

Initial Draft 3GPP TR 23.955 V0.01.0

Technical Report

3rd Generation Partnership Project; Technical Specification Group Services and Systems Aspects Virtual Home Environment (VHE) Concepts (Release 5 | 4)



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Foreword

This Technical Report has been produced by the 3rd Generation Partnership Project (3GPP).

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of the present document, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

Version x.y.z

where:

- x the first digit:
 - 1 presented to TSG for information;
 - 2 presented to TSG for approval;
 - 3 or greater indicates TSG approved document under change control.
- y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.
- z the third digit is incremented when editorial only changes have been incorporated in the document.

1 Scope

The present document is to capture VHE concepts. It is not limited to any specific type of services. It includes OSA, CAMEL, SIP, MExE USAT etc..

Contributions for VHE/OSA concerning the document TS 23.127 have to be provided in the form of Change Requests. Since a lot of changes are expected due to the shift of the focus of the document from OSA to VHE this is an inflexible procedure.

Consequently this document was created to collect contributions, ideas and proposals for TS 23.127. They have to be written against the current structure of the document. It is planned to dissolve the TR and to create Change Requests against the TS 23.127 or other applicable documents from it at the end.

The body of this document is planned to be incorporated into appropriate TS documents.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies.

This specification may contain references to pre-Release-4 GSM specifications. These references shall be taken to refer to the Release 5 | 4 version where that version exists. Conversion from the pre-Release-4 number to the Release 4 (onwards) number is given in subclause 6.1 of 3GPP TR 41.001.

[<seq>] <doctype> <#>[((up to and including) {yyyy[-mm]}V<a[.b[.c]]>[onwards])]: "<Title>".

[1] 3GPP TR 41.001: "GSM Release specifications".

[2] 3GPP TR 21 912 (V3.1.0): "Example 2, using fixed text".

3 Definitions, symbols and abbreviations

Delete from the above heading those words which are not applicable.

Subclause numbering depends on applicability and should be renumbered accordingly.

3.1 Definitions

For the purposes of the present document, the [following] terms and definitions [given in ... and the following] apply.

Definition format

<defined term>: <definition>.

example: text used to clarify abstract rules by applying them literally.

3.2 Symbols

For the purposes of the present document, the following symbols apply:

Symbol format

<symbol> <Explanation>

3.3 Abbreviations

For the purposes of the present document, the following abbreviations apply:

Abbreviation format

<ACRONYM> <Explanation>

Editor's Note: It is suggested to mark each section with R4, R4/R5 or R5 according to the applicability in order to focus resources on R4 issues

4 Introduction to Service Lifecycle

This section includes a brief description of the service lifecycle.

4.1 Service Registration

4.1.1 Service perspective

In order to allow discovery by subscribers, services are registered in the ~~network~~Home Environment. The service registration must include enough information about these services to allow a subscriber to understand the purpose of the service and to subscribe to the service.

This section addresses different concepts for registration of services.

4.1.2 Network Infrastructure Perspective

This section discusses the implications to other network elements. It also includes the infrastructure functionality for downloading and using MExE and SAT ~~application~~services.

This part includes

- where the ~~application~~service data is stored in the ~~network~~home environment. The storage can be in a central location or the storage could be distributed (e.g., based on ~~application~~service type)
- where specific ~~application~~services are registered (home network and/or visited network)

4.2 Service Discovery

4.2.1 User experience

This section addresses

- Discovery of available VHE services when home and roaming
- Discovery of Non-VHE services when home and roaming.

We have to distinguish between services that the ~~network~~home environment takes responsibility for and services that the home ~~network~~environment points to.

Editor's Note: for clarification it is suggested to change "VHE service" to "VHE capable service" in above section.

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4.2.2 Network Infrastructure Perspective

This section describes the network infrastructure needed to support services Discovery including possible scenarios for ~~application~~service discovery while roaming.

4.3 Service Activation¹ and Modification of Service Data

This section has to cover the subscription and activation etc. as well as modification of user specific data. Activation is the process up to initial access of a service.

4.3.1 User experience

From the users point of view this section addresses:

- choosing [application services](#),
- updating user specific service data
- activating/deactivating services

The actions may be dependent on whether the user is in the home or visited network.

4.3.2 Service perspective

Once a subscriber has selected a service for subscription, the service must be activated for that subscriber and user specific service data needs to be updated. This concept includes one or more of the following items:

- receiving data provisioned by the user
- receiving data provisioned by the network (if any)

4.3.3 Network Infrastructure Perspective

This section addresses the implications to other network elements. It also includes the infrastructure functionality for

- downloading and using MExE and SAT [application services](#).
- making the appropriate billing arrangements
- delivering data provisioned by the user
- delivering data provisioned by the network (if any)

4.4 Service Invocation

4.4.1 User experience

The user experience starts when the service is invoked. Invocation of a service can be

- 1) subscriber driven (e.g. when the subscriber clicks on a link to a new service)
- 2) network driven (e.g. a call forwarding unconditional [application service](#) is invoked by the CSCF when a call is attempted to the subscriber)
- 3) [application-service](#) driven (e.g. and alarm clock [application-service](#) invoked when the alarm time is reached)

From the user perspective service execution can have side effects that are available at the next execution.

4.4.2 Service perspective

This view addresses what the service has to do in the network to get the service to the user.

From a service perspective, service invocation occurs through interactions with the network elements

¹ Activation in this document is defined as the association of an application with a specific user.

The service should be able to utilize during execution the services from one or more networks.

4.4.3 Network Infrastructure Perspective

This section discusses the implications to other network elements. It also includes the infrastructure functionality for downloading and using MExE and SAT ~~applications~~^{services}

5 Relationships between value-added service provider (VASP) and a home or visited network

Editor's Note: it should be reviewed whether the use of 'service' and 'application' is correct in this section, or whether only one term is supposed to be used here.

This section tries to classify the possible relationship between a value-added service provider (VASP) and a home or visited network, for the provisioning of a particular service to a particular user.

Based on this classification, scenarios for the provision of services to a roaming user are listed and investigated one by one.

In the context of this section, it is considered that:

- The service might be subscription-based or might not require any subscription to be used by the user.
- The service might be part of the user VHE or not.
- The service is supplied by a value-added service provider (VASP), which can either be the Home Network, the Visited Network, or a 3rd party service provider

5.1 Information Model

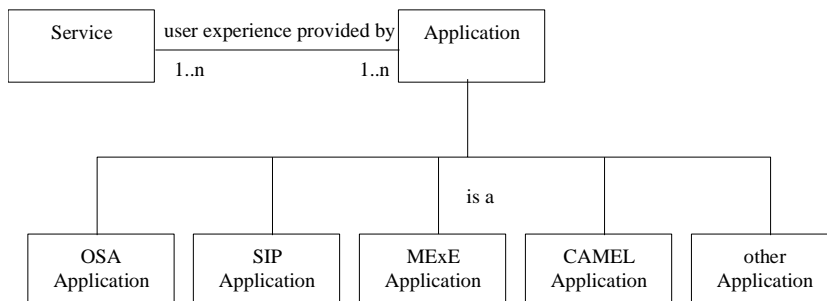
From an application perspective, application execution occurs through interactions with the CSCF and other functional elements (e.g. location services, etc.)

During execution the application should be able to utilize the services from one or more networks.

Editor's Note: to clarify the usage of Service and Application in the following sections it is suggested to add figure 5.1-1 as below

To clarify the usage of Service and Application in the following sections figure 5.1-1 shows the relationship between services and applications based on Service definition provided by TS 22.121 v4.1.0

The Information Model in Figure 5.1-2 shows the possible interfaces for SIP applications¹ and OSA applications.



¹ SIP applications in this context are understood as being capable of acting as a SIP endpoint.

Figure 5.1-1 Relationship between Service and Applications

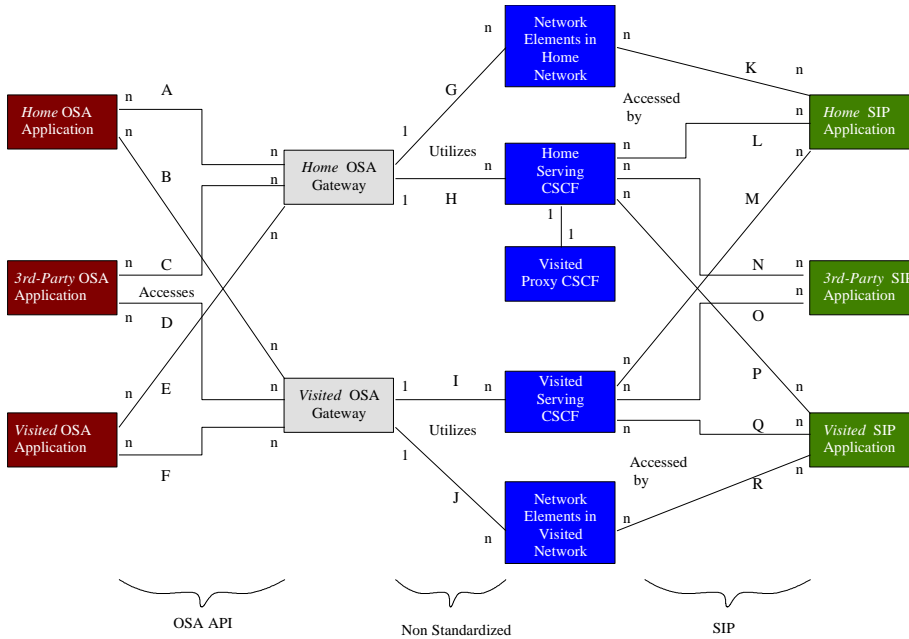


Figure 5.1-2: VHE Functional Element Relationships

5.2 Characterisation of the relationship between a VASP and a home/visited network

The following tries to characterise different types of relationships between a VASP and a home or visited network. Note that these relationships are considered specifically for a **particular service** provided to a **particular user**. This means that a VASP may adopt a certain relationship with a home or visited network for a specific set of services, a specific set of users, or a specific combination of both, while adopting other ones for other sets.

For instance, the VASP may be an HE-VASP for the home network/environment for a user location –based service, while being a P-VASP for a call control supplementary service and a NP-VASP for an information retrieval service.

The following types of relationships are identified:

1. **The VASP is a Home Environment VASP (HE-VASP) to the home network.** This implies that:
 - There is a privileged relationship between the VASP and the home network for this service and this user. This privileged relationship permits the service to use particular capabilities from the home network/environment, as needed by the service and agreed between the VASP and the home network/environment.
 - The level of privilege is likely to be higher than for a P-VASP.
 - This privileged relationship may be supported by OSA when the VASP is a 3rd party service provider. It may also include additional technical and/or business aspects such as priority access to bandwidth and bearers.

- The home network is a Home Environment for the user.
 - The user subscribed to the service with the Home Environment.
 - The service is part of the user Personal Service Environment and as such, can be customised by the user and benefits from VHE (i.e. service portability across networks).
2. **The VASP is a privileged VASP (P-VASP) to the home or visited network.** This implies that:
- There is a privileged relationship between the VASP and the home or visited network for this service and this user. This privileged relationship permits the service to use particular capabilities from the home/visited network, as needed by the service and agreed between the VASP and the home/visited network.
 - The level of privilege is likely to be lower than for a HE-VASP and may vary between different P-VASPs for the same or similar services.
 - This privileged relationship may be supported by OSA when the VASP is a 3rd party service provider. It may also include additional technical and/or business aspects such as priority access to bandwidth and bearers.
 - The user may or may not have subscribed to the service, and has a direct business relationship with the P-VASP.
 - The service is not part of the user PSE and cannot benefit from VHE. This is, the user cannot use the PSE to subscribe and personalise the service, and the home network does not ensure service portability across networks.
3. **The VASP is a non privileged VASP (NP-VASP) to the home or visited network.** This implies that:
- There is no privileged relationship between the VASP and the home or visited network for this service and this user.
 - The VASP does not use OSA for this user and this service.
 - The user may or may not have subscribed to the service, and has a direct business relationship with the NP-VASP.
 - The service is not part of the user PSE and cannot benefit from VHE. This is, the user cannot use the PSE to subscribe and personalise the service, and the home network does not ensure service portability.

The HE-VASP benefits from service portability across different networks, thanks to the VHE support by the home and the variety other networks the home environment has VHE-compliant agreements with. It also benefits from its privileged relationship with the home network (i.e. Home Environment) to use particular capabilities from the network. However, it does not get direct revenue from the user as she subscribed to the service with the Home Network/Environment.

Editor's Note: This document should not talk about how VASPs get their revenue; therefore it is proposed to delete last sentence in above paragraph and first sentence in next two paragraphs.

The P-VASP can directly get revenue from the user. It benefits from its privileged relationship with the home or visited network to use particular capabilities from the home or visited network. However, this access may be more limited than for the HE-VASP and it cannot benefit from VHE. This implies more complexity on its side in order to provide VHE-like characteristics.

The NP-VASP can directly get revenue from the user. However, it cannot use particular capabilities from the home or visited network, and has therefore to behave like another user to the home or visited network. Service portability may be hard to achieve, but this also depends on the nature of this service. For instance, a pure information retrieval service may not require any particular support from the network to be portable across networks.

It should be noted that the relationships defined in this section are both technical (e.g. access to capabilities from the network) and business oriented (e.g. service level agreement, charging). The technical relationship (and interfaces supporting it) possibly include access to capabilities supported by the CSCF but are certainly not limited to it.

Considering this characterisation of the VASP relationship to a home or visited network, the next section analyses the possible scenarios for a service accessed by a user while roaming.

5.3 Possible scenarios for a service when the user is roaming

Considering:

- a user;
- a VASP;
- a service provided to the user by the VASP;
- a user roaming situation with both a visited and a home network; and
- the 3 relationships defined in section 2,

it is possible to systematically analysed the possible relationships between the VASP and each of the visited and home network.

The following table summarises the various possible scenarios, including the cases where the VASP is either the Visited Network (scenario 2) or the Home Network (scenario 3 and 4).

	scenario 1	scenario 2	scenario 3	scenario 4	scenario 5	scenario 6	scenario 7	scenario 8	scenario 9
<u>Relationship of VASP to Home Network (HN)</u>	NP-VASP	P-VASP or NP-VASP	VASP is HN and provides non-VHE capable service	VASP is HN and provides VHE capable service	HE-VASP	HE-VASP	P-VASP	P-VASP	NP-VASP
<u>Relationship of VASP to Visited Network (VN)</u>	NP-VASP	VASP is VN	P-VASP and provides non-VHE capable service	P-VASP and provides VHE capable service	NP-VASP	P-VASP	P-VASP	NP-VASP	P-VASP

The following sub-clauses analyse in more detail the scenarios that are directly related to VHE. Though in theory scenarios 4 to 6 could be subjects of this analysis, only 4 and 5 will be further analysed. The other scenarios are discussed in the Annex A.

This is because scenario 6, while possible in theory, is not realistic in practice for the following reason: the main benefit of an HE-VASP relationship is for the VASP to rely on the home network/environment for service portability across networks, thus simplifying service development and business relationships. Consequently, a P-VASP relationship with

the Visited Network (and the associated technical and business complexity) does not seem to be logical for the HE-VASP.

5.3.1 The VASP is the home network and the service is part of the user PSE

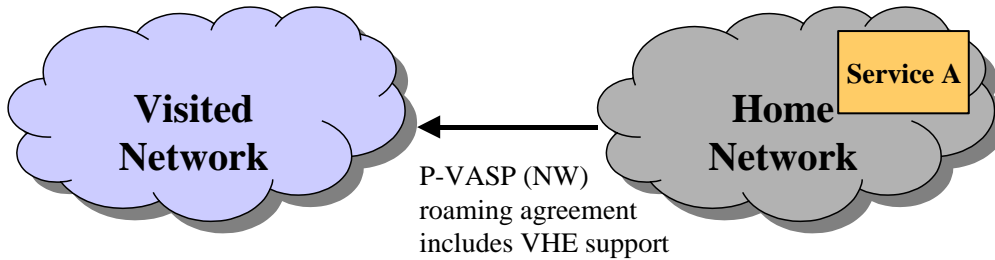


Figure 5.3.1-1: VASP is Home Network / Home Environment (VHE case)

This scenario includes following legs in the information model in section 5.1:

AG, AH, BI, BJ, K, L, M

As a VHE service, the service is portable across networks and accessible/customisable through the user PSE.

Being the home network/environment, the VASP can access its own network capabilities.

However, if the user is roaming, the VASP may need to access capabilities from the visited network.

As the service is part of the user's PSE, this means that particular capabilities are required from the visited network in order for the service to be portable. In case there is no service agreement between the two networks or the visited network does not provide enough support to VHE requirements, the home environment may decide to select home control.

It should be noted that the P-VASP relationship between the home network and the visited network may possibly differ from that between a 3rd party service provider and a network, because it is part of a roaming agreement between two networks. Moreover, it has to support VHE requirements. Consequently, different interfaces may have to be used.

5.3.2 HE-VASP to the home network and NP-VASP to the visited network

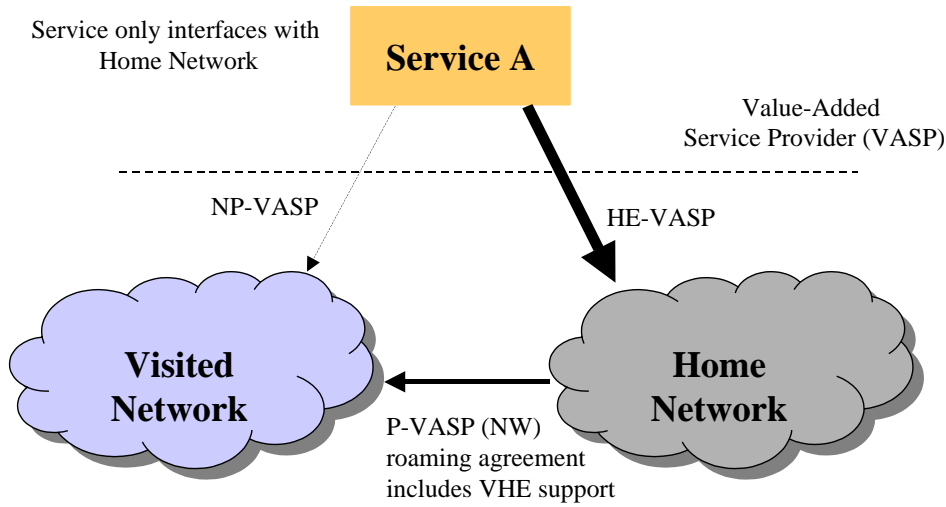


Figure 25.3.2-1: HE-VASP to Home Network and NP-VASP to Visited Network

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[This scenario includes following legs in the information model in section 5.1:](#)

[CG, CH, DI, DJ, N, O](#)

As a VHE service, the service is portable across networks and accessible/customisable through the user PSE.

The primary entry point for the VASP to access user-related information and to be notified about user-related events is the home environment.

Then the following situations are possible:

- For this service, the VASP has no agreement with the HE to be notified about the user’s roaming in another network or to request the user’s current location (i.e. home or visited network). This might be due to a restriction from the HE or because the VASP does not desire such agreement (which makes both the service implementation and the VASP’s business model more complex).
- The VASP has an agreement with the HE permitting it to know about the roaming situation of the user. However, in this specific case, the user happens to roam in a network with which the VASP has no privileged relationship.

As the VASP has only a NP-VASP relationship to the visited network (which it may not even be aware of), it has to rely on the privileged relationship between the HE and the visited network to realise the service.

Through its HE-VASP relationship to the home network/environment, the VASP benefits from service portability across networks while having a simple service development and business model (i.e. privileged interface with a single network, which takes care of roaming and portability issues).

6 OSA API and IM Subsystem

Editor's Note: this section should update "Release 2000" to either R4 or R5 in paragraph and figure title.

Figure 6.1-1 provides the architectural view of accommodating the OSA in Release 2000 reference architecture². The proposed OSA model is to resolve the open interface issues for the Applications Server (AS) to communicate with both the S-CSCF and the HSS. It also presents an inter-working model between an OSA API and an IM CN subsystem as well as an inter-connection with Release 99 MSC/GMSC servers.

The OSA part of the proposed architecture consists of three main components, the AS, the Framework (FW) Service Capability Server (SCS) and the Network (NW) SCS. The AS constitutes the top level of the OSA. This level is connected to the SCSs via the OSA standard interface. The Network SCS serves as gateway between the network entities (e.g., HSS and CSCF) and the AS, and maps the OSA interface onto the underlying network protocols (e.g. MAP, CAP, SIP, etc.). The Framework SCS provides applications with basic mechanisms that enable them to make use of the service capabilities in the network. It should be noted that due to the intermediate role that the SCS plays in the exchange of messages between the AS and the HSS (or the CSCF), the network node identity is hidden from the AS, the OSA does not know which network node it is talking to. It sees object requests coming from an object request broker (ORB)³.

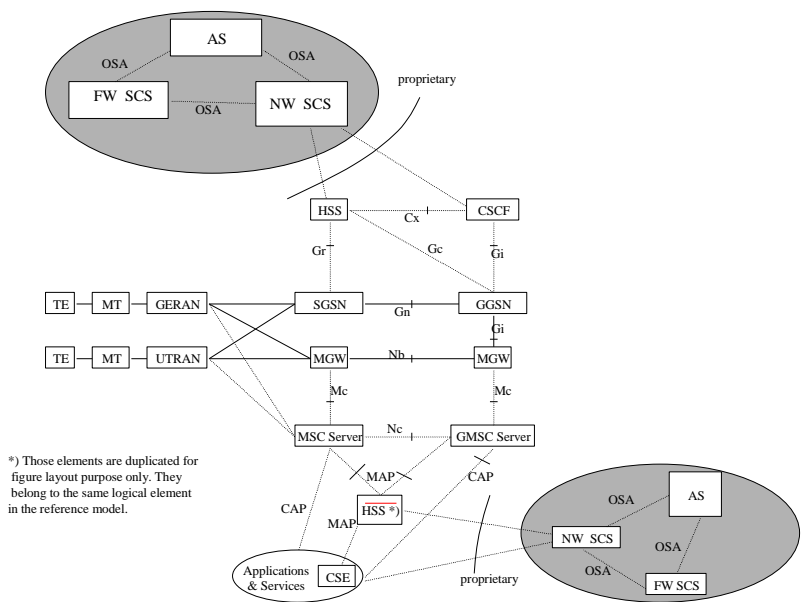


Figure 6.1-1: OSA in Release 2000 Reference Architecture.

The service logic is executed in the AS towards the OSA interfaces, while the underlying core network functions use their specific protocols to functionally interact with the AS via the NW SCS. Thanks to the use of the FW SCS and proprietary protocols, the network complexities are hidden from the applications.

² An alternative view of the SCS gateway block was presented in the S2 VHE/OSA Ad-Hoc meeting in Montreal (August 9-10, 2000). The SCS blocks in this OSA reference architecture model can be finalised when consensus is reached on the discussion related to S2 VHE issues.

³ For more detailed description of the OSA see "Virtual home Environment/Open service Architecture (3G TS 23.127)."

The Framework SCS may have an interface to the network nodes. Such an interface, not shown in the figure, even though proprietary shall exist since the Framework needs to report some network load information to applications (e.g., FW SCS to network management node(s)).

The Framework SCS and the Network SCS, while could be functionally different, they may be located on the same SCS. However, For the SCFs, being functionally different, the SCS allows the separate physical realization of the SCFs.

Release 99 Compatibility:

The proposed architecture of Figure 1 is also compatible with Release 99 through the OSA inter-connection with the MSC/GMSC entities via the HSS and CSE. The Camel Service Environment (CSE) entity within the "Applications & Services" oval in Figure 1, showing the OSA to MSC/GMSC inter-connections, is not for providing the service logic execution environment for applications using the OSA interface. The applications are executed in Application Servers. The CSE via a proprietary mapping to SCS can support outbound roamers via the CAP protocol, interacting with the HSS for location management information, and saving the switching platforms from having a direct OSA interface.

7 VHE user profile

This section presents a companies view and was not reviewed and agreed to in S2 VHE/OSA drafting session and for now it is just a placeholder.

7.1 VHE user profile at S2 level

VHE is defined as a concept, which relies, for its realisation, on a set of toolkits such as MExE or OSA.

Consequently, the concept of VHE user profile may be considered, from a network point of view, as a set of VHE-related requirements on user profile information defined for the individual toolkits that support VHE.

This implies that the notion of a *VHE user profile* identified and defined as a homogeneous set of data stored in, or accessed from a unique network-based location, may not have any relevance. On the contrary, the VHE user profile, as such, may only exist in the Home Environment's service management system and in the user-oriented view of the Personal Service Environment. These logical views of the VHE user profile may need to actually be mapped onto individual toolkits in the network.

Following this perception, it is possible to address the VHE user profile issue from an S2 perspective by individually defining the impact of related requirements onto each of the VHE toolkits. Requirements for which several toolkits need to be considered simultaneously should be the exception. This may be the case, however, for the requirement concerning interoperability between toolkits.

7.2 User Profile Aspects for OSA

For toolkits like MExE, VHE R5 user profile requirements may lead to modifications of or additions to the user profiles as defined prior to R5.

OSA is a special case, as its R99 version has no explicit notion of user profile.

Moreover, it is assumed that both VASPs and HE-VASPs can use OSA as an interface to the Home Environment. This is, OSA can also be used outside of the VHE.

Consequently, OSA-related user profile standardisation in 3GPP R4/R5 may have to address two separate issues:

- 1) Standardising relevant OSA user profile aspects if any.
- 2) Standardising OSA user profile aspects specific to the support of VHE, if any.

7.3 VHE user profiles and toolkits

It is proposed that the VHE user profile within S2 be addressed by analysing the impacts of VHE requirements on the user profiles of individual toolkits that support VHE.

It is proposed to refine VHE user profile standardisation planning toolkit by toolkit.

7.4 Non-VHE user profile

It is proposed to address OSA user profile –related standardisation in two directions:

- Non-VHE –specific standardisation
- VHE-specific standardisation

8 Information Flows

8.1 Information flow Scenarios for Value Added Service Control

8.1.1 Introduction

This list of service control information flow diagrams was generated based on the following assumptions:

- Non-value added services such as switch-based basic and supplementary services are addressed within the scope of “Call Control Information Flow” scenarios.
- Per TS 23.228 (Section 4.2.3), both the home and the visited Serving CSCF control models are assumed.
- The third party platform offers no CSCF capability.
- The Application Server (AS) may reside either in the home, the visited, or the 3rd party platform.
- When the AS and the serving CSCF are in the same network, standardization of the interface might not be needed.

The following two general categories of the value added service control procedures are considered for preparation of the information flows.

8.1.2 Call Related Value Added Services

This category of the service control flows consists of all services that are invoked during a call that has a minimum of two parties. The service invocations (triggers) could come from either the originating party’s Serving CSCF or the terminating party’s Serving CSCF.

- Visiting Mobile Originated Service (e.g., Pre-paid Calls)
 - S-CSCF in Home
 - AS in Visited/3rd Party (1)
- S-CSCF in Visited
 - AS in Home/3rd Party (2)
- Visiting Mobile Terminated Service (e.g., Call Forwarding)
 - S-CSCF in Home
 - AS in Visited/3rd Party (3)
- S-CSCF in Visited
 - AS in Home/3rd Party (4)
- Home Served Mobil Originated Services
 - S-CSCF in Home
 - AS in 3rd Party (5)
- Home Served Mobil Terminated Services (e.g., Call Forwarding)
 - S-CSCF in Home
 - AS in 3rd Party (6)

Terminal Location	Visited Serving Network		Home Serving Network	
	Originated	Terminated	Originated	Terminated
Home S-CSCF	AS in Visited/3 rd Party (1)	AS in Visited/3 rd Party (3)	AS in 3 rd Party (5)	AS in 3 rd Party (6)
Visited S-CSCF	AS in Home/3 rd Party (2)	AS in Home/3 rd Party (4)	NA	NA

8.1.3 Non-Call Related Value Added Services

This category of services consists of those services that do not have pre-identified called parties. In this case either the mobile terminal initiates a service request, or the network prompts the terminal for a service. The exchange of non-call related information between various functional entities may not require the S-CSCF to be in the signalling path.

- Home Served Mobile Terminal Service Request (e.g., location services)
 - AS in 3rd Party (7)
- Visiting Mobile Terminal Service Request (e.g., location services)
 - AS in 3rd Party (8)
 - AS in Home (9)
- Network Initiated Service to Home Served Mobile Terminal
 - AS in 3rd Party (10)
- Network Initiated Service to Visiting Mobile Terminal
 - AS in 3rd Party (11)
 - AS in Home (12)

Service Initiation Terminal Location	Mobile Terminal		Serving Network	
	Home serving Network	Visited serving Network	Home serving Network	Visited serving Network
	AS in 3 rd Party (7)	AS in 3 rd Party (8)	AS in 3 rd Party (10)	AS in 3 rd Party (11)
	NA	AS in Home (9)	NA	AS in Home (12)

8.2 Example of an OSA-API interface VHE service

Author's note1: There is no need for the S-CSCF of the UEb to be involved in the call setup path from the UEa to the UEc since the CFonCLI service can be considered as Call Forwarding Unconditional service or Call Forwarding on mobile subscriber not reachable.

Author's note2: The S2 VHE-OSA Drafting Group meeting in Paris (21-22 November 2000) agreed with the inclusion of the CFonCLI information flow diagram in this TR with the following remarks:

- 1. The information flow diagram in this section is an example of the OSA-API enabled CFonCLI service control. SIP based and CAMEL-based CFonCLI service control are other possible examples.]*
- 2. The CFonCLI re-direction feature shown in Flows 6 through 8 may be done differently, requiring the UEa visited network to redirect the Invite message to the UEc home network.*

3. [The flow segments dealing with the “Mobile Originated” call of Flows 1-3 and the “Mobile Terminated” call of Flows 13-16, and “Inter-network” call of Flows 6-11 should be shown as common procedures per S2 approved call information flow diagrams contained in TS 23.228.](#)
[Using this example of end-to-end CFonCLI information flow diagram, S2 VHE-OSA Drafting Group will focus on preparing detailed information flows for the segments covered by Flows 5, 12 and 15.](#)

The S2 VHE-OSA Drafting Group meeting on 17-18 October in Vienna has agreed to a list of high-priority service control scenarios for which information flow (IF) diagrams are to be prepared for Stage 2 work. The Application Server (AS) based Call-Forwarding (CF) service falls in one of the categories highlighted below:

Visiting Mobile Terminated Service

S-CSCF at Home	S-CSCF at Visited
AS in Visited	AS in Home
AS in 3 rd Party	AS in 3 rd Party

This contribution presents the CF service IF diagram when there are three UEs involved in the service provisioning.

8.2.1 Description of service

The UEa wants to make a call to the UEb. The UEb is subscribed to a CF feature in the AS whereas all incoming calls with UEa's Calling Line Identification (CLI) will be forwarded to another destination (e.g. voice mail or UEc). Figure 8.2.1-1 presents the functional architecture for this call-forwarding scenario. It is based on Figures 4-1 and 4-2 of TS 23.228.

Author's Note: In case of the OSA API interface, the Network SCS of the OSA API serves as gateway between the network entities (e.g., HSS and CSCF) and the AS, and maps the OSA interface onto the underlying network protocols (e.g. MAP, CAP, SIP, etc.).

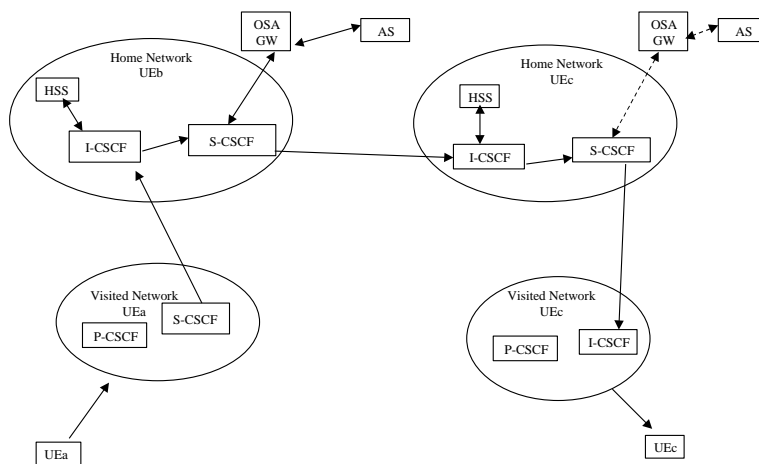


Figure 8.2.1-1: Call Forwarding Service Control Provisioning (service logic residing in an external application server)

In this configuration, the originating UEa and the terminating UEc are assumed to be roaming in their respective visited network. The UEb may be either at its home network or roaming. For calls with a specific CLI intended for the UEb to be forwarded to a different destination, the UEb has to activate the CFonCLI feature, and the CFonCLI feature must be invoked. Furthermore, there are two steps to this service provisioning as described below:

Step 1: Service Activation and Programming

The UEb activates the CFonCLI service and programs it with a Forwarded-to Number which is UEc's number. The CFonCLI service shall be invoked for an incoming call associated with the CLI of UEa.

Step 2: Service Invocation and Control

The UEa makes a call to the UEb. The CFonCLI is invoked and the call is terminated on the UEc. The UEa is notified that its call is being forwarded. The UEc accepts the (forwarded) call.

The information flows for Step 2 are described below.

8.2.2 CFonCLI Service Invocation and Control Information Flows

Editor's Note: Typo, in next sentence needs to be fixed, but it is not clear what was intended.

For this service invocation and control procedures the following are assumed to hold:

- Subscriber data of the UEa, the UEb and the UEc are available in their corresponding HSS.
- Service Control for the UEb is done in its home network.
- It is assumed that the UEb has already been subscribed to the CFonCLI service residing in an external AS.
- The subscriber data (e.g., CLI of UEa) is stored by the CFonCLI application.
- It is assumed that the interface between the AS and the I-CSCF is an OSA API.
- OSA API operations and parameters are mapped onto specific protocol operations (e.g., CAMEL) in an OSA gateway (e.g., CSE).

Figure 8.2.2-1 presents the information flow diagram for the invocation and control of the CFonCLI service. The CFonCLI service logic is executed by an application residing in the AS. The UEa (located in the originating visited network) makes a call to UEb. The CFonCLI is invoked and the call is forwarded to the UEc. The network notifies the UEa. The UEc accepts the (forwarded) call. A detailed description for each flow is given below:

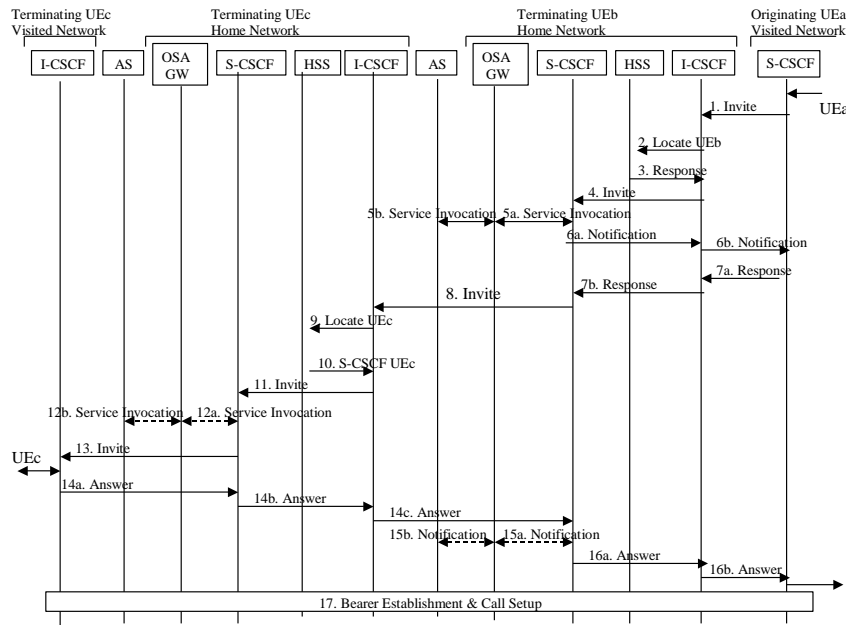


Figure 8.2.2-1: CFonCLIService Invocation and Control Information Flow Diagram

- 1) The I-CSCF of the UEb receives a SIP Invite message form the S-CSCF of the originating (visited) of the UEa by the procedure of the originating flows.
Author's note: the SIP Invite message shall support inclusion of the CLI of the UEa.
- 2) The I-CSCF of the UEb queries the HSS to obtain the S-CSCF of the UEb.
- 3) The HSS returns the S-CSCF location.
- 4) The I-CSCF forwards the SIP Invite message to the S-CSCF of the Ueb.
- 5) Based on the information obtained from the UEb Service Profile (during registration), the S-CSCF of UEb interacts with the AS to invoke the CFonCLI. The AS executes the CFonCLI service logic and instructs “the network” to do the following:
 - The originating party UEa to be notified that the call is being forwarded.
 - The call to be forwarded to UEc, based on the received CLI of the UEa.
 - In case the forwarded party UEc accepts the call, optionally the CFonCLI application, the AS, to be notified of this event (See Flow 15).
- 6) (a & b). The S-CSCF of UEa sends a Notification to UEa indicating that the call is being forwarded.

Author's note: To be decided is whether or not the SIP message to be used for this purpose: an Invite message or a 181("Call is forwarded") message.

- 7) (a & b). The originating network of UEa returns a Response (SIP message: 200, OK??).
- 8) The S-CSCF of UEb forwards the SIP Invite message to the I-CSCF of UEc .
- 9) The I-CSCF of UEc queries the HSS to obtain the S-CSCF of UEc.
- 10)The HSS returns the S-CSCF of UEc.
- 11)The I-CSCF forwards the SIP Invite message to the S-CSCF of the UEc.
- 12)The S-CSCF invokes UEc's service feature.

Author's note: It is assumed that no SS or VAS feature of the UEc is invoked.

- 13)The S-CSCF sends a SIP Invite towards the I-CSCF of the UEc visited network (and to the UEc via the P-CSCF).
- 14)a. The I-CSCF of the UEc visited network returns a Answer (SIP message: 200, OK) to the S-CSCF of the UEc in the home network.
- 14) b. The S-CSCF of the UEc sends a Answer (SIP message: 200, OK) to the I-CSCF of the UEc in the home network .
- 14) c. The I-CSCF of UEc sends a Answer (SIP message: 200, OK) to the S-CSCF of UEb.
- 15)(a & b). Optionally, the S-CSCF of UEb interacts with the AS. In this case the CFonCLI application is notified that the forwarded-to party, the UEc has answered the call.
- 16)(a & b). The S-CSCF of UEb sends a Answer (SIP message: 200, OK) to the originating (visited) network of Uea (and to the UEa via the P-CSCF).
- 17)Bearer establishment & call setup between from the UEa to the UEc is performed following the procedure described in the basic call flow sections for originating, inter-network and terminating segments (See TS 23.228.).

Annexes are only to be used where appropriate:

Annex <A>: Additional Possible scenarios for a service when the user is roaming

A.1 NP-VASP to both home and visited network

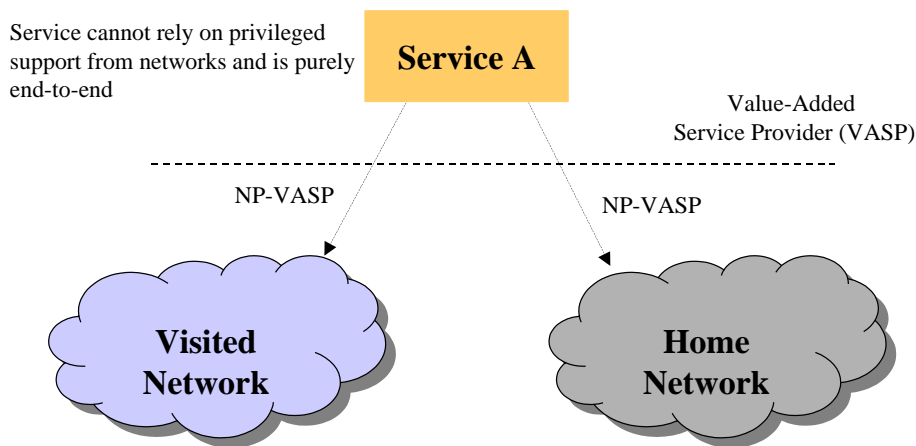


Figure A.1-1: NP-VASP to home and visited network

This scenario includes following legs in the information model in section 5.1:

- DI, DJ, CG, CH, N, O

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The VASP cannot have access to particular capabilities from either the home or visited network for the realisation of the service. For instance, it is not able to impact the user's calls or retrieve user location information from the network.

The service has to be provided from end-to-end without particular assistance from the home or visited networks.

The service may be provided through end-to-end data or multimedia sessions, possibly using technologies such as WAP or SIP, or a combination of both.

Such mechanisms are also available to P-VASPs and HE-VASPs, which can benefit from additional support from networks.

A.2 The VASP is the visited network

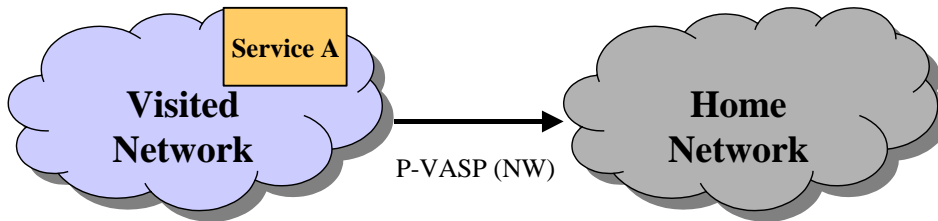


Figure A.2-1: VASP is Visited Network

This scenario includes following legs in the information model in section 5.1:

- EG, EH, FL, FJ, P, R

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Being the visited network, the VASP can conveniently access its own network capabilities, but may also need to access capabilities from the home network. For instance if the service is call-related and the serving CSCF is in the home network.

In this context, the relationship of the visited network to the home network may be that of a NP-VASP or a P-VASP, depending on the existence or not of a service agreement between them.

In the former case, the service will not be able to use specific capabilities from the home network. For instance, if the serving CSCF is in the home network, the visited network will not be able to impact multimedia calls.

In the latter case, depending on the service itself and the service level agreement between the two networks, the visited network will be able to access specific capabilities from the home network.

It should be noted that this P-VASP relationship between the visited network and the home network may possibly differ from that between a 3rd party service provider and a network, because it is part of a roaming agreements between two networks. Consequently, different interfaces may have to be used.

A.3 The VASP is the home network and the service is not part of the user PSE

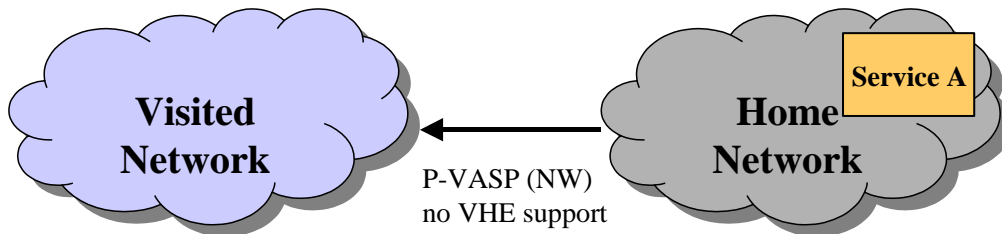


Figure A.3-1: VASP is Home Network (non-VHE case)

This scenario includes following legs in the information model in section 5.1:

- AG, AH, BI, BJ, K, L, M

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Though provided by the home network, the service is not VHE compliant. Service portability is limited and the user cannot access/personalise the service through its PSE.

Being the home network, the VASP can conveniently access its own network capabilities.

However, if the user is roaming, the VASP may need to access capabilities from the visited network.

In this context, the relationship of the home network to the visited network may be that of a NP-VASP or a P-VASP, depending on the existence or not of a service agreement between them or the inclusion or not of this particular service in their roaming agreement.

In the former case, the service will not be able to use specific capabilities from the visited network. Consequently, the home network may prefer to support home network control for the services, in order to ensure optimal service offering to the user.

In the latter case, depending on the service and the service level agreement between the two networks, the home network will be able to access specific capabilities from the visited network.

It should be noted that the P-VASP relationship between the home network and the visited network may possibly differ from that between a 3rd party service provider and a network, because it is part of a roaming agreement between two networks. Consequently, different interfaces may have to be used.

As the service is not part of the user's PSE, the capabilities to be supported by the visited network through the P-VASP relationship need not be VHE compliant.

A.4 HE-VASP to the home network and P-VASP to the visited network

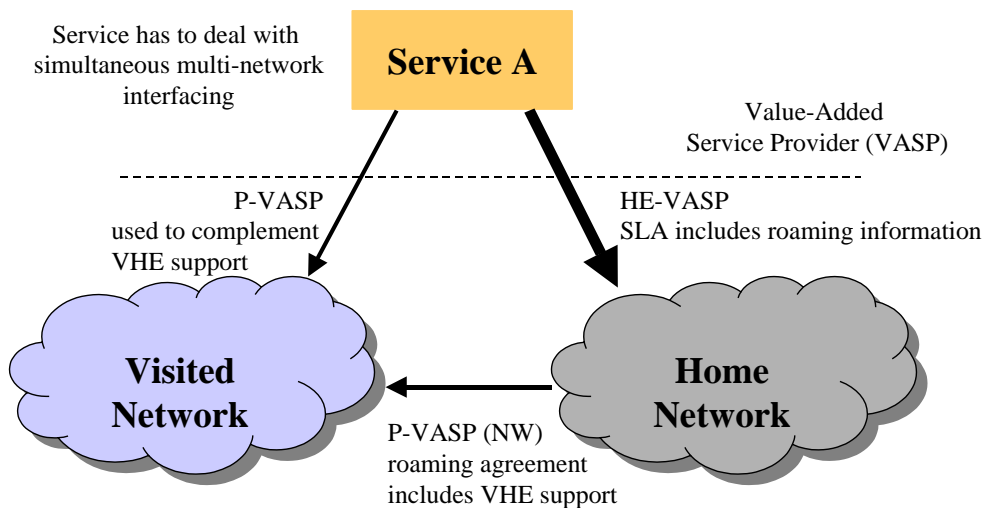


Figure A.4-1: HE-VASP to Home Network and P-VASP to Visited Network

This scenario includes following legs in the information model in section 5.1:

- CG, CH, DI, DJ, N, O

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As a VHE service, the service is portable across networks and accessible/customisable through the user P SE.

The primary entry point for the value-added service provider to access user-related information and to be notified about user-related events is the home environment.

An agreement with the HE permits the HE-VASP to be notified about the user roaming to another network and/or to explicitly request to the HE about the user location (i.e. home or in a visited network).

In order to provide the service to the user, the HE-VASP can rely on both the privileged relationships between the HE and the visited network (if any), and its own privileged relationship with the visited network for the same service. This might add to the power of the service, but this also makes the service implementation and the business model for the VASP more complicated.

This scenario may not be realistic because the main benefit of an HE-VASP relationship is for the VASP to rely on the home network/environment for service portability across networks, thus simplifying service development and business relationships (see scenario in section 3.5).

A.5 P-VASP to both the home network and the visited network

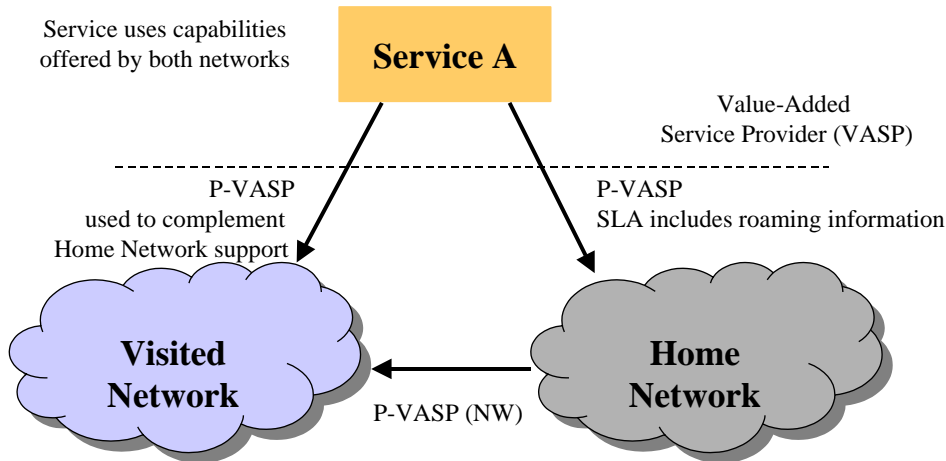


Figure A.5-1: P-VASP to both Home Network and Visited Network

This scenario includes following legs in the information model in section 5.1:

- CG, CH, DI, DJ, N, O

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As the service is not a VHE one, it is not part of the user's PSE. Moreover, it cannot rely on VHE support from the home and visited networks.

For this particular service, the VASP has a privileged relationship with both the home and visited networks. These relationships, as well as the potential privileged relationship between the home and the visited network may permit the VASP to emulate or at least approach VHE-based service portability across networks. However, this is at the expense of service creation simplicity, and this requires peer-to-peer business relationships with various networks.

The home network is *a priori* the first entry point for the VASP to get access to user's related information and events (e.g. call related, location related).

The agreement with the home network permits it to get access to the user's roaming situation, either on an event basis (i.e. notification when roaming), a request basis, or both.

Depending on the natures of the capabilities required by the service and the respective service level agreements with each network, the VASP can make an optimal use of its privileged relationships with them.

A.6 P-VASP to the home network and NP-VASP to the visited network

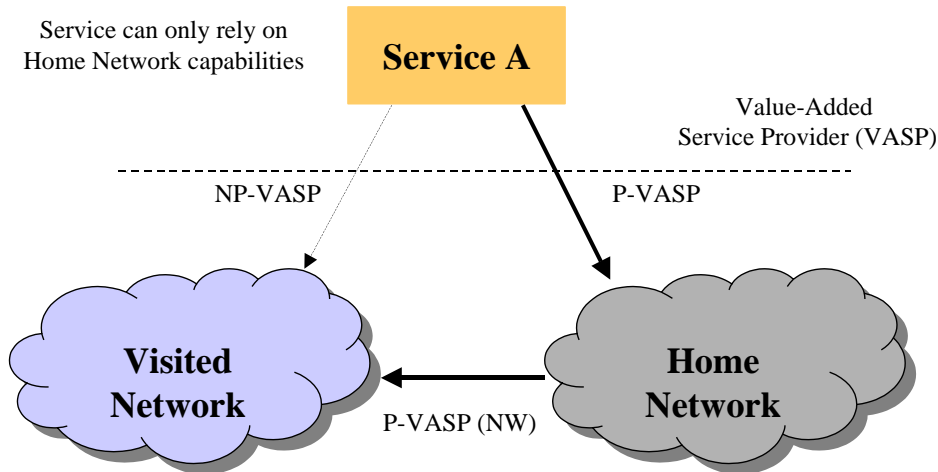


Figure A.6-1: P-VASP to Home Network and NP-VASP to Visited Network

This scenario includes following legs in the information model in section 5.1:

- CG, CH, DI, DJ, N, O

As the service is not a VHE one, it is not part of the user's PSE. Moreover, it cannot rely on VHE support from the home and visited networks.

The primary entry point for the value-added service provider to access user-related information and to be notified about user-related events is the home environment.

Then the following situations are possible:

- For this service, the VASP has no agreement with the home network to be notified about the user's roaming in another network or to request the user's current location (i.e. home or visited network). This might be due to a restriction from the home network or because the VASP does not desire such agreement (which makes both the service implementation and the VASP's business model more complex).
- The VASP has an agreement with the home network permitting it to know about the roaming situation of the user. However, in this specific case, the user happens to roam in a network with which the VASP has no privileged relationship.

As the VASP has only a NP-VASP relationship to the visited network (which it may not even be aware of), it can only rely on its privileged relationship with the home network and the (potential) privileged relationship between the home network and the visited network to realise the service.

Depending on the capabilities required by the service and the various service agreements at stake, service portability across networks may be more or less reachable.

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A.7 NP-VASP to the home network and P-VASP to the visited network

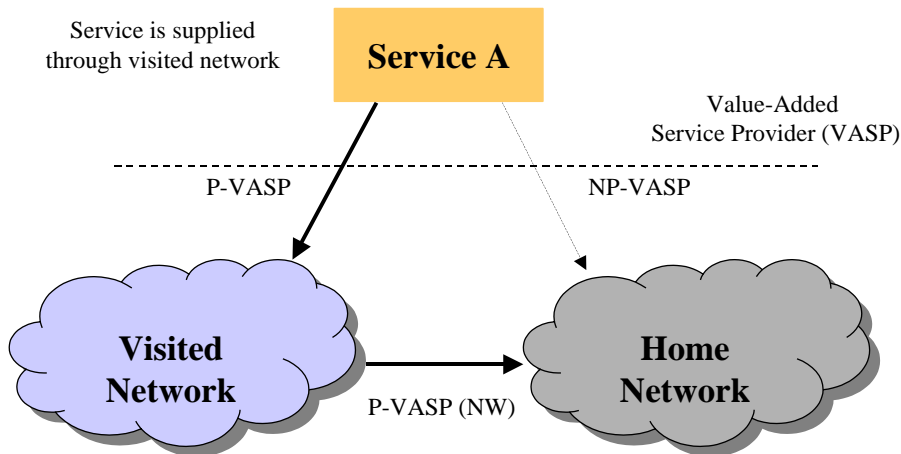


Figure A.7-1: NP-VASP to Home Network and P-VASP to Visited Network

This scenario includes following legs in the information model in section 5.1:

- CG, CH, DI, DJ, N, O

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As the service is not a VHE one, it is not part of the user's PSE. Moreover, it cannot rely on VHE support from the home and visited networks.

The service has either been discovered by the user while roaming or is provided by a VASP with which the user has had a longer-term direct business relationship. In this latter case, the VASP happens to have a privileged relationship with the visited network and not with the user's home network⁴.

The invocation of the service is likely to be performed by the user herself, possibly using a web-oriented interface or a multimedia session.

The service can use the capabilities of the visited network. If needed, the capabilities from the home network can only be used through the privileged interface between the visited and the home network.

⁴ However, a prerequisite for this scenario to work is that the VASP can gain knowledge of the network where the user is roaming, either from the network itself (e.g. the service is accessed through a visited network-based portal) or via the user (e.g. "what is your current operator?").

Bibliography

The Bibliography is optional. If it exists, it shall follow the last annex in the document.

The following material, though not specifically referenced in the body of the present document (or not publicly available), gives supporting information.

Bibliography format

- <Publication>: "<Title>".

OR

<Publication>: "<Title>".

Annex <X>: Change history

It is usual to include an annex (usually the final annex of the document) for reports under TSG change control which details the change history of the report using a table as follows:

Change history							
Date	TSG #	TSG Doc.	CR	Rev	Subject/Comment	Old	New

Version	Date	Comment
0.0.0	January 2001	Initial Draft (content from agreed contributions of SA2 VHE/OSA Drafting Session Paris, November 2000: S2v000068, S2v000069, S2v000074, S2v000078, S2v000079, S2v000080 and SA2# 15, Makuha'i, November, 2000: S2-001867)
<u>0.1.0</u>	<u>January 2001</u>	<u>Incorporation of contributions from SA2 VHE/OSA Drafting Session Berlin, January 2001: S2v000089 (including pulling scenarios into Annex A) and terminology and figure adjustments.</u>

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