to a roaming subscriber; |
| **home PLMN (HPMN):** PLMN where the Mobile Country Code (MCC) and Mobile Network Code (MNC) of the PLMN identity are the same as the MCC and MNC of the IMSI. |
| **local data roaming service:** a regulated data roaming service provided, temporarily or permanently, to roaming subscribers directly on a visited network, by an alternative roaming provider without the need for roaming subscribers to change their SIM card or mobile device; |
| **mobile number portability (MNP):** The ability for a mobile subscriber to change subscription network within the same country whilst retaining their original MSISDN(s). |
| **network barring:** a control function used by the home network operator aimed at avoiding the selection of certain visited networks for its roaming subscribers; |
| **offline charging:** charging mechanism where charging information **does not** affect, in real-time, the service rendered. |
| **online charging system (OCS):** the entity that performs real-time credit control. Its functionality includes transaction handling, rating, online correlation and management of subscriber accounts/balances. |
| **online charging:** charging mechanism where charging information can affect, in real-time, the service rendered and therefore a direct interaction of the charging mechanism with bearer/session/service control is required. |
| **packet switched domain:** domain in which data is transferred between core network elements. |
| **real-time:** real-time charging and billing information is to be generated, processed, and transported to a desired conclusion in less than 1 second. |
| **recipient roaming provider:** a roaming provider, that will provide roaming services instead of roaming services currently provided by the donor roaming provider after the change of roaming provider; |
| **Regulated roaming service:** within the context of the resale of retail roaming services,a provision of regulated roaming services, provided as a bundle, and associated services, such as voice mailbox services, that are usually available to roaming subscribers, without the need for roaming subscribers to change their SIM card or mobile device, in accordance with a wholesale agreement concluded between an alternative roaming provider and a domestic provider; |
| **retail charging**: see charging |
| **roaming subscriber:** a subscriber of a roaming provider of regulated roaming services, by means of a terrestrial public mobile communications network situated in the Union, whose contract or arrangement with that roaming provider permits Union-wide roaming. |
| **roaming provider**: an undertaking that provides a roaming subscriber with regulated retail roaming services; |
| **roaming:** The ability for a user to function in a serving network different from the home network. The serving network could be a shared network operated by two or more network operator. |
| **Subscriber:** the individual or entity that is associated with the actual device, and hence is the entity that generates traffic. Alternative terms from other documentation may be user, end user or subscription. This also covers individual M2M devices. The term does not imply any specific charging mechanism.  **traffic steering**: a control function used by the home network operator aimed at the selection of visited networks for its roaming subscribers based on a priority list of preferred visited networks; |
| **union-wide roaming**: the use of a mobile device by a roaming subscriber to make or receive intra-Union calls, to send or receive intra-Union SMS messages, or to use packet switched data communications, while in a Member State other than that in which the network of the domestic provider is located, by means of arrangements between the home network operator and the visited network operator; |
| **visited network**: a terrestrial public mobile communications network situated in a Member State other than that of the roaming subscriber’s domestic provider that permits a roaming subscriber to make or receive calls, to send or receive SMS messages or to use packet switched data communications, by means of arrangements with the home network operator; |

**wholesale charging:** charging that is levied between one service provider and another, for traffic that is sent from one to the other.

## Abbreviations

3GPP Third Generation Partnership Project

APN Access Point Name

ARP Alternative Roaming Provider

BEREC Body of European Regulators for Electronic Communications

CAMEL Customised Application for Mobile networks Enhanced Logic

CDR Charging Data Record

CLIP Calling Line Identification Presentation

CLIR Calling Line Identification Restriction

CRM Customer Relationship Management

DSP Domestic Service Provider

EDGE Enhanced Data rates for GSM Evolution

EU Member States of the European Union, the outermost regions of the European Union and countries adopting Regulation

GGSN Gateway GPRS Support Node

GPRS General Packet Radio Service

GSM Global System for Mobile communication

GSMA GSM Association

HPMN Home Public Mobile Network

ICCID Integrated Circuit Card Identifier

IMSI International Mobile Subscriber Identity

LBO Local BreakOut

LU Location Update

M2M Machine-to-Machine

MCC Mobile Country Code

MMS Multimedia Messaging Service

MNC Mobile Network Code

MNP Mobile Number Portability

MSISDN Mobile Station International Subscriber Directory Number

MVNO Mobile Virtual Network Operator

NRTRDE Near Real-Time Roaming Data Exchange

OCS On-line Charging System

SGSN Serving GPRS Support Node

SIM Subscriber Identity Module

SMS Short Messaging Service

UICC Universal Integrated Circuit Card

UMTS Universal Mobile Telecommunications System

VPAA VPMN Access Allowed

VPMN Visited Public Mobile Network

Important: This document will contain obligation and option.

* “Shall” will describe an obligation
* “May” will describe an option

# Context and Presuppositions

The objective of this document is to describe the detailed requirements for processes to implement roaming unbundling for EU roaming regulation III. This document builds upon the work described in *EU Roaming regulation III, Structural Solutions, High Level Technical specifications [1]* and is a compliment to the work of the parallel subgroups dealing with Billing and Provisioning, and with Interfaces and Protocols. The document is intended to meet the objectives of the Scope in Chapter 1 of this document.

The work of the three subgroups and the Technical Requirements Group is overseen by the Steering Committee for the definition of implementation of the EU Roaming Regulation III, which is chaired by BEREC. This document, along with the output of the Technical Requirements group and the other two subgroups, will serve as input to the BEREC consultation process to subsequently define the recommendations for implementation of the two Roaming reform mechanisms – Single IMSI and Local Breakout. These are further defined in the High Level Technical Specifications document [1].

## Presuppositions

Within all contracts, described in Terms and Conditions for Roaming there should be a clause that states that, unless the subscriber has an active contract with an ARP, the DSP will provide roaming service to the subscriber. This will allow the DSP to take a subscriber back at the expiry, termination or deactivation of the ARP contract, and not leave the subscriber without roaming service.

# Single IMSI Processes

The capability of an Alternative Roaming Provider (ARP) to provide a roaming service based on Single IMSI provision of service, requires the ARP to enter into an agreement with the Domestic Service Provider (DSP) of potential ARP subscribers. Single IMSI offerings reuse the existing roaming agreements and coverage of the DSP, with the agreement between the DSP and various VPMNs they have roaming agreements with being materially unaffected. As a result, processes for the establishment and termination of a relationship between DSP and ARP, and the establishment and termination of a contract for service between a subscriber and an ARP, do not involve the VPMN.

MNO’s and MVNO’s are included within the definition of DSPs. The High Level Technical Requirements specification [1] defines the ways in which the interfaces to be exposed towards the ARP should be realised where the subscriber receives domestic service from an MVNO. The various configurations depend upon the level of network components that the MVNO operates themselves versus the functions that are provided by the host MNO that the MVNO is dependent upon. For the purpose of this document, the term DSP is used to cover the functions provided by the various combinations of entities that fulfil the entire set of functions and interfaces that are used to serve an ARP. Where these functions are split between a MNO and MVNO, this is subject to commercial agreement (on fair and reasonable terms) by which the MNO will expose interfaces to ARPs that are not served by the MVNO themselves. Where an MVNO is in the role of DSP, the interfaces exposed to the ARP and the level of roaming coverage that the customers of the ARP attached to the MVNO can offer, are dependent upon the MNO and the technical implementation of capabilities between the MNO and the MVNO.

It is possible that an individual subscriber may hold a roaming contract with more than one ARP for Single IMSI service at any one time. However, a subscriber can only have one **active** ARP subscription at any time.

This means that a number of different states of the relationship between a subscriber and an ARP exist. These can be understood by considering the following overview of the processes described in this chapter.

A bill payer has a contract with a DSP that includes roaming service for the individual subscribers covered by that contract, and has no relationship with an ARP. The subscriber decides to take a roaming offer based on Single IMSI from an ARP. Until such time as that service has been activated, the subscriber continues to receive roaming service from the DSP. The DSP checks that the request from the ARP is genuine using some authorisation credentials, and the eligibility of the subscriber to use a Single IMSI roaming service. If the subscriber request is genuine and the subscriber is eligible for service, the ARP is notified that the request is accepted and the ARP provisions the subscriber for service within their systems. At this point the ARP informs the subscriber that their request for service has been accepted and will be activated shortly.

When provisioning of the ARP’s systems has been completed, the ARP informs the DSP so that the DSP can provision their systems to route information relating to Roaming service to the ARP. When this is completed, the DSP notifies the ARP that Provisioning has been completed. At this point the subscriber has a contract with the ARP and the contract takes effect. The ARP will charge the subscriber for EU Roaming traffic from the point in time when each service has been provisioned. The ARP is considered to be **activated** for that specific subscriber in the DSP. The process by which an ARP can be **activated** is described in section 3.2.

The ARP may become **deactivated** under a number of circumstances. The most likely situation will be that the subscriber initiates service from a different Single IMSI ARP (see section 3.2), thus making them the active ARP. As part of the process of activating the new ARP, the DSP will inform the previous ARP that they have become deactivated. It should be noted that in this scenario, the deactivation of an ARP **does not imply that the contract with the previous ARP has been terminated.** Because the contract between a subscriber and an ARP does not involve the DSP, the DSP cannot act on the subscriber’s behalf, nor should the DSP assume that the subscriber’s decision to receive roaming services via a new ARP means that the subscriber wishes to end the contract with the previous ARP. If the subscriber wishes to subsequently **terminate their contract** with an ARP, this requires a separate action by the subscriber towards the ARP, and without the involvement of the DSP, since the ARP has already been deactivated.

Alternatively, the subscriber may request the termination of their contract with the ARP (section 3.8) before deactivation has taken place. In this case, the ARP will notify the DSP that they are to be deactivated.

Various additional reasons exist why deactivations may occur and in some cases, these may be associated with the termination of the contract between the ARP and the subscriber. These are described in section 3.8 to 3.10 of this chapter.

There are thus three states that a relationship between a subscriber and an ARP can be in. These are:-

* No relationship between the subscriber and the ARP.
* The subscriber has a contract with the ARP, and the ARP is the **active ARP** for the subscriber within the systems of the subscriber’s DSP.
* The subscriber has a contract with the ARP, but the ARP is **deactivated** for the subscriber within the systems of the subscriber’s DSP.

An additional state exists where the ARP can **suspend** the subscriber. This may occur for example in situations of fraud or bad debt. When a subscriber is suspended the ARP will not serve the subscriber for Roaming service. It is likely that the DSP will also suspend Roaming service, so that the subscriber is prevented from generating any additional traffic or charges. The ARP will then take a decision as to whether to **unsuspend** the subscriber (if for example, debt is cleared or the potentially fraudulent behaviour is investigated and found to be legitimate) or to **deactivate** the subscriber. Note that the ARP decision to unsuspend a subscriber does not imply that the DSP will also unsuspend the subscriber

Wherever possible, subscriber MSISDN shall be used as the primary identifier of a subscription on interfaces between roaming providers. Where a MSISDN is not associated with the subscription, IMSI shall be used. It shall be possible for MSISDN and IMSI to both be included in protocol messages, but it is not mandatory to include both under any circumstance.

Scheduling for provisioning and de-provisioning activities shall be implemented only on the requester-side by scheduling the sending of messages that initiate a process. Once a PreProvisioningRequest or DeprovisioningRequest is issued to the DSP it will processed within one working day.

## Relationship between DSP and ARP

### DSP’s contract template to ARPs

DSP’s may choose to prepare a ‘Contract Template’ that could be used by an ARP as the basis upon which a Single IMSI Roaming offer can be established. The Contract Template should include basic information about what the DSP will expose to the ARP in such an agreement.

This should include:-

* Pricing information for the establishment of the agreement.
* Wholesale pricing information for voice, SMS and Data traffic that will be used by an ARP subscriber whilst roaming, and served by the DSP.
* A list of countries, operators and services in EU footprint that the DSP can offer Roaming services within.
  + Any technical limitations to coverage should be identified. For example, the absence of CAMEL roaming interfaces between VPMN and DSP.
* Technical interfaces exposed by the DSP towards the ARP including references, versions of specifications and any relevant implementation details that would be considered specific to that DSP.
* Contact points within the DSP to be used by an ARP to progress the establishment of an agreement.
* The Process and timescales associated with the process, for establishing an agreement between the DSP and an ARP.
* Authorisation information required by the DSP for the validation of provisioning requests.
* If applicable, indication of the maximum volume of subscriber activations that can be handled by the DSP (shared across all ARPs), and mechanisms for determining the order in which these are handled.
* Working hours and official holidays of the DSP.

### DSP to ARP relationship establishment process

Taking the Contract template of the DSP as a starting point (where such a contract template is available), when an ARP approaches the DSP to establish a Single IMSI Roaming relationship, there will need to be additional specific detail added to the Contract template. This should cover as a minimum, the following aspects;-

* All topics covered by the Contract template, including variance from the contract template that is specific to the agreement between the DSP and the specific ARP, and contact persons of the ARP.
* Definition of the scope of the Agreement with regards to subscribers’ eligibility, and any exclusions to eligibility.
* Process for management of modifications to the service. This should cover modifications made by the DSP that impact the ARP, and modifications made by the ARP that impact the DSP. The process should include periods of notice required prior to a modification being made and mechanisms whereby an existing agreement between DSP and ARP can be modified without the need for a new agreement.
* Testing of interfaces between DSP and ARP prior to service launch or during service, including;-
  + Any required testing and certification of interfaces.
  + Testing for availability of the service.
* Interconnectivity implementation details of interfaces including relevant technical addressing details and interfaces for exchange of information to mitigate against exposure to fraud.
* Mechanisms for ensuring the integrity and security of the DSP and ARP networks, and the links interconnecting them.
* Response time associated with specific process phases, in particular;-
  + Time between DSP receiving the PreProvisioningRequest and sending the PreProvisioningCompletion.
  + Time between ARP receiving the PreProvisioningCompletion and sending the ProvisioningRequest (defines the timeout the DSP applies whilst waiting for a ProvisioningRequest, see 3.2.1.1).
  + Time between the DSP receiving the ProvisioningRequest and sending the ProvisioningCompletion.
  + Time between the DSP receiving the SuspendRoamingRequest and sending the RoamingSuspendedConfirmation.
* Working hours and official holidays of the ARP.
* Prior to launch, a forecast from the ARP to the DSP of the amount of traffic they expect to bill consumers for.
* A bank guarantee to assure payment for services used by ARP subscribers. This may be based on forecasted traffic, number of subscribers or other factors.
* Details for the settlement of Bills between DSP and ARP including;-
  + Periodicity of payment
  + Schedule of payments from ARP to DSP (e.g. dates of month, day of week)
  + Process for payment of any due refund from DSP to ARP.
  + Penalties and/or interest terms resulting from failure to pay.
  + Liability for Bank Charges
  + Currency for settlement
  + Country of settlement for VAT payments.
* The responsibilities of the DSP and the ARP for Customer Care, and the definition of any interface between the DSP and ARP to enable each to provide Customer Care. Particular focus should be given to;-
  + Availability of subscriber eligibility information.
  + Availability of coverage information
  + Information relating to DSP and VPMN network faults.
  + Handling of reports of lost or stolen UICC cards
  + Handling of reports of lost, stolen or faulty mobile equipment
  + Billing enquiries.

See section 3.3 for further details on Customer Care responsibilities.

* Conditions relating to Confidentiality of the Agreement between DSP and ARP, and liabilities of either party found to be in breach of that confidentiality.
* References to Charging Information Exchange.
* Obligations of each party in relation to Data Privacy, including
  + Conditions relating to sharing of information on suspected fraud.
  + Legal Interception and information disclosure.
* Measures that are to be put in place to prevent exposure of either party to fraud.
* Fraud liability
* Liability of each party to fraud losses that might result from either party not fulfilling its fraud management obligations (e.g. NRTRDE)
* Responsibilities regarding data exchange related to fraud. For instance, where an ARP terminates a subscriber contract on the grounds of suspected fraud the DSP may wish to be notified of this.
* DSP assurances regarding the integrity of authentication algorithm(s) used in subscriber UICCs and the integrity of the parameters used to identify the subscriber, and obligations and liabilities in the event that such algorithm(s) are compromised and abused.
* Availability of interfaces, and processes for notification and scheduling of planned down time.
* Conditions under which the service shall be suspended.
* Events and conditions considered to be Force Majeure.
* Conditions under which the contract between DSP and ARP shall be terminated or suspended.
* Conditions under which a specific subscribers’ request for service may be rejected, or under which existing service may be suspended or terminated.
* Process and conditions under which changes can be made to the agreement.
* Dispute resolution, Arbitration processes and Choice of Law.
* Clauses defining requirements for ethical and legal business conduct between DSP and ARP including the right to terminate the contract should either party fail to abide by these.
* Duration of the contract.

Any statements included within an agreement between DSP and ARP related to the quality of the roaming service provided to the ARP should reflect the fact that quality is also dependent on the VPMN that the subscriber is roaming in, and hence some aspects of quality of service are beyond the DSP’s control.

### Identification of Retail Billing Interface to be used

In agreeing the business arrangements between the DSP and the ARP, the retail charging interface options that the DSP can offer to the ARP will be agreed. There are three possible outcomes to these negotiations:-

Option 1 DSP may provide an online retail charging interface for all subscribers. This will mean that the ARP receives real-time charging information for every subscriber, even if the subscriber’s contract with the DSP is based on offline, non-real-time charging.

Option 2 DSP may offer online and offline retail charging interfaces to ARP. Interfaces are used as follows:-

* 1. For a subscriber with a pre-paid contract with the DSP, wishing to take a pre-paid contract with the ARP, the DSP shall provide an online retail charging interface.
  2. For a subscriber with a pre-paid contract with the DSP, wishing to take a post-paid contract with the ARP, the DSP shall provide either an online or an offline retail charging interface.
  3. For a subscriber with a post-paid contract with the DSP, wishing to take a pre-paid contract with the ARP, the DSP shall provide an online retail charging interface.
  4. For a subscriber with a post-paid contract with the DSP, wishing to take a post-paid contract with the ARP, the DSP shall provide either an online or an offline retail charging interface.

Option 3 Where the DSP has no capability to provide online retail charging support for roaming subscribers, the DSP shall only provide an offline retail charging interface to the ARP.

**Note:** The offline charging interface is always required (also for options 1 and 2) for the purpose of wholesale billing between the DSP and the ARP, but this only need to contain the specific retail information in case no online retail charging support is provided.

For Option 2 above, special care needs to be taken when the customer changes the basis of their contract with either the ARP or the DSP. This is taken into account within the process described in sections 3.2 and 3.5.

## Service activation by the subscriber

This section describes the process whereby a subscriber can opt to take Roaming Service from a new Roaming Provider. For this to be possible, the bill payer associated with the subscriber must have a roaming contract with their DSP. This in turn means that the subscriber is never without a roaming provider, and so the change from one Roaming Provider to another is a ‘swap’ process from one Roaming Provider to another.

The Roaming Provider that is providing roaming service to the subscriber at the initiation of the process is referred to as the Donor Roaming Provider, whilst the Roaming Provider that is providing roaming service to the subscriber after a successful swap process has been finished is referred to as the Recipient Roaming Provider.

For Single IMSI roaming service, subscribers have the capability to instigate three different types of roaming provider change:-

* The subscriber is receiving roaming service from their DSP and elects to take roaming service from an ARP.
  + The DSP plays the role of the Donor Roaming Provider
  + The ARP plays the role of the Recipient Roaming Provider;
* The subscriber is receiving roaming service from an ARP (ARP-A)and elects to take roaming service from an different ARP (ARP-B).
  + ARP-A plays the role of the Donor Roaming Provider
  + ARP-B plays the role of the Recipient Roaming Provider;
* The subscriber is receiving roaming service from an ARP and elects to take roaming service from their DSP.
  + The ARP plays the role of the Donor Roaming Provider
  + The DSP plays the role of the Recipient Roaming Provider

The swap of service from one Roaming Provider to another shall require some level of authorisation. Authorisation is already a part of the MNP Process, and so examples of MNP authorisation credential that are currently used in EU member states are provided in Annex A for information. MNP Authorisation credentials could be used as the basis for the mechanism to be used for Single IMSI swap authorisation. Where connection between DSP and ARPs from different countries are permitted, the authorisation process of the country where the DSP is a service provider is used.

All interactions shall be acknowledged to implement an implicitly reliable protocol. Missing acknowledgments (after timeout) may trigger the sender to re-send the same request. This will require proper handling of duplicate requests on the receiver side.

Mandatory return codes are required for some messages. In some cases, an additional optional attribute, which can be used to provide more talkative information, may also be included. The definition of this interface (SI-IF7) is within the scope of the Billing and Provisioning subgroup. Defined within the process are requirements for the mandatory set of return codes. The option to include additional codes through agreement between DSP and ARP should be supported in the protocol design.

The duration of the process shall not exceed 1 Working Day as per BEREC guidance.

### Process description for ‘swap’

*Process Description*

A subscriber of DSP currently has a subscription for roaming from her or his Donor Roaming Provider and wants to have a roaming subscription from the ‘Recipient Roaming ‘Provider’ from now on or in the near future.

*Pre-conditions and Trigger*

Bill payer associated with the subscriber has a contract with DSP;

Bill payer associated with the subscriber has a subscription for roaming services from Donor Roaming Provider. If the Donor Roaming Provider is the DSP, this contract for roaming services may be an integral part of the billl payer’s contract with the DSP;

Subscriber wants to have subscription for roaming services from Recipient Roaming Provider;

Recipient Roaming Provider has a commercial agreement and a technical interconnect to the DSP of the subscriber, and can provider roaming service for the DSP’s subscribers;

Subscriber asks ‘Recipient Roaming Provider for a roaming services subscription;

*Result of Process*

Subscriber has a roaming services subscription from the Recipient Roaming Provider;

*Assumptions*

No assumptions.

*Non-functional requirements*

The time-period between PreProvisioningRequest and ProvisioningCompletion must not exceed one working day;

#### Process

The following diagram shows the core communication sequence of the different parties involved:

**

*Step 1 “SubscriptionRequest”*

The subscriber asks the Recipient Roaming Provider for a roaming service subscription.

The subscriber can only receive service from a Recipient Roaming Provider who is attached to the subscriber’s DSP. The Recipient Roaming Provider will typically check this pre-condition as a first step.

If subscriber and Recipient Roaming Provider agree on a subscription, the Recipient Roaming Provider prepares itself to provide service, and proceeds to Step 2. If there is no agreement between subscriber and Recipient Roaming Provider, or if the subscriber changes their mind prior to the initiation of Step 2 for any reason, the activity stops. This is not mentioned in the diagram.

*Step 2 “PreProvisioningRequest”*

The Recipient Roaming Provider asks the DSP for provisioning by sending a PreProvisioningRequest. The PreProvisioningRequest shall include the MSISDN to be unbundled, if it is known by the Recipient Roaming Provider. If MSISDN is not known, the PreProvisioningRequest shall include the IMSI to be unbundled.

Where the DSP chooses to offer option 2 of the retail billing interface mechanisms described in section 3.1.3, the ARP will need to inform the DSP of the required charging basis for the subscriber’s service from the ARP. If the subscriber is selecting a post-paid contract from the ARP, the DSP will then be able to select the retail charging interface it will provide to the ARP. In the case, PreProvisioningRequest shall include a parameter to indicate the intended billing basis that the subscriber will be contracted to the ARP. The parameter can take the values;-

* Pre-paid
* Post-paid

If the DSP has implemented either option 1 or option 3 from section 3.1.3, the interface used by the DSP to send charging information to the ARP is always the same and so no indication of the specific interface to be used for that subscriber is needed.

When the DSP receives the PreProvisioningRequest, this initiates checks within the DSP (steps 4 to 6), which will be concluded with a PreProvisioningCompletion.

*Step 3 “PreProvisioningAcknowledgement”*

The DSP sends a PreProvisioningAcknowledgement to the Recipient Roaming Provider. This message includes the time at which the DSP received the PreProvisioningRequest.

*Step 4 “CheckAgreement”*

The receiving DSP will check for the existence and whether the agreement with Recipient Roaming Provider currently allows for provisioning requests to be issued to ensure that the Recipient Roaming Provider is entitled to deliver roaming service to the subscriber.

If the Recipient Roaming Provider is not currently entitled to offer roaming service to the subscriber, the DSP returns PreProvisioningCompletion with return code ‘NOK-NoActiveAgreement’.

If the CheckAgreement step is passed, the DSP moves on to Step 5.

*Step 5 “CheckAuthorisation”*

The DSP checks whether the Recipient Roaming Provider’s PreProvisioningRequest is authorised by the bill payer associated with the subscriber and uses the correct authorisation credentials required by the DSP for the subscription type that the subscriber holds with the DSP.

How the authorisation step is achieved and the method of authorisation that is used shall be defined and used as common practise on a per-country basis. Examples of MNP authorisation credential that are currently used in EU member states are provided in Annex A.

If the authorisation credentials provided by the Recipient Roaming Provider are not correct the DSP returns PreProvisioningCompletion with return code ‘NOK-NotAuthorised’ to the Recipient Roaming Provider, with the option to include the reason of unsuccessful authorisation.

Optional information to be included as reasons for the Notification Response being the ‘NOK-NotAuthorised’ message are:-

* Not subscriber of this DSP
* Incorrect Authorisation method
* Incorrect Authorisation credentials (including for corporate subscribers, Requestor is not the bill payer for this subscriber).

If the CheckAuthorisation step is passed, the DSP moves on to Step 6.

*Step 6 “CheckEligibility”*

The DSP checks whether eligibility for Single-IMSI is given for the MSISDN or IMSI provided within the PreProvisioningRequest. If the subscriber is found to be ineligible for the requested roaming service, the DSP returns PreProvisioningCompletion with return code ‘NOK-NotEligible’’ to the Recipient Roaming Provider, with the option to include the reason of ineligibility.

Optional information to be included as reasons for the Notification Response being the ‘NOK-NotEligible’ message are:

* The subscriber’s domestic service has been suspended;
* The subscriber has no contract to receive roaming service;
* The subscriber’s roaming service has been suspended:
* There is another provisioning or de-provisioning process currently on-going for this MSISDN or IMSI.
* Request is based on non-primary IMSI for the subscription.
* Request is based on non-primary MSISDN for the subscription.
* Subscriber or Bill Payer requested MNP from the DSP and the domestic port out process is on-going.

If a PrePovisioningRequest is received from a Recipient Roaming Provider that duplicates a request that has already been received, the DSP may suppress the sending of a ‘NOK-NotEligible’ response as this duplicated request may be indicative of the Recipient Roaming Provider not having received the PreProvisioningAcknowledgement (Step 3) and re-issuing the original request.

ARP

If the subscriber is found to be eligible to receive the requested service from the Recipient Roaming Provider, the DSP shall send PreProvisioningCompletion with return code ‘OK’. In this case, the PreProvisioningCompletion may contain the IMSI for the subscription – this is an optional choice for the DSP.

If the DSP has chosen option 2 regarding the possible charging interface selection in section 3.1.3, the PreProvisioningCompletion message shall include a parameter identifying whether the DSP will provide an online or an offline retail charging interface to the ARP. If the ARP indicated that the subscriber would be taking a pre-paid contract in the PreProvisioningRequest (step 2), the DSP shall offer an online retail charging interface only. If the ARP indicated the subscriber would be taking a post-paid contract in the PreProvisioningRequest (step 2), the DSP shall offer either an online or an offline retail charging interface, dependent upon the DSP’s specific implementation.

Upon receiving PreProvisioningCompletion with return code ‘OK’, the Recipient Roaming Provider shall;-

* Inform the subscriber that their request for service has been Granted.
* Provision systems within the Recipient Roaming Providers network in preparation to start receiving messages and information related to the subscriber’s service usage whilst roaming.
* Where the parameter indicating either online of offline retail charging interface is to be provided by the DSP to the ARP for that subscriber, the ARP will provision its billing systems accordingly for information to be received over the identified interface.

Once the Provisioning of the Recipient Roaming Provider’s network systems have been completed, the Recipient Roaming Provider will move to Step 7.

If the Recipient Roaming Provider does not complete step 6 and issue the ProvisioningRequest within the time agreed between ARP and DSP (see 3.1.2) the DSP shall continue provisioning with step 8. The DSP shall not undo changes ("database rollback") that may have been applied during the pre-provisioning phase. Instead the DSP will finalise the provisioning, which has been initiated with the PreProvisioningRequest.

Please note that the DSP can set the above-mentioned timeout to zero in order to have immediate continuation of the provisioning on the DSP side. This can be helpful if there is e.g. no need for the DSP to wait for any ARP-side activity to be completed.

*Step 7 “ProvisioningRequest”*

The Recipient Roaming Provider sends a ProvisioningRequest to the DSP after it has finished all preparation. This initiates the provisioning activities on the “Domestic Service Provider’s” side.

*Step 8 “FreezeProvisioningStartTime”*

Upon receiving the ProvisioningRequest from the Recipient Roaming Provider, the DSP captures or ‘freezes’ the point in time at which provisioning of the DSP systems starts. This will be used by the DSP in Steps 11 and 12.

*Step 9 “Provision”*

The DSP implements the provisioning of roaming services for the MSISDN and/or IMSI in question to the requesting Recipient Roaming Provider. Within the sequence diagram this is modelled as a separate activity to emphasize that it may take some time.

It is assumed that the provisioning of DSP systems may not be an atomic one and that the switch may happen incrementally, e.g. per service. This is due to the distributed nature of the various involved systems. As a consequence there is no single point in time at which the switch of roaming service from the Donor Roaming Provider to the Recipient Roaming Provider will take place. Instead there will be a period of time during which the switch of each service will take place individually. This is the period between the FreezeProvisioningStartTime (Step 8) and the FreezeProvisioningEndTime (Step 10). The timestamps at the start and end of the provisioning period shall be provided to the Recipient Roaming Provider and to the Donor Roaming Provider.

It is recommended that the DSP provisions SI-IF6 as the first action of this step.

At the point when provisioning of DSP systems takes place, if the subscriber is currently roaming, any calls and sessions that are already initiated will be charged for by the DSP until they are terminated. The termination of such calls and sessions may be forced by the DSP.

*Step 10 “FreezeProvisioningEndTime”*

The DSP captures or ‘freezes’ the point in time at which provisioning of the DSP systems is completed. This will be used by the DSP in Steps 11 and 12.

*Step 11 “DeprovisioningCompletion”*

The DSP sends out a notification to the Donor Roaming Provider, to inform them that they are no longer the provisioned roaming provider for the MSISDN provided with the ProvisioningRequest. The message contains the start and end times of the DSP provisioning system from steps 8 and 10.

*Step 12 “ProvisioningCompletion”*

The DSP sends out a notification to the Recipient Roaming Provider, to inform them that they are now provisioned as roaming provider for the IMSI provided with the ProvisioningRequest. The message contains the start and end times of the DSP provisioning system from steps 8 and 10.

*Step 13 “SubscriptionConfirmation”*

Upon receiving the Provisioning Completion message, the Recipient Roaming Provider sends a message to the subscriber as a confirmation of the activation of the subscription for regulated roaming services. This message is to inform the subscriber that roaming services are now provided by the Recipient Roaming Provider and is sent to the subscriber regardless of whether the subscriber is currently roaming or not.

#### Capability of the subscriber to change their mind

At any point during the process, the subscriber may change their mind and decide not to take the Single IMSI service of the Recipient Roaming Provider. To do this the subscriber must inform the Recipient Roaming Provider. If the communication from the subscriber comes prior to the PreProvisioningRequest message being sent from the Recipient Roaming Provider to the DSP, the process for initiating the provisioning of service in the Recipient Roaming Provider should be stopped. If the communication from the subscriber comes after the PreProvisioningRequest message is sent from the Recipient Roaming Provider to the DSP, the Recipient Roaming Provider and DSP may need to complete the provisioning of their systems, and then need to reverse this provisioning as a separate request, following the same swap procedure.

## Customer Service query responsibilities

*Process Description*

The subscriber requests information or registers a complaint about the roaming services to DSP or ARP. DSP or ARP clarify the request and provide the appropriate information to the subscriber. Subscriber will get the information from the operator who is responsible for billing of services the subscriber is inquiring about.

*Pre-conditions and Trigger*

* Subscriber of DSP is using ARP for regulated roaming services, or is considering using an ARP for regulated roaming services.
* Subscriber contacts DSP or ARP to request information.

*Result of Process*

* Information is provided to the subscriber

*Assumptions*

CRM of DSP should provide information that a subscriber is decoupled, so that contact points are aware if the subscriber is/has been using the ARP and during what period.

CRM of ARP should be maintained to support all subscribers that have contracts, so that all subscriber inquiries can be properly handled.

### DSP

*Input for Process Step*

Subscriber is/was/will be Single IMSI ARP subscriber.

Subscriber requests information about services that DSP is responsible for.

Only DSP relevant information can be presented to the subscriber.

*Description of the Process Step*

The subscriber contacts DSP (any touch point) and requests any one or more of the following pieces of information:

* Specific Single IMSI ARP availability (agreement exists between the ARP and DSP)
* Eligibility status of the Registered End User.
* Process to subscribe to an ARP
  + subscriber is advised that subscription request needs to be directed to an ARP. All other process related information is to be addresses by the ARP.
* Data cut-off service: provided ONLY for the services still provided by DSP (for non EU).
* Usage and pricing related to traffic outside of EU.
* Data packages usage for traffic other than Single IMSI and/or LBO data traffic
* Voicemail receipt (free for subscriber) and retrieval (outgoing call - provided by ARP)
* Information on how to avoid inadvertent roaming in border regions - standard procedure
* Any supplementary services still provided by DSP (Call forward, CLIP, CLIR, multi-call)
* Information regarding any services by DSP which can affect or are affected when subscriber is using a Single IMSI ARP (e.g. Voice mail, SMS info, networks available, suspension of roaming, DSP roaming offers, etc.).
* Non-available services in Single IMSI (if applicable to the subscriber).
* Subscriber gets explanation about invoice issued by the DSP - DSP is charging only non-EU roaming traffic.
* Necessary actions for the subscriber to return to the DSP for roaming.

*Output/Result of the Process Step*

Subscriber request is clarified by the DSP.

*Remarks*

None

*Reference*

None

### ARP

*Input for Process Step*

Subscriber is/was Single IMSI ARP subscriber

Subscriber requests information about services that ARP is responsible for

Only ARP relevant information can be presented to the subscriber.

*Description of the Process Step*

The subscriber contacts ARP (any available touch point, including a customer care reachable by phone and possibly Internet) and requests the following information on Single IMSI:

* Subscription processes
* Anything regarding specific offers including prices of services provided by the Single IMSI ARP
* Subscription activation and deactivation
* Single IMSI Contract termination
* Single IMSI Contract Terms and Conditions
* Setup of the data limit with the Single IMSI ARP
* Price notifications
* Service availability and quality inquiries
* Subscriber complaint about inability to use roaming services in EU with Single IMSI. This could be a result of:
  + Suspension of provided Single IMSI roaming service by Single IMSI ARP
  + Lack of roaming network coverage
  + Contract terminated with Single IMSI ARP
  + Termination of subscriber’s contract with DSP
* Technical issues preventing service. Single IMSI invoice/charging/usage

*Output/Result of the Process Step*

Subscriber request is clarified by the ARP.

*Remarks*

None

*Reference*

None

## Subscriber is issued a bill

A subscriber that has opted to take Single IMSI roaming service from an ARP shall be billed for this service according to the terms of the contract they hold with the ARP. The subscriber shall not be charged by the DSP for roaming services which are included within the ARP offer, during any period when the subscriber has a contract with an ARP that is active.

DSP will always charge the subscriber for domestic services, regardless of subscriber’s roaming provider selection. The DSP shall also charge for roaming services used outside of the EU markets and unregulated roaming services, unless the contract between the DSP and the ARP specifically extends to markets or services beyond the scope of regulation.

The process by which a bill is generated by and conveyed from an ARP to a subscriber is specific to the ARP and subscriber’s contract, and so is not defined.

## Subscriber changes billing basis

In section 3.1.3, three possible options for the way in which the DSP will provide billing information to the ARP to serve a subscriber’s contract with the ARP are identified. In Options 1 and 3, the DSP provides the same charging interface to the ARP regardless of the nature of the contract the subscriber has with the DSP and regardless of the contract the subscriber has with the ARP. Option 2 offers the DSP flexibility in the interfaces it uses to send retail charging information to the ARP, when the subscriber takes a post-paid contract at the ARP. These options vary upon DSP choice and the contract type the subscriber has with the DSP and are left open for the DSP to select according to their preference.

However, using these options means that if the subscriber opts to change their contract basis with the ARP, the ARP shall notify the DSP of this change to allow the DSP to offer a different charging information interface if they so choose. Similarly, if the subscriber changes their contract basis with the DSP, or the DSP chooses to change the way that the subscriber’s charging information is relayed to the ARP, this may impact the interface that the DSP uses to convey charging information to the ARP for that subscriber, and so the DSP shall inform the ARP of this change to allow the ARP to adjust its systems to receive retail charging information for the subscriber over a different interface.

This section describes the processes by which these changes are notified. These process are only required if the DSP has implemented Option 2 from section 3.1.3.

### Change of subscriber contract at the ARP

Process Description

The subscriber of an ARP decides to change their billing basis for Roaming Services from post-paid to pre-paid or vice versa. This results in the need for the ARP to notify the DSP of this change, and for the DSP to reprovision its systems accordingly.

*Pre-conditions and Trigger*

Subscriber is receiving roaming service from an ARP.

Subscriber wishes to change the basis of his billing from pre-paid to post-paid or vice versa.

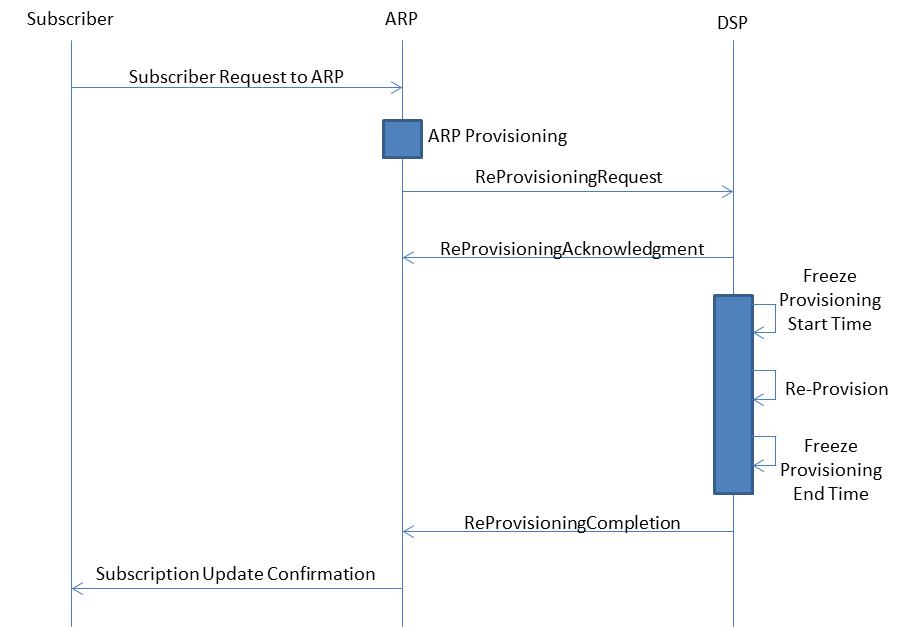
*Result of Process*

Subscriber’s billing basis is updated

*Assumptions*

This process is used only if the interfaces that are exposed by the DSP towards the ARP vary dependent on whether the subscriber is taking a pre-paid or post-paid contract from the ARP. In some implementations, the DSP may expose the same interfaces for all subscribers regardless of their billing basis with the ARP (see options 1 and 3 in Step 2 of section 3.2) in which case the change of billing basis for the subscriber would be handled entirely within the ARP’s systems.

#### Process



*Step 1 Subscriber request to ARP*

The subscriber requests a change in their billing basis from the ARP. This request can be made via any available channel that allows for this facility between ARP and subscriber. The ARP shall confirm that the request has been received to the subscriber.

*Step 2 ARP Re-provisioning*

The ARP will re-provision its systems to be capable of receiving records for the subscriber relating to both pre- and post-paid charging principles. The ARP systems will need to be capable of handling both pre- and post-paid charging records for the subscriber for a period of time during which the shift from one principle to another will take place.

*Step 3 “ReProvisioningRequest”*

The ARP sends the DSP a ReProvisioningRequest. The ReProvisioningRequest shall include the subscription identifier relating to the subscription that is to be reprovisioned. The ReProvisioningRequest shall also contain a field describing the change that is being requested. This shall either be ‘Change billing basis – pre-paid to post-paid’ or ‘Change billing basis – post-paid to pre-paid’.

*Step 4 “ReProvisioningAcknowledgement”*

The DSP sends a ReProvisioningAcknowledgement to the ARP. This message includes the time at which the DSP received the ReProvisioningRequest.

If the subscriber is swapping from a pre-paid contract to a post-paid contract at the ARP, the DSP may choose to continue to serve the subscriber using the online charging interface exposed to the ARP. If so, no update to the DSP systems is needed and the DSP can move to step 8.

If the subscriber is swapping from a post-paid contract to a pre-paid contract at the ARP, but is already being served using the online charging interface exposed by the DSP to the ARP, no update to the DSP systems is needed and the DSP can move to step 8.

If the subscriber is swapping from a post-paid contract to a pre-paid contract at the ARP, and is being served using the offline retail charging interface exposed to the ARP, the DSP systems shall be reprovisioned to use the online charging interface to the ARP for that subscriber. The DSP should move to Step 5.

*Step 5 “FreezeProvisioningStartTime”*

Upon receiving the ReProvisioningRequest from the ARP, the DSP captures or ‘freezes’ the point in time at which re-provisioning of the DSP systems starts. This will be used by the DSP in Step 8.

*Step 6 “Re-Provision”*

The DSP implements the re-provisioning of the charging basis for roaming services for the subscription in question.

It is assumed that the provisioning of DSP systems may not be an atomic one and that the switch may happen incrementally, e.g. per service. This is due to the distributed nature of the various involved systems. As a consequence there is no single point in time at which the switch of charging basis will take place. Instead there will be a period of time during which the switch of each service will take place individually. This is the period between the FreezeProvisioningStartTime (Step 5) and the FreezeProvisioningEndTime (Step 7). The timestamps at the start and end of the provisioning period shall be provided to the ARP.

At the point when provisioning of DSP systems takes place, if the subscriber is currently roaming, any calls and sessions that are already initiated will be charged for by the ARP under the subscriber’s old charging basis until they are terminated. The termination of such calls and sessions may be forced by the DSP.

*Step 7 “FreezeProvisioningEndTime”*

Upon completion of the re-provisioning of the DSP’s systems, the DSP captures or ‘freezes’ the point in time at which provisioning of the DSP systems is completed. This will be used by the DSP in Steps 8.

*Step 8 “ReProvisioningCompletion”*

The DSP sends out a notification to the ARP, to inform them that the re-provisioning for the subscription provided within the ReProvisioningRequest has now been completed. The message contains the indication of the retail billing interface to be used for that subscriber following any necessary reprovisioning of the DSP systems. This indication shall take the value of either ‘online’ or ‘offline’. The ReProvisioningCompletion message shall include the start and end times of the DSP provisioning process from Steps 5 and 7 above. If Steps 5 to 7 were not required, the start and end times included in the message shall be set to the same time that was indicated in the ReProvisioningAcknowledgement message.

*Step 9 “Subscription Update Confirmation”*

Upon receiving the ReProvisioningCompletion message, the ARP sends a message to the subscriber as a confirmation of the changes made to the charging basis of their subscription for regulated roaming services. This message is sent to the subscriber regardless of whether the subscriber is currently roaming or not.

### Change of billing interface used for a subscriber from DSP to ARP

Process Description

The DSP chooses to change interface that is being used to provide charging information to the ARP. Only subscribers with post-paid contracts at the ARP would be able to be modified in this way since all pre-paid ARP subscribers shall have online charging interfaces used by the DSP towards the ARP.

The DSP may choose to change the interface used to send charging information to the ARP for post-paid ARP subscribers for a number of reasons, which may include a change in the contract between the subscriber and the DSP, or DSP operational reasons.

*Pre-conditions and Trigger*

Subscriber is receiving roaming service from an ARP.

DSP chooses to modify the interface being used to provide charging information to the ARP for that subscriber.

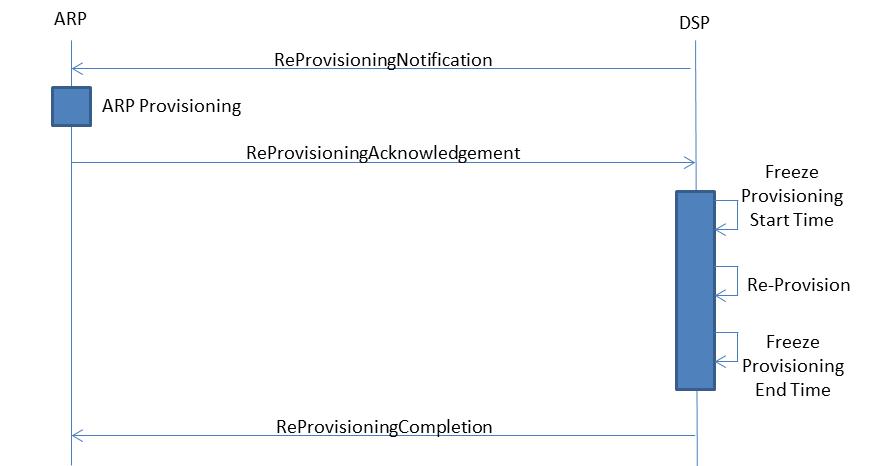
*Result of Process*

Interface from DSP to ARP for charging information for that subscriber is modified.

*Assumptions*

None

#### Process



*Step 1 ReProvisioningNotification*

The DSP notifies the ARP that the interface being used to provide charging information for subscriber is to be changed. The ReProvisioningNotification shall include the subscription identifier relating to the subscription that is to be reprovisioned. The ReProvisioningNotification shall also contain a field describing the change that is being requested. This shall either be ‘Change charging interface – online to offline’ or ‘Change charging interface – offline to online’.

*Step 2 “ReProvisioningAcknowledgement”*

Upon receiving the ReProvisioningNotification, the ARP will re-provision its systems to be capable of receiving records for the subscriber relating to both pre- and post-paid charging principles. The ARP systems will need to be capable of handling both pre- and post-paid retail charging records for the subscriber for a period of time during which the shift from one principle to another will take place. Once completed, the ARP sends a ReProvisioningAcknowledgement to the DSP. This message includes the time at which the ARP received the ReProvisioningNotification.

*Step 3 “FreezeProvisioningStartTime”*

Upon receiving the ReProvisioninAcknowledgement from the ARP, the DSP captures or ‘freezes’ the point in time at which re-provisioning of the DSP systems starts. This will be used by the DSP in Step 6.

*Step 4 “Re-Provision”*

The DSP implements the re-provisioning of the charging basis for roaming services for the subscription in question.

It is assumed that the provisioning of DSP systems may not be an atomic one and that the switch may happen incrementally, e.g. per service. This is due to the distributed nature of the various involved systems. As a consequence there is no single point in time at which the switch of charging basis will take place. Instead there will be a period of time during which the switch of each service will take place individually. This is the period between the FreezeProvisioningStartTime (Step 3) and the FreezeProvisioningEndTime (Step 5). The timestamps at the start and end of the provisioning period shall be provided to the ARP.

At the point when provisioning of DSP systems takes place, if the subscriber is currently roaming, any calls and sessions that are already initiated will be charged for by the ARP under the subscriber’s old charging basis until they are terminated. The termination of such calls and sessions may be forced by the DSP.

*Step 5 “FreezeProvisioningEndTime”*

Upon completion of the re-provisioning of the DSP’s systems, the DSP captures or ‘freezes’ the point in time at which provisioning of the DSP systems is completed. This will be used by the DSP in Steps 6.

*Step 6 “ReProvisioningCompletion”*

The DSP sends out a notification to the ARP, to inform them that the re-provisioning for the subscription identifier provided within the ReProvisioningNotification has now been completed. The message contains the indication of the retail billing interface to be used for that subscriber following any necessary reprovisioning of the DSP systems. This indication shall take the value of either ‘online’ or ‘offline’. The ReProvisioningCompletion message shall include the start and end times of the DSP provisioning process from Steps 3 and 5 above.

## Bill-shock measures

All service providers that offer Roaming service in Europe are obliged to provide information to the subscriber about their spending (unless the subscriber opts out of receiving such messages). This regulation was first put in place in REGULATION (EC) No 717/2007 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 27 June 2007 [4], and has since been regularly updated. At the time of writing, the most recent version of this regulation is REGULATION (EU) No 531/2012 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 13 June 2012 [2].

If a subscriber opts to receive regulated roaming service within the EEA from an ARP, the obligation to provide anti-bill shock measures for these services passes to the ARP, along with the service itself. Described here are additional processes to allow ARP to meet this regulation.

Bill shock thresholds are **per roaming provider**. As such, a subscriber will have one cap per ARP and so could use multiple ARPs and have multiple caps within one time period, in addition to the cap associated with the DSP.

A subscriber may opt in or out of each element of the anti-bill shock service separately with each provider (DSP/ARP). Subscribers shall not receive any notifications or be affected in any other way regarding the services they chose to opt-out from. Subscribers that have opted out of bill shock services from one service provider, must still receive these services from the service providers in which they have not opted-out.

Preconditions and Triggers

* Subscriber is activated for roaming services from ARP.
* An upper limit to the billed amount has been selected (either explicitly by the subscriber to the ARP or by adoption of the ARP default limit).
* Threshold points for alerts have been selected (either explicitly by the subscriber to the ARP or by adoption of the ARP default threshold).
* Medium used for notification of thresholds and limits being reached has been selected (either explicitly by the subscriber to the ARP or by adoption of the ARP default mechanism).
* Subscriber has not opted-out of the anti bill shock services by the ARP.

Process Description

The process deals with two aspects of the anti-bill shock measures, which must be supported by the roaming service providers:

1. The roaming service provider must inform the subscriber of roaming pricing information for calls, SMS and data services. This pricing information must be sent by means of widely available media, without undue delay and free of charge. It must be sent in the following cases:
   1. After the subscriber has entered a new network in a Member State other than that of his domestic provider.
   2. After the subscriber sends a specific request for pricing information.
   3. Upon ARP activation if the subscriber is already roaming in the EU.
2. The roaming provider must control the subscriber’s roaming data usage in the following cases:
3. In case a subscriber has already spent the maximum amount allowed (cap limit) under the terms of their bill shock conditions, the ARP must deny data access.
4. In case a subscriber with an active data session reaches a service threshold, the ARP must send the subscriber a notification.
5. In case a subscriber with an active data session reaches their maximum spend (cap limit), the ARP must end the data session.

While an ARP subscriber is roaming outside the EU, the DSP is responsible for all of the anti-bill shock measures (unless the ARP and DSP contract extends the provision of roaming services by the ARP outside of the EU).

All anti bill shock measures shall be applied both to postpaid and prepaid subscribers.

Where a subscriber takes a retail offer from the ARP that does not result in incremental charging based on usage, no bill shock will result. Therefore for such offers, the ARP does not need to offer anti-bill shock measures.

Process Flows

1. Process Flow – Pricing Info Notification Upon Registration to VPMN
2. Subscriber enters a new network in a Member State other than that of his domestic provider.
3. VPMN sends a registration request to the DSP.
4. If the subscriber is activated for an ARP and roaming in the EU, the DSP must send a mobility notification to the ARP via the mobility interface.
5. ARP must notify the subscriber of pricing information for roaming charges (including VAT) that apply in the visited network for making and receiving of regulated calls, sending of regulated SMS messages and using of data services. Alternatively, the ARP may notify the subscriber of the charges applied on all networks in the visited country upon first registering in any network within that country. This pricing information must be sent by means of widely available media, without undue delay and free of charge.



Process Result

The subscriber is notified of pricing information for all roaming services in the visited network/country upon first registration.

B. Process Flow – Pricing Info Notification Upon Subscriber Request

1. Subscriber sends a request to the ARP for roaming pricing information.
2. ARP must inform the subscriber of pricing information for regulated roaming charges (including VAT) that apply in the visited network for making and receiving of regulated calls, sending of regulated SMS messages and using of data services. This pricing information must be provided without undue delay and free of charge.

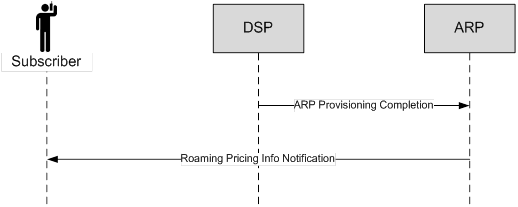


Process Result

The subscriber is informed of pricing information for all roaming services in the visited network/country upon request. The information is provided by the relevant roaming provider (ARP/DSP).

C. Process Flow – Pricing Info Notification Upon ARP Activation

1. ARP activation has been completed, and ProvisioningCompletion message is sent to the ARP (see section 3.2).
2. ARP must notify the subscriber of pricing information for roaming charges (including VAT) that apply in the visited network for making and receiving of regulated calls, sending of regulated SMS messages and using of data services. This pricing information must be sent by means of widely available media, without undue delay and free of charge. The information provided is general pricing information. If the customer is roaming at the point of ARP Activation, Process A above is triggered when the ARP receives location information for the customer.



Process Result

The subscriber is notified of pricing information for all roaming services in the visited network/country if they are in roaming upon activation of the ARP.

1. Process Flow – Data Usage Control – Subscriber Over Cap Limit

1. Subscriber initiates a roaming data session, which is received by the DSP.
2. If the subscriber is activated for an ARP and roaming in the EU, the DSP shall forward the data session request to the ARP.
3. If the subscriber has already spent the maximum amount allowed (cap limit) under the terms of their bill shock conditions, the ARP must deny access. If the maximum amount has not been reached, the session is allowed to be established (not shown in diagram).



Process Result

If the subscriber is over their cap limit, data access is denied. Otherwise data session is established.

1. Process Flow – Data Usage Control – Subscriber Reaches Threshold
2. Subscriber is using an active data session with an ARP.
3. If the subscriber reaches a service threshold, the ARP must send the subscriber a notification explaining that they have reached a threshold for data usage.



Process Result

The subscriber receives a notification after reaching a data usage threshold.

1. Process Flow – Data Usage Control – Subscriber Reaches Cap Limit
2. Subscriber is using an active data session with an ARP.
3. If the subscriber reaches their maximum spend (cap limit), the ARP must send the subscriber a notification explaining that they have reached the limit and the ARP must end the data session.



Process Result

The subscriber receives a notification upon reaching their maximum spend (cap limit) and their data session is blocked.

## Fraud management and prevention

Fraud is the responsibility of the service provider implementing the retail billing. In the case of unbundled roaming services this is the ARP. Therefore fraud information has to cascade from the DSP to the ARP.

The ARP shall be responsible for high usage control of ARP subscribers and implementing prompt actions to prevent fraudulent usage of roaming services.

For the purpose of fraud identification the ARP shall use all relevant information provided by DSP.

In case of suspected fraudulent usage the ARP shall restrict the usage of regulated roaming services via online interfaces or bar regulated roaming services for the subscriber with other means.

The fraud information can consist of

* Real time signalling over the online interfaces (IF1, 2 & 3).
* NRTRDE records (over the interface IF8)

Where online billing interfaces exist between the DSP and ARP, the information passed on these interfaces shall be used by the ARP for Fraud detection purposes.

Another mechanism for fraud management is based on the exchange of NRTRDE records from VPMN to HPMN to DSP to ARP. For details of these interfaces, refer to the TRG document Roaming Regulation III technical requirements [1].

The DSP is required to pass on NRTRDE records received from the VPMN to the ARP (or its agent), so that the ARP (or its agent) can monitor for fraudulent use of ARP services.

Note: Fraud managed by the ARP for ARP subscribers could have a huge impact on DSP wholesale business. Current fraud prevention procedure between HPMN Operators and VPMN Operators implies HPMN’s liability towards VPMN for traffic generated by ARP’s subscribers. HPMN operators remain involved in the information flows for fraud prevention procedures in order to take prompt actions in case of lack of re-actions from ARP in case of important frauds.

The DSP may leave its current Fraud Management Procedures in place and might suspend roaming services of ARP subscribers if they trigger DSP’s fraud prevention criteria.

*Process Description*

A subscriber of DSP currently has a subscription for roaming from an Alternative Roaming Partner and is using a high amount of the regulated roaming services that are managed by the ARP.

*Pre-conditions and Trigger*

* Bill payer associated with the subscriber has a contract with DSP;
* Bill payer associated with the subscriber has a subscription for roaming services from Alternative Roaming Provider.
* Subscriber is generating a high amount of billable events.
* Subscriber violates the fraud detection criteria of the ARP
* Or alternatively, subscriber violates the fraud detection criteria of the DSP

*Result of Process*

* Subscriber’ regulated roaming services as managed by the ARP are suspended
* Subscriber’s other services as managed by the DSP may also be suspended

*Assumptions*

The NRTRDE records for the services that are managed by the ARP are passed on by the DSP from VPMN to the ARP (or its agent), so that the ARP (or its agent) can monitor for fraudulent use of ARP services.

This exchange of NRTRDE records is irrespective of other potential ways to prevent fraud and high usage risks.

*Non-functional requirements*

The time-period between the creation of billable events at the VPMN and the reception of the correct NRTRDE records by the ARP shall not exceed 8 hours.

The timescale for the VPMN to make the NRTRDE records available to the HPMN is 4 hours from call/partial end time. As at least some of the information will be sourced from the incoming NRTRDE files, the HPMN will need additional time to make the records available to the ARP (potentially via a MVNO).

The DSP must make correct NRTRDE records available to the ARP within 8 hours after the creation of the billable event. The additional 4 hours is needed to cater for exceptional cases of operational problems, validation, re-rating, transfer via a MVNO, etc. The actual time can also be shorter than 8 hours as agreed between the DSP and ARP.

The timescale for the DSP to respond on suspension requests and deactivation requests for fraud reasons needs to be as short as possible to minimize the financial risks for both parties. Specific timelines and liabilities will be agreed upon in the commercial agreement between DSP and ARP.

*Liability*

In the case that real-time signalling (IF1, 2 and 3) is used, the ARP is fully enabled to manage retail charging and control fraud cases, apart from those resulting fom usage of 3rd party SMS-C. The ARP is fully liable for any proven fraud cases that can be controlled with real-time signalling.

In the case there is no on-line (real-time) retail charging interface applicable to the ARP, the DSP must forward NRTRDE records for regulated roaming services to the ARP, or is otherwise liable for any related proven roaming fraud. The liability principles that apply to the VPMN and HPMN over the VPMN/HPMN interface as defined in GSMA Permanent Reference Document (PRD) BA.20 “Fraud Prevention Procedures” [8] apply also to the DSP and ARP over the DSP/ARP interface. The two interfaces are independent of one another.

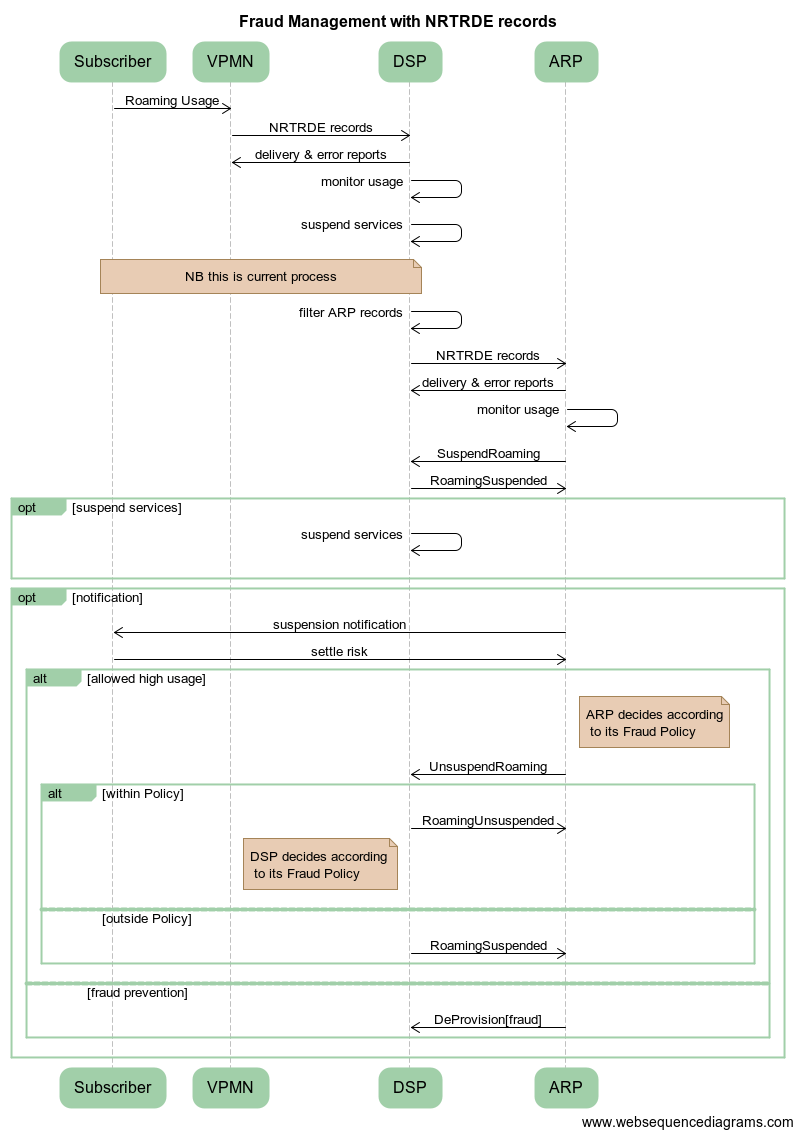
The ARP is liable for the costs associated with a fraudulent subscriber until the subscriber’s service has been suspended or deprovisioned.

Refer to the reference documentation GSMA Permanent Reference Document (PRD) BA.20 “Fraud Prevention Procedures” [8] and all related documentation for the full specification of this procedure, such as timelines, liability, and file formats of this records exchange. If the recipient fails to follow this procedure, it may become liable for fraud associated with those records.

### Process flow with NRTRDE

This process flow describes the use of NRTRDE to prevent and manage fraud cases.

The following diagram shows the core communication sequence of the different parties involved:



*Step 0 VPMN NRTRDE records*

Subscriber uses roaming services, VPMN sends NRTRDE records to the DSP monitors high usage and fraudulent behaviour.

The VPMN must make NRTRDE data timely available to the DSP in line with current GSMA rules and procedures, or is otherwise liable for any related proven roaming fraud.

Note: this is the current process.

Note2: only in the case of a specific misalignment of fraud profiles (i.e. DSP has more restrictive threshold then the ARP would use for triggering fraud management) and without online interfaces the standard DSP fraud policy and threshold might interfere with the effective provision of regulated roaming service. In this specific condition the alignment of Fraud Policies must be negotiated upfront between ARP and DSP

*Step 1 DSP passes on the NRTRDE records to the ARP*

The DSP passes on the NRTRDE records pertaining to the regulated roaming services that are managed by the ARP onto the ARP.

The DSP must make the NRTRDE timely available to the ARP in line with the same GSMA rules and procedures with slight modifications (such as timing and inclusion of VPMN), or is otherwise liable for any related proven roaming fraud.

*Step 2 ARP returns NRTRDE reports to the DSP*

The ARP returns NRTRDE error reports and file delivery reports to the DSP to ensure overall integrity of the NRTRDE process. If the ARP fails to do this, then it remains liable for fraud losses even if the DSP fails to meet its NRTRDE obligations (e.g. DSP delivers NRTRDE files after 8 hours, or not at all).

*Step 3 ARP monitors the usage*

The ARP monitors the usage of its subscriber according to its Fraud Prevention Policy

*Step 4 ARP Suspends the roaming service*

If potentially fraudulent behaviour is detected, the ARP sends a “SuspendRoaming” trigger to the DSP

*Step 5 Subscriber Suspension*

The DSP suspends the regulated roaming services of the subscriber and sends a message to ARP upon completion

*Step 6 Suspend other services*

Optionally any other services that the DSP sees fit according to its Fraud Management Policy might be suspended as well

Note on DSP Fraud Management Process: Irrespective of the ARP monitoring, the DSP has its normal Fraud Management procedures and may suspend the subscriber when the usage triggers the fraud prevention criteria. This is the same Fraud Management Process as in the currently used by the DSP. The presence or working of DSP’s fraud processes change nothing on the liability of the ARP for fraudulent behaviour of the ARP subscribers.

*Step 7 Subscriber Notification*

The ARP may notify the subscriber that it has suspended (or is going to suspend) the regulated roaming service.

*Step 8 Risk Settlement*

The subscriber contacts the ARP to request re-activation of the regulated roaming services. This may involve additional payments or guarantees to the ARP to settle the high usage risks.

*Step 9 ARP Allows High Usage*

If the ARP is convinced that the high usage risks are sufficiently mitigated, it sends a “UnsuspendRoaming” trigger to the DSP.

*Step 10 Subscriber UnSuspended*

Assuming that the DSP is satisfied, within its own fraud policy, to provide roaming services to the subscriber again, it unsuspends the regulated roaming services of the subscriber and sends a message to ARP upon completion. If DSP is not satisfied to unsuspend, DSP will notify the ARP with RoamingSuspended message

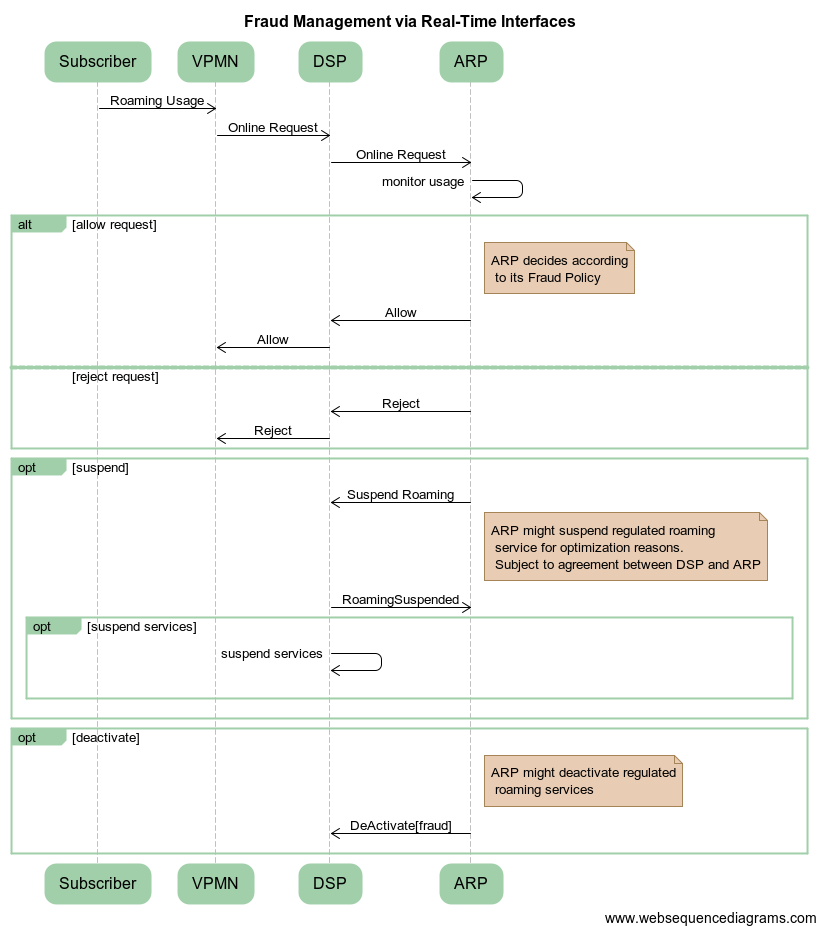
*Step 11 DeProvision Subscriber*

If the ARP is not satisfied with the outcome it may decide to deactivate the regulated roaming service altogether for reasons of fraud suspicion. The ARP will use the deactivate process with reason code “fraud management” as described in section 3.9.

### Process Flow with Online Interface

This process flow describes the use of real-time interfaces to prevent and manage fraud cases.

The following diagram shows the core communication sequence of the different parties involved:



Step 1 ARP manages its fraud risk by monitoring the usage of it subscriber via the online interface

Step 2 When fraud suspected, ARP rejects the roaming services real-time requests

Step 3 (Optional) For signaling traffic optimization the ARP may request suspension of the roaming. If the DSP has this capability available this option can be agreed upon upfront between ARP and DSP.

Step 3a (Optional) DSP may suspend any other services as per DSP’s Fraud Mngt Policy

Step 4 (Optional) Alternatively, the ARP can deactivates the subscriber with the deactivate process with reason code “fraud management”

Note: usage of 3rd party SMSC cannot be detected through online interfaces in this way. If ARP needs to mitigate their fraud risks, they need to take complementary measures. The NRTRDE mechanism as described in the preceding section (section 3.7.1) provides a procedure to detect and act on this abuse case. The DSP must pass on the NRTRDE records to the ARP, unless the fraud risk of 3rd party SMSC is covered differently in the DSP-ARP commercial agreement.

## Service deactivation initiated by the subscriber

*Process Description*

A subscriber of DSP currently has a subscription for regulated roaming services provided by an ARP. Due to some reason the subscriber wants to fall-back onto the DSP’s roaming-service offer, which may be included in his base offer.

De-provisioning shall be finished after at most one working day.

*Pre-conditions and Trigger*

Subscriber has a contract with DSP;

Subscriber has a subscription for roaming services from ARP;

Subscriber wants to have a subscription for roaming services from DSP;

*Result of Process*

Subscriber has a roaming services subscription from the DSP;

*Assumptions*

*Non-functional requirements*

Please see non-functional requirements of description for ‘swap’.

### Process

*The following diagram shows the core communication sequence of the different parties involved:*



*Step 1 “DesubscriptionRequest”*

The subscriber asks the ARP for de-subscription.

*Step 2 “DeprovisioningRequest”*

After the ARP has accepted the subscriber’s wish for de-subscription, he sends a DeprovisioningRequest to the DSP. The DeProvisioningRequest shall include the MSISDN to be unbundled, if it is known by the ARP. If MSISDN is not known, the DeProvisioningRequest shall include the IMSI to be unbundled.

*Step 3 “CheckSubscription”*

The DSP checks whether the ARP is the current active ARP for the subscriber identified in the DeProvisioningRequest. This step does not imply the use of an explicit authorisation mechanism, but the DSP shall check that the MSISDN and/or IMSI in the DeProvisioningRequest are related to a subscriber of the DSP. If this is found not to be the case, the DSP will return DeprovisioningAcknowledgment with result code ‘NOK-NotAuthorised’. The DSP may include the optional information ‘Not subscriber of this DSP’ within the message.

If the CheckSubscription step is passed, the DSP moves on to Step 4.

*Step 4 “CheckEligibility”*

The DSP checks whether eligibility for de-provisioning is given for MSISDN and/or IMSI provided within the DeProvisioningRequest. If the subscriber is found to be ineligible for the deactivation of the ARP provided roaming service, the DSP returns DeProvisioningAcknowledgment with return code ‘NOK-NotEligible’ to the ARP, with the option to include the reason of ineligibility.

Reasons why ‘NOK-NotEligible’ may be sent are;-

* There is another provisioning or de-provisioning process currently on-going for this MSISDN or IMSI.

Each of these reasons may be included in the DeProvisioningAcknowledgement ‘NOK-NotEligible’ message as optional information.

If a DeProvisioningRequest is received from an ARP that duplicates a request that has already been received, the DSP may suppress the sending of a ‘NOK-NotEligible’ response as this duplicated request may be indicative of the ARP internal processes re-issuing a request.

*Step 5 “DeprovisioningAcknowledgement”*

If the request is found to be Authorised and Eligible, the DSP shall send DeProvisioningAcknowledgement with return code ‘OK’. The time at which the DSP received the DepovisioningRequest shall be included in the DeprovisioningAcknowledgment ‘OK’ message.

*Step 6 “FreezeDeprovisioningStartTime”*

DSP captures or ‘freezes’ the point in time at which deprovisioning of the DSP systems starts. This will be used by the DSP in Step 9.

*Step 7 “Deprovision”*

The DSP initiates re-provisioning of its sysems to take back roaming services from the ARP for the MSISDN and/or IMSI provided within the DeprovisioningRequest..

It is assumed that the provisioning of DSP systems may not be an atomic one and that the switch may happen incrementally, e.g. per service. This is due to the distributed nature of the various involved systems. As a consequence there is no single point in time at which the switch of roaming service from the ARP to the DSP will take place. Instead there will be a period of time during which the switch of each service will take place individually. This is the period between the FreezeProvisioningStartTime (Step 6) and the FreezeProvisioningEndTime (Step 8). The timestamps at the start and end of the provisioning period shall be provided to the ARP.

At the point when provisioning of DSP systems takes place, if the subscriber is currently roaming, any calls and sessions that are already initiated will be charged for by the ARP until they are terminated. The termination of such calls and sessions may be forced by the DSP.

*Step 8 “FreezeDeprovisioningEndTime”*

The DSP captures or ‘freezes’ the point in time at which provisioning of the DSP systems is completed. This will be used by the DSP in Step 9.

*Step 9 “DeprovisioningCompletion”*

The DSP sends out a notification to the ARP, to inform them that they are no longer the provisioned roaming provider for the MSISDN and/or IMSI provided with the DeprovisioningRequest. The message contains the start and end times of the DSP provisioning system from steps 6 and 8.

*Step 10 “SubscriptionConfirmation”*

The DSP sends a message to the subscriber as a confirmation of the activation of the subscription for regulated roaming services provided by DSP. This message is to inform the subscriber that roaming services are now provided by the DSP and is sent to the subscriber regardless of whether the subscriber is currently roaming or not. However, the ability of the subscriber to use the roaming services provided by the DSP depends on the availability of roaming services from the DSP to that specific subscriber.

## Service deactivation by the ARP

This process is very similar to that described in section 3.8 (subscriber initiated service deactivation), especially the automated procedure. The following diagram describes the sequence of activities.



The procedure in the diagram above only varies from that in section 3.8 in that there is a non-standardised interaction between subscriber or the bill payer associated with the subscriber and ARP in advance of the procedure. This interaction is for the ARP to inform the subscriber or the bill payer associated with the subscriber of the action they are about to take. Once this interaction has taken place, the process follows the description in Steps 2 to 10 of section 3.8.

If ARP is deactivating service before end of contract for fraud management reasons, it should inform DSP of this, so that the fraudster will not be able to continue making fraudulent calls when it falls back to service provided by the DSP. This notification needs to be sent to the DSP in a timely fashion – ideally this would be sent as part of the message flow related to the service deactivation request so that the DSPs systems could automatically ensure that they do not reinstate roaming to the subscriber.

## ARP Roaming Service deactivation by the DSP

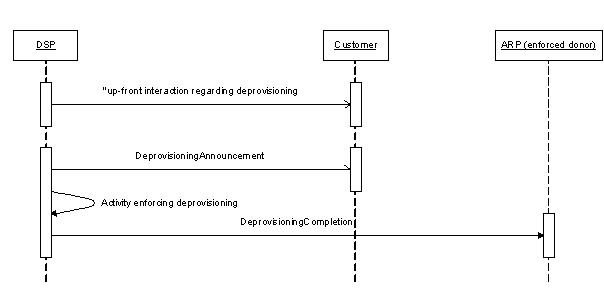
There will be situations, which will require the DSP to deprovision a subscription from an Alternative Roaming-Provider. These situations are

* The DSP subscription with the subscriber is terminated. This would occur as a result of;
* MNP process initiated by the subscriber or the bill payer associated with the subscriber (see 3.10.1)
* DSP terminating contract with the subscriber or the bill payer associated with the subscriber.
* subscriber or the bill payer associated with the subscriber terminating the contract with the DSP.
* The primary identifier of the subscriber is modified (see 3.10.2).
* Modifications to the subscription of the subscriber with the DSP that result in the subscriber becoming ineligible for Single IMSI ARP roaming service (e.g. specific VPN-related products)

Where these cases occur, the DSP will attempt to enter in an interaction with the subscriber or the bill payer associated with the subscriber in advance of the procedure. This interaction is for the DSP to inform the subscriber or the bill payer associated with the subscriber of the action they are about to take. As part of this interaction the DSP will inform the subscriber or the bill payer associated with the subscriber that one part of circumstances that are in existence is the need for deprovisioning of the subscriber from the registered ARP.

The sequence itself shall start with a notification from the DSP to the subscriber, saying that deprovisioning of the registered ARP is about to start. The activity, which requires deprovisioning, is an internal process of the DSP (e.g. implementation of the cancellation). It is left as an opaque step for the sake of this discussion.

The following sequence diagram illustrates the procedure.



The DeprovisioningAnnouncement is a step that implies that the subscriber is in some way informed that their Single IMSI ARP subscription is being deprovisioned. This is either an explicit message or may be a part of the wider communication relating to the actions of the DSP.

The process for the deprovisioning of the ARP within the DSP shall follow steps 6 to 9 of section 3.8 and occurs alongside ‘Activity enforcing deprovisioning’ within the diagram.

The DeprovisioningCompletion message shall include a parameter indicating the reason for the DSP initiating the deactivation of the subscriber. This parameter shall take one of the following values:-

* Termination of contract with the subscriber – bill payer initiated.
* Termination of contract with the subscriber – operator initiated.
* Change in subscriber primary identifier.
* Subscription modification incompatible with ARP contract.

### Subscriber ports out via MNP during Single IMSI contract

If a subscriber or the bill payer associated with the subscriber requests to move from one service provider to another using Mobile Number Portability, the basis of the contract between the subscriber and the ARP will fundamentally be affected. In swapping mobile operator, the extent of the roaming coverage that forms the basis of the subscriber’s roaming service is impacted.

As a result, from the perspective of the ARP, a subscriber that undergoes MNP should be seen to use the ‘Service deactivation by the DSP’. When the subscriber is activated in their new DSP following MNP, the subscriber will need to establish new subscriptions with ARPs if they wish to take Single IMSI based roaming.

### Subscriber changes MSISDN and/or IMSI during Single IMSI contract

Single IMSI subscriptions can be identified by using a primary identifier of either MSISDN or IMSI, or both MSISDN and IMSI, where MSISDN is considered to be the primary identifier of the two. If the primary identifier for the subscription with an ARP is changed, the agreement between subscriber and ARP shall be terminated, and a new agreement based on the new identifier(s) for the subscriber must be initiated before the subscriber can use roaming services provided by the ARP again.

Deactivation of the service for the subscriber should take place using the process described in section 3.10 (ARP Roaming Deactivation by the DSP). Once deactivated, the subscriber and ARP should use the process in section 3.2 (Service activation by the subscriber) to reinstate service.

## Suspension and Termination of contract between DSP and ARP

In section 3.1, it is identified that within the contract between a DSP and an ARP, conditions under which the service between the two parties can be suspended and terminated should be included. No specific process for the suspension or termination of the entire service between two parties is described here as this will be complex and likely to be subject to dispute.

If such a situation occurs, whereby a large number of ARP customers will have their ARP roaming contract disabled (either temporarily or permanently), their roaming service will fall back to being provided by the DSP. A message, similar to the DeProvisioningAnnouncement described in 3.10 should be sent to all customers affected to inform them of the deactivation of their ARP contract.

# LBO

## Pre-requisite requirements for the DSP and LBO Provider

Process Description

Identifying the subscribers who are eligible to use data offers provided by an LBO.

Subscribers are informed about ability to use ARP and LBO providers in EU.

Identifying the roaming partners who are eligible to provide LBO offers to subscribers include those with whom DSP has EDGE/GRPS/UMTS agreement and is located in EU.

*Pre-conditions and Triggers*

* Eligibility rules applied to all subscribers and VPMNs in EU
* LBO provider must fulfill certain condition in order to offer LBO services
* Need for inclusion of LBO service in Roaming Agreement between DSP and LBO Provider (HPMN and VPMN) – via notification procedure and IR.21 data exchange according to the Roaming Agreement between DSP and LBO Provider.

*Result of Process*

* Eligible VPMN LBO and eligible subscribers are permitted by DSP systems to allow providing and use of LBO services
* Eligible subscribers (existing and new ones) are informed about eligibility
* LBO provider is able and prepared to offer LBO services
* Note that the DSP should not need to interact with an LBO provider beyond standard automated interfaces, if such an interface is used by DSP. As a result, a DSP that meets pre-requisite requirements for its subscribers to use LBO services (if the subscriber is eligible) will be otherwise greatly unaffected by the use of the service by its subscribers.

### DSP pre-requisites



***Step 1 - Allowing eligible subscribers and restricting non-eligible***

*Input for Process Step*

* DSP subscriber base screening
* DSP is to ensure that the following subscriber eligibility criteria is adhered to:
  + In order to access the LBO offer, the user shall have data roaming capabilities. That is:
    - Roaming service option is not blocked due to bill payer request (High Level Tech document [1], section 3.3) or DSP service restriction
    - Data service option is not blocked due to bill payer request (High Level Tech document [1], section 3.3) or DSP service restriction
    - Any LBO service is conditional on the subscriber’s data service:DSP shall not allow LBO usage in any PLMN if the subscriber is not in receipt of packet switch data services and Internet access (i.e. not restricted to private APN) ( High Level Tech Document [1], section 3.4.1)
  + Bill Payer SIMs in a multi-user contract, such as business subscriber contract (only bill payer SIMs and those which are identified by the bill payer as eligible for LBO can use an LBO provider)

*Description of the Process Step*

The subscribers should be screened, identified as eligible or restricted to use LBO services in EU in the DSP system(s).

This process should be setup to do continuous eligibility check of the subscriber base and identifying automatically if the subscribers’ eligibility is subject to change.

*Output/Result of the Process Step*

Subscriber is or is not eligible for using an LBO in EU:

* Subscriber is eligible for using LBO in EU -> *provision DSP systems to allow the subscriber to use LBO service using EUInternet APN by setting VPAA flag to Yes.*
* Subscriber is NOT eligible for using LBO in EU -> *Do not provision the EUInternet APN.*

*Remarks*

When a subscriber is reactivated after suspension or roaming service unbarring takes place, given the compliance to the other eligibility rules, the subscriber needs to be automatically identified as eligible.

Physically only one LBO can be used at a time. However, multiple LBO contracts can be active at one time. Even in the same country, subscriber would be able to have multiple LBOs, manually selecting networks and using the EUInternet APN. Where LBO-IF2 is used between LBO provider and DSP, it should be noted that the DSP will only be aware of the most recent notified event across this interface. The customer may change LBO provider regularly, with the DSP being unaware of such changes other than when a new LBO contract is established or a first use of an LBO providers service occurs.

A subscriber who has an active Single IMSI agreement with an ARP, provisioned in the DSP, is free to also choose an LBO provider, having therefore an active Single IMSI ARP and LBO provider at the same time.

Each SIM (under a multi-user contract such as a business subscriber contract) can have a different LBO provider and offer. The bill payer of a business contract decides whether a subscription is eligible for LBO service or not.

Where the bill payer manages the use of APNs in DSP systems themselves (for example, some M2M use cases), the DSP shall allow the bill payer to configure the use of EUInternet APN for LBO service.

***Step 2 - Eligibility information to the subscriber***

*Input for Process Step*

* Subscribers eligible for LBO port-out

*Description of the Process Step*

Subscribers will be informed about their ability to use ARPs and LBO service in EU, based on the requirements in the regulation. Optionally, DSP could also inform subscribers about product/device specific conditions applying to subscribers when using LBO, such as:

* MMS service still provided by DSP
* Services not available when using LBO, such as Blackberry mail service; Blackberry Enterprise services; VPMN service, any IP services provided directly by the DSP.

*Output/Result of the Process Step*

Subscribers are informed by DSP about their ability to use ARPs and LBOs in EU.

*Reference*

See Impl reg, L 347/4, par 25 and Article 6

EU Reg, L172/25, article 4, point 4:

***Step 3 - VPMN LBO eligibility***

*Input for Process Step*

* Screening the list of existing roaming agreements for packet switched data services in EU.

*Description of the Process Step*

DSP will identify their roaming partners that are eligible to provide LBO service based on the following rules:

* All roaming partners in EU with whom DSP has launched GPRS, EGDE or UMTS data roaming (incl. MVNOs hosted by these roaming partners) and which support standard automated interface LBO-IF2, if such an interface is requested by DSP.
* DSP steering mechanism should enable subscriber to use LBO from any network providing LBO service. Note that where no CAMEL roaming arrangements exist between a DSP and an LBO service provider, the subscriber is still free to select LBO service. This will result in the subscriber having no voice or SMS service.

This process should to be set-up to do continuous eligibility check automatically (i.e. in case of newly signed agreements).

*Output/Result of the Process Step*

VPMN is identified as eligible or not eligible to provide LBO service in the systems of the DSP.

Subscribers are informed by DSP about the availability of ARPs and LBO providers that they can use.

### LBO pre-requisites

*Input for Process Step*

LBO provider must meet the following conditions to be capable and eligible to provide LBO service:

* must be located in EU.
* must have a roaming agreement for packet switched data services with a DSP whose subscribers it wants to target.
* must support the standard automated interface LBO-IF2 and use it if such an interface is requested by DSP.
* must support EUInternet APN at SGSN and VPAA Flag at SGSN (in MAP messages).
* must be able to provide subscribers with all LBO relevant information, including but not limited to
  + instructions on manual network selection,
  + instructions on how to configure devices in order to change APN to EUInternet APN to allow subscriber to receive service
  + instructions on how to configure devices in order to change APN back to original DSP APN settings at the end of contract with LBO),
  + LBO contract and offer conditions including pricing
  + Information on limitations to the subscribers’ services that may result from taking up LBO service, such as loss of Blackberry services, loss of DSP provided VPN connectivity, loss of Voice and SMS service if CAMEL roaming with the subscribers DSP is not supported.
* provide subscriber with data anti-bill shock measures.
* provide subscribers with contact information for customer service.

*Description of the Process Step*

* LBO provider fulfills the basic criteria to act as an LBO provider

*Output/Result of the Process Step*

VPMN is able to provide LBO services.

### M2M LBO services

It is recognized that the applicability of Roaming Regulation III to M2M use cases may be limited due to technical limitations. The processes described below reflect how service may be initiated and deactivated on a device where there is a suitable user interface to allow the subscriber to reconfigure the APN on the device directly. Where an LBO contract is being activated for an M2M subscription, the above process may need to also involve the bill payer for the service, as the change of APN may need to be actioned remotely. No special provision is made for this within the process descriptions in this chapter.

### Support of LBO-IF2

LBO-IF2 is an interface to allow notification to be sent from the LBO Provider to the DSP when a DSP customer;-

* Subscribes to take LBO-service from the LBO Provider.
* Uses an LBO service for the first time for a specific subscription.

The interface is Conditional for the LBO provider to support – shall be available, but used only if the interface is requested by DSP.

The interface is Optional for the DSP to support.

LBO providers shall notify DSP about the availability of the LBO-IF2 via notification procedure and IR.21 data exchange according to the Roaming Agreement between DSP and LBO Provider, identifying the LBO-V functional element.

DSP, which request the use of LBO-IF2, shall inform LBO providers via notification procedure and IR.21 data exchange according to the Roaming Agreement between DSP and LBO Provider, identifying the LBO-H functional element.

## LBO Service activation by the subscriber

Process Description

Subscriber is choosing to take data roaming service from an LBO provider.

*Pre-conditions and Trigger*

* Roaming Agreement for packet switched data services between LBO Provider and DSP, including LBO service.
* LBO provider is able to provide the LBO offer (all prerequisites are fulfilled)
* Subscriber is eligible to use the LBO offer
* LBO offer is made available to the roaming subscriber

*Result of Process*

* Subscriber is subscribed to an LBO offer

### Process



***Step 1 - Subscriber does location update in EU visited LBO network and receives offer from LBO***

*Input for Process Step*

* Subscriber is registered in VPMN (manual or automatic network selection).
* See process pre-conditions

*Description of the Process Step*

* Subscriber is making location update (LU) and receives LBO offer from the VPMN.

*Output/Result of the Process Step*

* LU in VPMN LBO completed and offer received by subscriber from VPMN LBO.

*Reference*

Impl reg, L347/3, par 15 to 18

***Step 2 - Subscriber subscribes to the LBO offer***

*Input for Process Step*

* Subscriber wants to take the LBO offer
* Eligibility restrictions set up in DSP system (and possibly in LBO system) will prevent LBO service for non-eligible subscribers.

*Description of the Process Step*

* After subscriber activated EUInternet APN and exchanged the necessary data with the LBO provider, he can start using the LBO offer (what information is exchanged and how is up to the LBO provider -> no effect on DSP/ARP).

*Output/Result of the Process Step*

* Subscriber activates service by LBO provider (EUInternet APN is set up to use LBO for data)
* If LBO-IF2 is supported between the LBO provider and the DSP, the Subscription Notification message is sent from the LBO-V function of the LBO Provider to the LBO-H function for the DSP. The LBO-H function shall acknowledge receipt of this message.
* The LBO is responsible for all data related roaming services toward subscribers, invoicing, etc.
  + If LBO-IF2 is supported between the LBO provider and the DSP, the Usage Notification message is sent from the LBO-V function of the LBO Provider to the LBO-H function for the DSP when the customer first uses the LBO service. The LBO-H function shall acknowledge receipt of this message.

*Remarks*

* LBO offers data service only locally (in EU country where LBO is located), unless it offers a permanent LBO offer (then subscriber can continue to use LBO offer in other selected networks covered by the offer as long as the APN settings are correct)
* How the contract is signed and what kind the contracts will be signed, depends on LBO.

*Reference*

Imp reg, L347/6, article 4, point 4:

The donor roaming provider shall collaborate with the recipient roaming provider in order to ensure that roaming subscribers who have concluded a contract with a recipient roaming provider for the provision of local data roaming services are able to use the services provided by this provider instantaneously from the moment a recipient roaming provider sends a request to a donor roaming provider.

## Customer Service query

Process Description

The subscriber requests information or registers a complaint about the roaming services to DSP, LBO Provider or ARP. DSP, LBO Provider or ARP clarify the request and provide the appropriate information to the subscriber. Subscriber will get the information from the operator who is responsible for billing of services the subscriber is inquiring about.

*Pre-conditions and Trigger*

* Subscriber is a DSP subscriber and using LBO. The subscriber may also have an ARP Single IMSI contract that is active.
* Subscriber requests information at any available DSP or LBO provider touch point, o via an ARP touch point if an ARP Single IMSI contract is active

*Result of Process*

* Requested information has been given to subscriber by the responsible party

### Subscriber inquiries handled by the DSP

*Input for Process Step*

Subscriber is/was/will be an LBO subscriber.

Subscriber requests information about services that DSP is responsible for.

Only DSP relevant information can be presented to the subscriber. DSP is probably unaware if subscriber is/was an LBO subscriber, unless subscriber identifies himself as such.

*Description of the Process Step*

* The subscriber contacts DSP (any touch point) and requests any one or more of the following pieces of information:
  + Availability of LBO service from a specific VPMN.
  + Eligibility status of the Registered End User.
  + Non-available services when using LBO.
  + Ability to adjust APN settings with subscriber's hardware
  + applicability of DSP data caps and ant-bill shock measures when using an LBO provider.
    - Data cut-off service is provided by DSP only for the services still provided by DSP
  + Pricing notification using commonly available media - standard procedure is followed.
  + Data packages provided by DSP – validity and charging (does not include LBO traffic)
  + Any usage and roaming charges on the invoice issued by DSP (LBO traffic will not be visible)
  + If the subscriber was charged for data roaming when they were using LBO (case of double invoicing) and complains about it to DSP, the incident will be analyzed by DSP.
  + Subscriber wants to use data in roaming with DSP in current VPMN (switch back to DSP from an LBO) -> instructions given on APN settings.
  + Subscriber wants to use data in roaming with DSP in new VPMN (new country or new VPMN in current country) -> instructions given on APN settings.
  + Subscriber wants to use data national with HPMN -> instructions given on APN settings.

*Output/Result of the Process Step*

* Subscriber request is clarified by the DSP.

*Reference*

Impl reg, L 347/4, par 25 and Article 6

Impl reg, L 347/4, par 27:

Roaming providers, including alternative roaming providers offering local data roaming services, should implement transparency and safeguard mechanisms for the data services provided by them, in accordance with Article 15 of Regulation (EU) No 531/2012. In order to ensure transparency, roaming providers should also provide to their roaming subscribers information on services that may not be available when using local data roaming services, such as proprietary services supported by the domestic network.

EU Reg 531/2012, article 4/5:

…Where the switch (to ARP) does not concern all regulated roaming services, those services which have not been switched shall continue to be provided at the same price and to the fullest extent possible, with the same technical characteristics, incl. quality parameters.

### Subscriber inquiries handled by the ARP

*Input for Process Step*

Subscriber is/was/will be an LBO subscriber.

Subscriber is/was/will be a Single IMSI ARP subscriber.

Subscriber requests information about services that ARP is responsible for.

Only ARP relevant information can be presented to the subscriber. ARP is probably unaware if subscriber is/was an LBO subscriber, unless subscriber identifies himself as such.

*Description of the Process Step*

* The subscriber contacts ARP (any touch point) and requests any one or more of the following pieces of information:
  + Non-available services when using LBO
  + Ability to adjust APN settings with subscriber's hardware
    - applicability of DSP data caps and anti-bill shock measures when using an LBO provider Data cut-off service is provided by ARP only for the services provided by ARP
  + Pricing SMS – still provided by ARP in all of EU, including in the LBO network subscriber has chosen
  + Offers provided by ARP – validity and charging (does not include LBO traffic)
  + Any usage and roaming charges on the invoice issued by ARP (LBO traffic will not be visible)
  + If the subscriber was charged for data roaming when using LBO (case of double invoicing) and complains about it to ARP, the incident will be analyzed by ARP and subscriber’s DSP.
  + Subscriber wants to use data in roaming with ARP in current VPMN (switch back to ARP from an LBO) -> instructions given on APN settings
  + Subscriber wants to use data in roaming with ARP in new VPMN in EU (new country or new VPMN in current country) -> instructions given on APN settings

*Output/Result of the Process Step*

* Subscriber request is clarified by the ARP.

### Subscriber inquiries handled by the LBO Provider

*Input for Process Step*

Subscriber is/was/will be an LBO subscriber

Subscriber requests information about services that LBO is responsible for

*Description of the Process Step*

* The subscriber contacts LBO Provider (any touch point) and requests any one or more of the following pieces of information:

- LBO subscription process.

- LBO specific offers .

- LBO offer and contract activation and deactivation processes.

- Setup of the data limit with LBO.

- APN Setup (LBO must provide information on set up of EUInternet APN and reset to the DSP’s APN settings after LBO offer has expired).

- VPMN selection.

- Status of the LBO contract/service.

- Non-available services when subscriber is using LBO service.

- LBO related usage and charging, including information on pricing.

- Configuration of anti-bill shock measure provided by the LBO provider including

- setting data caps

- opt-in/out of alerts at thresholds.

- Issues with using the LBO network and/or offer, which could be a result of:

- suspension of LBO service by LBO.

- deactivation of LBO services by LBO.

- lack of coverage by LBO.

- contract expiry with LBO.

- inability to manually select LBO network.

*Output/Result of the Process Step*

* Subscriber request is clarified by the LBO

*Remarks*

* LBO offers data service only locally (in EU country where LBO is located) or in multiple networks in EU via permanent LBO offer.
* All implications of the contract and offer types are a full responsibility of the LBO to properly inform the subscriber about.

*Reference*

Impl reg, L 347/4, par 25 and Article 6

## Subscriber is issued a bill

A subscriber that has opted to take LBO data roaming service from an LBO Provider, and who has correctly reconfigured their device and successfully attached to the LBO provider’s network, shall be billed for this service according to the terms of the contract they hold with the LBO Provider. For any data services that are charged for by the LBO Provider, the subscriber shall not be charged for Data Roaming services by the DSP or any Single IMSI ARP. If the subscriber’s LBO Provider contract is cancelled or suspended for any reason (see sections 4.10 to 4.14) and the subscriber attempts to use data roaming services, the subscriber may not receive data roaming service until such time as they have reconfigured their device for DSP-based data roaming, or the subscriber takes an alternate LBO service. It is option for the DSP to either block data session establishment for subscribers if the EU Internet APN is being requested for use at the H-GGSN, or to allow the session to be established and charge the subscriber on the basis of their home routed data roaming tariff. If the second option is used, and the subscriber has a Single IMSI ARP contract active, then the ARP will charge the subscriber for roaming data usage.

Subscribers will continue to be charged for all other Roaming services subject to the contracts that they have with Roaming Providers (DSP and/or ARP). Chapter 3 describes the relationships between subscribers, ARPs and DSPs.

The process by which a bill is generated by and conveyed from an LBO provider to a subscriber is specific to the contract between the LBO provider and subscriber, and so is not defined.

## Subscriber changes billing basis from LBO provider

The contract and billing basis for LBO service between an LBO Provider and a subscriber is entirely independent of the DSP. The charging basis between the subscriber and the LBO Provider therefore can be changed subject to the terms of conditions of service without the involvement of any other party. Therefore, no process for a change in billing basis is required.

## Bill-shock measures

All service providers that offer Roaming service in Europe are obliged to provide information to the subscriber about their spending (unless the subscriber opts out of receiving such messages). This regulation was first put in place in REGULATION (EC) No 717/2007 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL [4] of 27 June 2007, and has since been regularly updated. At the time of writing, the most recent version of this regulation is REGULATION (EU) No 531/2012 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 13 June 2012 [2].

If a subscriber opts to receive LBO data roaming service within the EEA from an LBO Provider, the obligation to provide anti-bill shock measures for data services passes to the LBO Provider, along with the service itself. The LBO Provider is the only entity that will be able to monitor data usage of the subscriber during LBO service. Hence, no explicit process for the provision of anti-bill shock measures can be described.

Bill shock thresholds are **per roaming provider**. As such, a subscriber will have one cap per LBO Provider and so could use multiple LBO Providers and have multiple caps within one time period, in addition to the cap associated with the DSP and any contracts the subscriber has with Single IMSI ARPs.

A subscriber may opt in or out of each element of the anti-bill shock service separately with each provider (DSP/ARP/LBO). Subscribers shall not receive any notifications or be affected in any other way regarding the services they chose to opt-out from. Subscribers that have opted out of bill shock services from one service provider must still receive these services from the service providers in which they have not opted-out.

Where a subscriber takes a retail offer from the LBO Provider that does not result in incremental charging based on usage, no bill shock will result. Therefore for such offers, the LBO provider does not need to offer anti-bill shock measures.

Process Description

The process deals with two aspects of the anti-bill shock measures, which must be supported by LBO providers:

1. The LBO provider must inform the subscriber of roaming pricing information for data services. This pricing information must be sent by means of widely available media, without undue delay and free of charge. It must be sent in the following cases:
   1. Upon LBO activation.
   2. After the subscriber sends a specific request for pricing information.
2. The roaming provider must control the subscriber’s roaming data usage in the following cases:
3. In case the subscriber has already spent the maximum amount allowed (cap limit) under the terms of their bill shock conditions, the LBO must deny data access.
4. In case the subscriber with an active data session reaches a service threshold, the LBO must send the subscriber a notification.
5. In case the subscriber with an active data session reaches their maximum spend (cap limit), the LBO must end the data session.

All anti bill shock measures shall be applied both to postpaid and prepaid subscribers.

Process Input

* Subscriber is activated for LBO service.
* An upper limit to the billed amount has been selected (either explicitly by the subscriber to the LBO or by adoption of the LBO default limit).
* Threshold points for alerts have been selected (either explicitly by the subscriber to the LBO or by adoption of the LBO default threshold).
* Medium used for notification of thresholds and limits being reached has been selected (either explicitly by the subscriber to the LBO or by adoption of the LBO default mechanism).
* Subscriber has not opted-out of the anti bill shock services by the LBO.

Process Flows

1. Process Flow – Pricing Info Notification Upon LBO Activation
2. LBO activation has been completed.
3. The LBO provider must notify the subscriber of pricing information for roaming charges (including VAT) that apply in the LBO network for using of data services. This pricing information must be sent by means of widely available media, without undue delay and free of charge.

Process Result

The subscriber is notified of pricing information for using data services in the LBO network.

1. Process Flow – Pricing Info Notification Upon Subscriber Request
2. Subscriber sends a request to the LBO for pricing information.
3. The LBO provider must inform the subscriber of pricing information for regulated roaming charges (including VAT) that apply in the LBO network for using of data services. This pricing information must be provided without undue delay and free of charge.



Process Result

The subscriber is provided with pricing information for data services in the LBO network upon request.

1. Process Flow – Data Usage Control – Subscriber Over Cap Limit

1. Subscriber initiates a data session, which is received by the LBO.
2. If the subscriber has already spent the maximum amount allowed (cap limit) under the terms of their bill shock conditions, the LBO must deny access. If the subscriber has not reached the maximum amount allowed, the session is established (not shown in the diagram).



Process Result

If the subscriber is over their cap limit, data access is denied. Otherwise, data access is allowed.

1. Process Flow – Data Usage Control – Subscriber Reaches Threshold
2. Subscriber is using an active data session with LBO.
3. If the subscriber reaches a service threshold, the LBO must send the subscriber a notification explaining that they have reached a threshold for data usage.



Process Result

The subscriber receives a notification after reaching a data usage threshold.

1. Process Flow – Data Usage Control – Subscriber Reaches Cap Limit
2. Subscriber is using an active data session with an LBO provider.
3. If the subscriber reaches their maximum spend (cap limit), the LBO provider must send the subscriber a notification explaining that they have reached the limit and the LBO provider must end the data session.



Process Result

The subscriber receives a notification upon reaching their maximum spend (cap limit) and their data session is blocked.

## Subscriber requests change in terms of contract

Changes to the terms and conditions of the contract between LBO Provider and the subscriber can be made subject to the processes allowed by the LBO Provider. No process is defined for this aspect of LBO service.

## Service deactivation at end of contract

Process assumption:

It is assumed that LBO service deactivation will happen at the end of LBO contract between subscriber and respective LBO provider. The service deactivation will be triggered by LBO provider which will disable LBO service for the subscriber no matter where the subscriber is or what services is using.

Process description:

Use cases:

1. At the point of contract expiration, subscriber is in roaming environment and is actively using LBO service.

Once LBO service is disabled by LBO provider, subscriber may not be able to use data service. Subscriber will be able to either establish a new contract relation with an LBO provider to start using data services (same process for activation of LBO) or will restore roaming settings (roaming APN) to start using data service under standard roaming framework.

It is option for the DSP to either block data session establishment for subscribers if the EU Internet APN is being requested for use at the H-GGSN, or to allow the session to be established and charge the subscriber on the basis of their home routed data roaming tariff. If the second option is used, and the subscriber has a Single IMSI ARP contract active, then the ARP will charge the subscriber for roaming data usage.

1. At the point of contract expiration with one LBO provider, subscriber is using LBO service with a different LBO provider within the same or different EU country.

If subscriber is no longer actively using LBO service from particular LBO provider, then this service deactivation will not have any impact on data service which is being used by subscriber at given point in time.

1. At the point of contract expiration subscriber is not actively using LBO service and is using standard roaming data service (with the HPMN APN set) in the same or different EU country

When subscriber is in roaming environment using standard roaming data service (provided by HPMN) then LBO service deactivation will not have any impact on subscriber.

1. At the point of contract expiration subscriber is no longer in roaming and is back in his HPMN, using the HPMN APN.

In case subscriber is back in his HPMN then LBO service deactivation will not have any impact on subscriber.

## Service deactivation by the subscriber before end of contract

Process assumption:

Subscriber is in roaming environment and is actively using LBO service provided by VPMN.

Process description:

Subscriber deactivates the LBO service only by:

* starting to use standard roaming data service by restoring default roaming setting or
* switching to another roaming network where he uses either standard roaming data service or new LBO with new VPMN
* returns to HPMN

Note: If subscriber deactivates the LBO service by switching to standard roaming data or using another LBO or returns to HPMN, they can at any time return to VPMN and start using LBO again if, in the interim, the LBO service wasn’t deactivated by the LBO provider.

The process by which the subscriber can terminate the contract between itself and the LBO Provider is subject to the terms and conditions of the LBO contract and is hence outside of the scope of this document.

## Service deactivation by the LBO provider before end of contract

LBO provider may deactivate its service due to various reasons (FUP used up, spent cap used, suspected fraud or other breach of service conditions etc.). At any case the same process applies as described in 4.8. The LBO Provider should notify the subscriber that their LBO service is being deactivated prior to deactivation to allow the subscriber time to reconfigure their device or contract with an alternative LBO Provider.

The process by which the LBO Provider can terminate the contract between itself and the subscriber is subject to the terms and conditions of the LBO contract and is hence outside of the scope of this document.

## Service deactivation by the DSP before end of contract

DSP can deactivate LBO service because the subscriber is no longer eligible for LBO service due to:

* DSP terminates their contract with the subscriber or bill payer associated with the subscriber.
* Roaming service deactivation
* Roaming barring due to fraud reasons
* Roaming barring due to domestic service restriction
* subscriber or bill payer associated with the subscriber requests deactivation of LBO service with DSP. In this case, subscriber will return to DSP and starts using standard roaming data service.

LBO deactivation by DSP has no implication on retail relation between subscriber and LBO provider. Any communication from DSP towards subscriber will be based on customer care principles of the DSP. Any communication between DSP and LBO provider will be based on mutual agreement.

## Subscriber ports out via MNP during LBO contract

A subscriber that requests MNP whilst also holding an LBO contract may or may not need to notify the LBO provider. This will depend on:-

* The identifier that the LBO Provider uses to identify the subscriber.
  + If the LBO provider uses IMSI, the subscriber would need to notify the LBO provider of the change.
  + If the LBO provider uses any other identifier, the subscriber’s service will still work.
* The eligibility criteria for the new subscription in the new DSP
  + If the eligibility criteria of the subscriber’s new subscription in the new DSP prevent LBO service from being used, the subscriber will no longer be able to use LBO service. If the subscriber is roaming and using LBO service at the point when MNP takes effect, the subscriber will need to reconfigure their device with the new DSP’s normal data APN, to receive any data roaming service.

The method by which the subscriber informs their LBO Provider of the change in their subscription information is subject to the terms and conditions of the contract between the subscriber and the LBO Provider.

## Subscriber changes UICC card during LBO contract

A subscriber that changes UICC (but not their MSISDN) whilst also holding an LBO contract may or may not need to notify the LBO provider. This will depend on:-

* The identifier that the LBO Provider uses to identify the subscriber.
  + If the LBO provider uses IMSI, the subscriber would need to notify the LBO provider of the change.
  + If the LBO provider uses any other identifier, the subscriber’s service will still work.

The method by which the subscriber informs their LBO Provider of the change in their subscription information is subject to the terms and conditions of the contract between the subscriber and the LBO Provider.

## Subscriber changes MSISDN during LBO contract

A subscriber that changes MSISDN whilst also holding an LBO contract may or may not need to notify the LBO provider. This will depend on:-

* The identifier that the LBO Provider uses to identify the subscriber.
  + If the LBO Provider only uses MSISDN, would need to notify the LBO provider of the change.
  + If the LBO provider uses any other identifier, the subscriber’s service will still work.

The method by which the subscriber informs their LBO Provider of the change in their subscription information is subject to the terms and conditions of the contract between the subscriber and the LBO Provider.

## Subscriber changes hardware during contract with an LBO Provider

If a subscriber changes hardware whilst actively using an LBO service the subscriber will need to reconfigure the APN on the new device to the EU Internet APN before the LBO service will be used. If the new device is configured with the APN for the DSP ad the subscriber does not reconfigure the APN, the subscriber will revert to DSP (or ARP if an active Single IMSI ARP contract exists) charging for data roaming service.

# ANNEX a – Authorisation options (for information)

For Single IMSI ARP subscription activation, it is proposed that an authorisation credentials is used between the subscriber (or bill payer associated with the subscriber), ARP and DSP to ensure that the request to swap roaming provider is genuine and is at the request of the subscriber or bill payer associated with the subscriber. Authorisation credentials are not defined in this document. It is suggested that the authorization credentials to be used is determined on a per country basis.

Within this Annex, information is provided on authorization credentials that exist today for MNP. It should be noted that in some cases, the authorisation credentials used for MNP are ‘manual’ in nature. These manual credentials may not be appropriate for use within the Single IMSI processes, since the time constraint for activation of service is one Working Day. It is therefore recommended that this is taken into account when choosing authorization credentials that are appropriate to Single IMSI processes.

Described below are examples of authorization credentials, and how they might apply to Single IMSI processes.

*Code-based authorisation*

For a *code* based authorisation the DSP could provide a code to the subscriber in advance of this sequence if the subscriber asks for it. The subscriber would have to ask the DSP for this code. He or she would get the code and provide it to the Recipient Roaming Provider, who in turn would provide it as part of his PrePovisioningRequest to the DSP. The latter one would verify that this code has been sent to the subscriber. If this would be verified authorisation would be granted.

The parameter for the PreProvisioningRequest would be the code itself. Additional interaction outside this sequence would be the request for a code from subscriber to DSP.

Please note that such a procedure would turn ‘swap’ from a one-step procedure into a two-step one.

A code based authorisation could be the only way in case e.g. anonymous prepaid business is common for a specific country as in this case the opportunities a very limited.

*Personal attributes*

For an authorisation based on *personal attributes* the Recipient Roaming Provider would ask the subscriber for some specific personal attributes, e.g. name, surname, date of birth, etc.. These attributes would become parameters of the PreProvisioningRequest and given to the DSP. The selection of attributes has to support verification by the latter one, i.e. those attributes have to be available to the DSP based on his contract with the subscriber.

There wouldn’t be additional interaction except for the interaction between Recipient Roaming Provider and subscriber. The additional parameters of the PreProvisioningRequest would be those, which are chosen as being sufficiently robust and reliable for this kind of authorisation.

An alternative approach could be based on *SIM-card attributes*, e.g. the ICCID. A combination of personal and SIM-card attributes is another idea.

*Direct communication between DSP and subscriber*

Another method could be based on *ad-hoc communication* of the DSP with the subscriber: The DSP could query authorisation based on the exchange of text-messages with the subscriber, i.e. the DSP could send a text-message to the subscriber and ask him or her to confirm that he or she wants the Recipient Roaming Provider to be his or her roaming provider from now on.

Such a procedure would require the availability of the subscriber’s feedback at provisioning time. If the subscriber is not available the process may have to be interrupted (due to a timeout constraint being met).

Moreover it is obvious that the delay due to ad-hoc communication would have to be excluded from the timing-constraint.

## MNP authorisation credentials per country and subscription

Provided in the table accompanying this document is information collected relating to the Authorisation mechanisms used for MNP in different EU counties. This is not exhaustive, and is provided to offer further insight into the options available for Single IMSI authorisation credentials.