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Abstract: This document contains the draft baseline for the new work item Q.BNG-FMI "Signalling Requirements for virtualized Broadband Network Gateway in Fixed-Mobile Interworking". It includes the discussion results in the Q5/11 meeting held in Geneva, 3-11 March 2026.

This document is the draft baseline text of new Recommendation ITU-T Q.BNG-FMI "Signalling Requirements for virtualized Broadband Network Gateway in Fixed-Mobile Interworking", resulting from discussion of Q5/11 meetings Geneva, 3-11 March 2026.

This meeting's discussion and results are as follows:

DOC	Source	Title	Discussion and results
SG11-C326	China Unicom, CAICT, New H3C Technologies Co., Ltd. (China)	Proposal to start a new work item on signalling requirements for virtualized Broadband Network Gateway in fixed-mobile interworking"	Accepted with modifications.

Draft new Recommendation ITU-T Q.BNG-FMI

Signalling Requirements for virtualized Broadband Network Gateway in Fixed-Mobile Interworking

Summary

This document aims to study the signalling requirements for virtualized Broadband Network Gateway in fixed-mobile interworking.

Keywords

Broadband Network Gateway, Fixed-Mobile Interworking

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Draft New Recommendation ITU-T Q.BNG-FMI

Signalling Requirements for virtualized Broadband Network Gateway in Fixed-Mobile Interworking

1 Scope

The scope of this Recommendation consists of:

- Architecture of the virtualized Broadband Network Gateway in fixed-mobile interworking.
- Signalling requirements of the virtualized Broadband Network Gateway in fixed-mobile interworking.
- Signalling procedures of the virtualized Broadband Network Gateway in fixed-mobile interworking.

2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

[ITU-T Q.3719] ITU-T Recommendation ITU-T Q.3719 (2019), *Signalling requirements for the separation of control plane and user plane in a virtualized broadband network gateway (vBNG).*

[TBD]

3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

3.1.1 Broadband Network Gateway (BNG) [ITU-T Q.3315]: The access point to the provider's IP network for wireline broadband services.

3.1.2 virtualized BNG (vBNG) [ITU-T Q.3719]: The virtualized BNG is the broadband network gateway of which all features or some features are directly implemented as virtualized network function(s) (VNF) running on the network function virtualization infrastructure (NFVI). It is used to either augment or replace the existing traditional BNG.

3.1.3 vBNG Control Plane [ITU-T Q.3719]: The vBNG Control Plane is in charge of the control functions, including AAA management function, IP address management function, user management function, access protocol processing function, and vBNG user plane management function, etc. The vBNG control plane is implemented using the virtualization technologies and deployed in the mode of centralization.

3.1.4 vBNG User Plane [ITU-T Q.3719]: The vBNG User Plane mainly provides user packets switching under the instruction of the vBNG Control Plane. The vBNG User Plane can be implemented in different types of forwarding hardware, including NP-based dedicated equipment, ASIC-based dedicated equipment, or X86-based commercial equipment.

3.1.5 fixed network [ITU-T Q.1762/Y.2802]: A network that provides wire-based (e.g., copper, fibre) or wireless access to its services. The fixed network may support nomadism, but does not support mobility.

3.1.6 mobile network [ITU-T Q.1762/Y.2802]: A network that provides wireless access to its services and supports mobility.

3.2 Terms defined in this Recommendation

This Recommendation defines the following terms:

[TBD]

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

AAA	Authentication, Authorization and Accounting
IPv4	Internet Protocol version 4
IPv6	Internet Protocol version 6
TCP	Transmission Control Protocol
UDP	User Datagram Protocol
vBNG	virtual Broadband Network Gateway
vBNG-CP	virtual Broadband Network Gateway-Control Plane
vBNG-UP	virtual Broadband Network Gateway-User Plane

[TBD]

5 Conventions

In this Recommendation:

The keywords "**is required to**" indicate a requirement which must be strictly followed and from which no deviation is permitted if conformance to this document is to be claimed.

The keywords "**is recommended**" indicate a requirement which is recommended but which is not absolutely required. Thus, this requirement need not be present to claim conformance.

The keywords "**can optionally**" indicate an optional requirement which is permissible, without implying any sense of being recommended. This term is not intended to imply that the vendor's implementation must provide the option and the feature can be optionally enabled by the network operator/service provider. Rather, it means the vendor may optionally provide the feature and still claim conformance with the specification.

6 Overview

[Contributor's Note] This clause specifies the necessarily and overall introduction of virtualized Broadband Network Gateway in fixed-mobile interworking.

With the development of internet technology and the increasing business demands, there has emerged a growing demand for application scenarios about fixed-mobile interworking, including but not limited to the following use cases:

1) Residential users seek secure remote access to smart home devices like NAS and cameras. They wish to stream 4K videos from their home NAS anytime and anywhere and avoid the bandwidth

limitations of cloud storage. Additionally, users require real-time viewing of live camera feeds or playback recordings stored locally on the cameras at any time.

2) Employees of enterprises require to access corporate intranet resources (such as OA systems and databases) from anywhere, at any time.

3) Healthcare institutions necessitate real-time data transmission between ambulances and hospital systems to minimize emergency response times.

4) In the agents communication scenarios, home agents and external agents require to interact data in real time to fulfill user intents collectively.

However, existing solutions (e.g. interconnecting via cloud services) present the following issues:

1) Security risks: Accessing enterprise or residential intranets via the public internet exposes internal resources to potential external threats, it could result in the leakage of confidential information, unauthorized access to sensitive business data, and broader security risks.

2) User experience limitations: Residential users accessing cloud storage or utilizing third-party public cloud relays to access home NAS systems encounter limitations such as restricted bandwidth, resulting in diminished access speeds.

Therefore, this contribution can help to solve the aforementioned problems preeminently. On an operator's network, BNG is the connection point between the fixed network and the mobile network. It functions as a portal for users to implement various broadband and data services through fixed-mobile interworking and as a policy enforcement point for controlling fixed-mobile interworking behaviors. Traditional BNGs cannot meet fixed-mobile interworking requirements. In order to solve the problem, enhancement for virtualized Broadband Network Gateway in fixed-mobile interworking is proposed. Based on control plane and user plane separated vBNG [ITU-T Q.3719], enhancement for broadband network gateway introduces interworking management fuction to vBNG-CP and interworking traffic identification, interworking traffic steering, interworking traffic control to vBNG-UP, making BNG implement fixed-mobile interworking as well as policy enforcement.

[TBD]

7 Architecture of the virtualized Broadband Network Gateway in fixed-mobile interworking

[Contributor's note] This clause specifies the signalling architecture of the virtualized Broadband Network Gateway in fixed-mobile interworking.

Within fixed-mobile interworking frameworks, the virtualized broadband network gateway (vBNG) is designed to provide interworking services in accordance with the subscriber's specific identifier. On the basis of its existing wireline broadband access service functions, the vBNG realizes this objective through the integration of functional modules responsible for interworking subscriber traffic identification and traffic steering. The architecture of the vBNG for fixed-mobile interworking is shown in Figure 7-1.

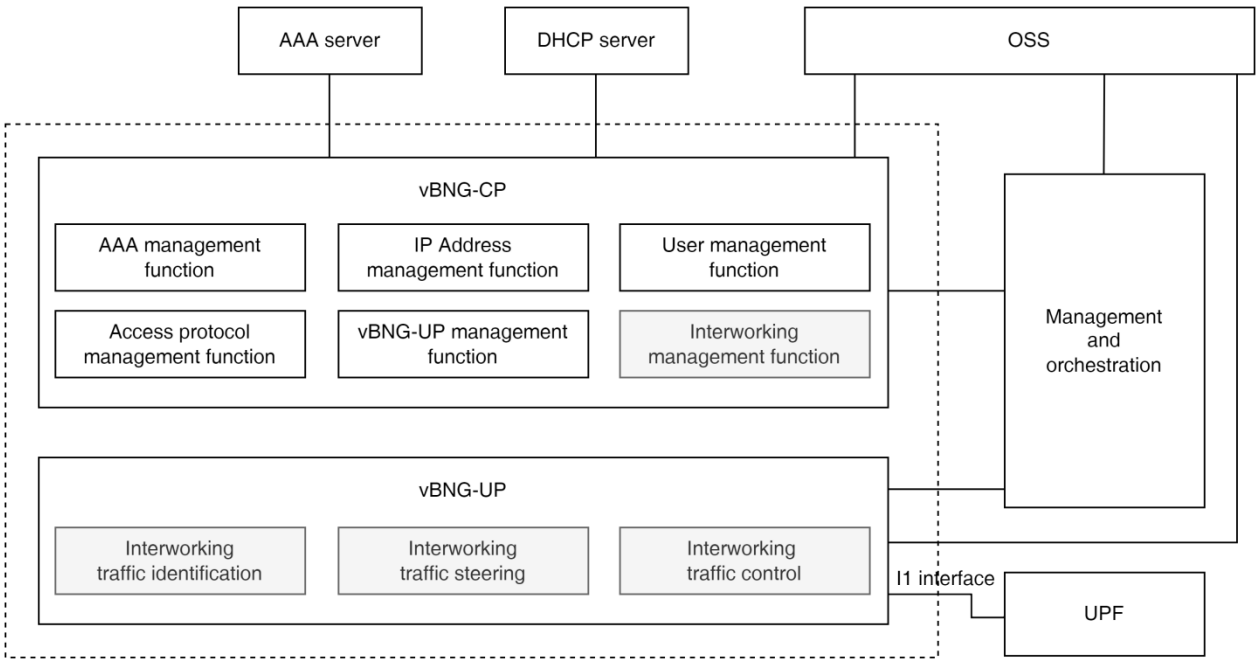

Figure 7-1 Architecture of vBNG for fixed-mobile interworking

In compliance with the functional requirements specified in ITU-T Q.3719, the vBNG-CP is equipped with comprehensive control functions that cover AAA management, IP address management, user management, access protocol management, vBNG-UP management, and interworking management customized for fixed-mobile interworking scenarios. The core purpose of the interworking management function is to issue interworking forwarding or filtering strategies to the vBNG-UP.

The fixed-mobile interworking virtual broadband network gateway user plane (vBNG-UP) is defined as a high-performance traffic forwarding system. On the basis of the baseline functions of wireline-access vBNG, the fixed-mobile interworking vBNG-UP is equipped with three supplementary core functions, namely interworking traffic identification, interworking traffic steering and interworking traffic control. The interworking traffic identification function serves to guarantee the transport of fixed-mobile interworking traffic associated with subscriber applications, which is achieved by identifying the intrinsic traffic characteristics of diverse subscriber applications. The interworking traffic steering function is designed to assign specific traffic transmission paths to subscriber applications according to the output of the interworking traffic identification function, so as to satisfy the technical requirements for fixed-mobile interworking transmission. The interworking traffic control function undertakes the task of forwarding traffic to the user plane function (UPF) through pre-specified tunnels. For the implementation of tunnel selection, the fixed-mobile interworking vBNG-UP adopts technical solutions including virtual extensible local area network (VXLAN) and network slicing, which support application-specific tunnel allocation.

[TBD]

8 Signalling requirements of the virtualized Broadband Network Gateway in fixed-mobile interworking

[Contributor's note] This clause specifies signalling requirements of the virtualized Broadband Network Gateway in fixed-mobile interworking.

8.1 Interfaces of fixed-mobile interworking for broadband network gateway

[Contributor's Note] This clause specifies the interfaces newly introduced in fixed-mobile interworking for broadband network gateway.

One interface is defined to support the communication between the virtual broadband network gateway userplane and UPF in mobile network. Figure 2 illustrates the interfaces of fixed-mobile interworking for broadband network gateway.

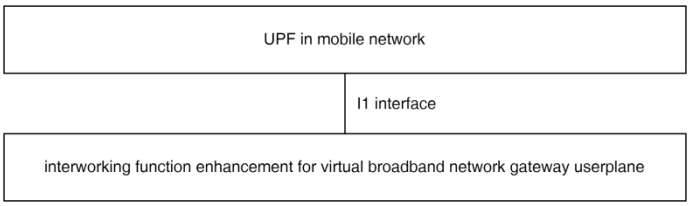

Figure 1 Interfaces of fixed-mobile interworking for virtual broadband network gateway

- I1 interface

The I1 interface connects interworking function enhancement for virtual broadband nework gateway userplane in fixed network and UPF in mobile network. UPF in mobile network use this interface to deliver mobile subscriber's information to the interworking function enhancement for virtual broadband network gateway user plane.

[TBD]

8.2 General requirements

[Contributor's Note] This clause specifies the general requirements of the virtualized Broadband Network Gateway in fixed-mobile interworking.

The fixed-mobile interworking virtual broadband network gateway control plane (vBNG-CP) shall support the function of retrieving fixed-mobile subscriber subscription information from the Authentication, Authorization and Accounting (AAA) system, as well as delivering interworking-subscriber-specific flow tables and policy rules to the virtual broadband network gateway user plane (vBNG-UP). In parallel, it shall provide configuration instructions for fixed-mobile routing schemes and dedicated tunnel setup processes to the vBNG-UP.

On the occurrence of subscriber login and service initiation events, the fixed-mobile interworking vBNG-UP shall implement the mapping between subscriber fixed-mobile interworking traffic and pre-established routing entries. This functional requirement ensures that subscriber traffic is forwarded to the specified dedicated tunnel, so as to satisfy the technical indicator of seamless service transmission across fixed and mobile network domains.

It is recommended that the fixed-mobile interworking vBNG-CP support the automatic provisioning of dedicated tunnels (e.g., Virtual Extensible Local Area Network [VXLAN], network slicing, etc.) for the deployment of fixed-mobile routing paths to the vBNG-UP. Meanwhile, the vBNG-CP shall be capable of issuing service identification labels (e.g., Virtual Local Area Network [VLAN] identifier, 5-tuple parameters, etc.) to the associated vBNG-UP instances. During the phase of subscriber service access, the vBNG-UP is recommended to be equipped with the capability of interworking traffic identification based on the aforementioned pre-delivered labels.

Subsequent to the completion of interworking traffic identification, the fixed-mobile interworking vBNG-UP shall fulfill two core functions: first, steering the identified interworking traffic to pre-configured dedicated tunnels; second, delivering traffic control functionality for subscriber services under centralized management, encompassing packet loss control, rate limiting, and other traffic management mechanisms.

[TBD]

9. Signalling procedures of the virtualized Broadband Network Gateway in fixed-mobile interworking

[Contributor's note] This clause specifies the signalling procedures of the virtualized Broadband Network Gateway in fixed-mobile interworking.

[TBD]

9.1 Fixed-mobile traffic access

[Contributor's note] this clause would provide the signalling procedures of fixed-mobile traffic access.

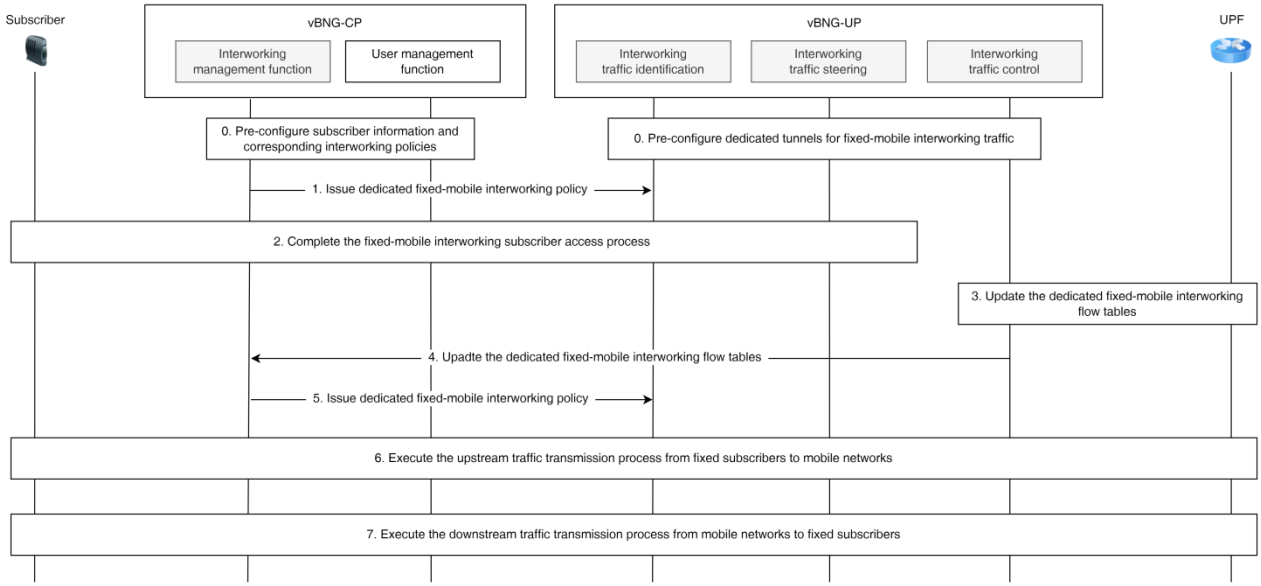

Figure 9.1 Procedure for fixed-mobile traffic access

0. Pre-configuration on vBNG-CP and vBNG-UP

The vBNG-CP shall retrieve subscriber subscription information from the AAA server, and pre-provision the registration of subscribers requiring fixed-mobile interworking as well as the corresponding policies. The policy configurations and tunnel parameters may be issued to the vBNG-UP for the establishment of dedicated tunnels, which can be implemented as VXLAN tunnels or network slicing instances or other mechanisms.

Upon receiving the policies and tunnel-related configurations issued by the vBNG-CP, the vBNG-UP shall complete the configuration of dedicated tunnels designed for transporting traffic to the mobile network. Through its interworking traffic steering function, the vBNG-UP shall calculate the forwarding path information to the destination mobile network, and deliver the relevant information to its interworking traffic control function. For fixed-mobile interworking services of different subscribers, distinct tunnels may be bound. Therefore, the interworking traffic identification function is utilized to identify the unique traffic characteristics of diverse subscriber applications; the interworking traffic steering function is responsible for assigning specific traffic transmission tunnels to subscriber applications; the interworking traffic control function is tasked with forwarding traffic to the UPF via pre-designated tunnels.

1. The interworking management function of the vBNG-CP issues dedicated fixed-mobile interworking policies to the interworking traffic identification function of the vBNG-UP.The policies may include one or multiple flow matching rules, which can cover specified source IP addresses, protocol types, port numbers, or specified VLAN identifiers, as well as application matching rules. Specifically, the policies shall specify the tunnel information mapped to flow characteristics for forwarding to the UPF, including VXLAN, network slicing instances and L2TP

tunnels, and other tunnel encapsulation technologies. Note: This operation assumes that a valid connection has been successfully established between the vBNG-CP and the vBNG-UP.

2. After the user management function of the vBNG-CP completes the access process of the subscriber, it shall notify the interworking management function to send a fixed-mobile interworking subscriber online notification to the vBNG-UP.

3. The interworking traffic control function of the vBNG-UP retrieves subscriber subscription information from the mobile network, which may include mobile subscriber numbers and associated IP addresses, and then updates the dedicated fixed-mobile interworking flow tables.

4. The interworking traffic control function of the vBNG-UP shall notify the interworking management function of the vBNG-CP about the updates to mobile subscriber information in the flow tables.

5. The interworking management function of the vBNG-CP issues dedicated fixed-mobile interworking policies to the interworking traffic identification function. Based on these policies, the interworking traffic identification function shall execute flow matching rules to precisely identify the designated fixed-mobile interworking traffic, so as to ensure reliable data transmission.

6. The fixed subscriber forwards packets to the vBNG-UP. The interworking traffic identification function identifies the packets as fixed-mobile interworking traffic. The interworking traffic steering function of the vBNG-UP selects the corresponding transmission path, and the interworking traffic control function forwards the packets to the UPF through the pre-designated tunnel while performing local traffic management.

7. After the vBNG-UP receives the return packets from the UPF, it shall perform specific tunnel encapsulation mapping, and then transmit the encapsulated packets to the fixed subscriber through the corresponding tunnel.

[TBD]

9.2 Network access control

[Contributor's note] this clause would provide the signalling procedures of network access control.

[TBD]