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Interoperability testing requirements of virtual Broadband Network Gateway

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Recommendation ITU-T Q.4064

Interoperability testing requirements of virtual Broadband Network Gateway

Summary

This Recommendation aims to specify virtual BNG (vBNG) interoperability testing requirements. Firstly, as a basic background, this Recommendation introduces the overview of vBNG and interoperability testing of vBNG, which includes but not limited to the definition, characteristics, general capabilities of vBNG as well as the overview of interoperability testing of vBNG. The description of use cases of vBNG will be provided as appendix. Base on analysis of involved vBNG capabilities in use cases, the corresponding derived requirements of vBNG's interoperability testing will be introduced.

Keywords

Virtual BNG; Interoperability; Testing; Requirements

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Interoperability testing requirements of virtual Broadband Network Gateway

1 Scope

The scope of this Recommendation consists of:

- 1) Overview of vBNG (virtual Broadband Network Gateway)
 - a) Concept of vBNG, including definition, characteristics and general capabilities of vBNG;
 - b) Framework of vBNG, which consists of control plane and data plane.
- 2) IOPT (Interoperability Testing) framework of vBNG based on the target areas of vBNG IOPT.
- 3) IOPT requirements of vBNG.

NOTE – The IOPT requirements of vBNG should include the IOPT requirements derived from analysis of typical use cases of vBNG, which should satisfy the need to verify vBNG's capabilities involved in cloud related use cases.

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.4040] | Recommendation ITU-T Q.4040 (2016), <i>The framework and overview of cloud computing interoperability testing</i> |
| [ITU-T Y.3011] | Recommendation ITU-T Y.3011 (2012), <i>Framework of network virtualization for future networks</i> |
| [ITU-T Q.3315] | Recommendation ITU-T Q.3315 (2015), <i>Signalling requirements for flexible network service combination on broadband network gateway</i> |
| [ITU-T Y.3500] | Recommendation ITU-T Y.3500 (2014), <i>Information technology – Cloud computing – Overview and vocabulary.</i> |

3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

- 3.1.1 broadband network gateway** [ITU-T Y.3315]: The access point to the provider's IP network for wireline broadband services.
- 3.1.2 cloud service provider** [ITU-T Y.3502]: A party which makes cloud services available.
- 3.1.3 cloud service customer** [ITU-T Y.3502]: A party which is in a business relationship for the purpose of using cloud services.
- 3.1.4 network virtualization** [ITU-T Y.3011]: A technology that enables the creation of logically isolated network partitions over shared physical networks so that heterogeneous collections of multiple virtual networks can simultaneously coexist over the shared networks. This includes the aggregation of multiple resources in a provider and appearing as a single resource.

3.1.5 cloud computing [ITU-T Y.3500]: Paradigm for enabling network access to a scalable and elastic pool of shareable physical or virtual resources with self-service provisioning and administration on-demand.

3.1.6 cloud interoperability [ITU-T Q.4040]: The capability to interact between CSCs and CSPs or between different CSPs, including the ability of CSCs to interact with cloud services and exchange information, the ability for one cloud service to work with other cloud services, and the ability for CSCs to interact with the cloud service management facilities of the CSPs.

3.2 Terms defined in this Recommendation

This Recommendation defines the following terms:

3.2.1 virtual broadband network gateway: vBNG is a virtualized solution of BNG by using virtualization technologies, and it is responsible for user's access and traffic forwarding to realize broadband services.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

AAA	Authentication, Authorization and Accounting
ACL	Access Control List
ARP	Address Resolution Protocol
ASIC	Application Specific Integrated Circuits
BGP	Border Gateway Protocol
BGP-FS	BGP Flow Specification
BSS	Business Support System
CGN	Carrier Grade Network Address Translation
CHAP	Challenge Handshake Authentication Protocol
CPE	Customer Premises Equipment
CPU	Central Processing Unit
CSC	Cloud Service Customer
CSP	Cloud Service Provider
CVLAN	Customer Virtual Local Area Network
DDOS	Distributed Denial of Service
DHCP	Dynamic Host Configuration Protocol
DPI	Deep Packet Inspection
DNS	Domain Name System
DOS	Denial of service
FW	Firewall
GRE	Generic Routing Encapsulation
HQoS	Hierarchical Quality of Service
ICMP	Internet Control Message Protocol
IGMP	Internet Group Management Protocol

IGP	Interior Gateway Protocol
IOPT	Interoperability Testing
IPoE	IP over Ethernet
IPTV	Internet Protocol Television
ISIS	Intermediate System-Intermediate System
ITMS	Integrated Terminal Management System
L2TP	Layer two Tunnelling Protocol
MAN	Metropolitan Area Network
MANO	Management and Orchestration
MLD	Multicast Listener Discovery Protocol
MP-BGP	Multiprotocol Border Gateway Protocol
MPLS	Multi-Protocol Label Switching
MSDP	Multicast Source Discovery Protocol
MTU	Maximum Transmission Unit
MVPN	Multicast VPN
NAT	Network Address Translation
NFVO	Network Function Virtualization Orchestration
NP	Network Processor
OSPF	Open Shortest Path First
OSS	Operation Support System
PAP	Password Authentication Protocol
PCEP	Path Computation Element Protocol
PE	Provider Edge
PIM-DM	Protocol Independent Multicast-Dense Mode
PIM-SM	Protocol Independent Multicast-Sparse Mode
PPP	Point-to-Point Protocol
PPPoE	Point-to-Point Protocol over Ethernet
QinQ	802.1Q-in-802.1Q
RADIUS	Remote Authentication Dial In User Service
SFC	Service Function Chain
SNMP	Simple Network Management Protocol
SR	Segment Routing
SR-TE	Segment Routing-Traffic Engineering
SVLAN	Service Virtual Local Area Network
TCP	Transmission Control Protocol
UDP	User Datagram Protocol
URPF	Unicast Reverse Path Forwarding

VAS	Value-Added Services
vBNG	virtual Broadband Network Gateway
vCPE	virtual Customer Premises Equipment
VIM	Virtual Infrastructure Manager
VLL	Virtual Leased Line
VLAN	Virtual Local Area Network
VM	Virtual Machine
VNFM	Virtual Network Function Manager
VPLS	Virtual Private LAN Service
VPN	Virtual Private Network
VxLAN	Virtual eXtensible Local Area Network
WAN	Wide Area Network
6VPE	IPv6 VPN Provider Edge

5 Conventions

The keywords “is required” 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.

6 Overview of vBNG

6.1 Concept of vBNG

BNG is defined as the access point to the provider's IP network for wireline broadband services [ITU-T Q.3315]. vBNG is the virtualization of BNG by using virtualization technologies, which include network virtualization [ITU-T Y.3011] and compute virtualization technologies. Virtualization technologies aggregate multiple resources which can be distributed in different equipment in a provider and appear as a single resource. vBNG should meet the signalling requirements between vBNG and service platform for flexible network service combination on broadband network gateway defined in [ITU-T Q.3315], and the on-demand service based on the flexible function providing.

NOTE – The service platform acts as an intermediate layer between the network services and the BNG.

Cloud computing is defined as a paradigm for enabling network access to a scalable and elastic pool of shareable physical or virtual resources with self-service provisioning and administration on-demand in [ITU-T Y.3500]. As a virtualized network element, vBNG can be deployed in scalable and elastic pool of shared physical or virtual resources, and can provide self-service and administration based on the management system such as MANO. vBNG belongs to cloud computing, and vBNG's IOPT is a kind of cloud IOPT. Comparing to BNG, the characteristics of vBNG can be concluded into the following aspects:

- vBNG can provide service functions as VNF, so it should provide compatibility for network function virtualization platform.
- vBNG can provide service functions on demand and customized functions for specific requirements such as DPI, FW and SFC functions.