Question 5/11 – Signalling requirements and protocols for border network gateway in the context of network virtualization and intelligentization

(Continuation of Question 5/11)

1 Motivation

As the anchor of user access network and service provision, the device form and the deployment of service functions for border network gateway (BNG) are constantly evolving with new technologies such as SDN, NFV, cloud computing, Internet of Things and artificial intelligence, especially with the network architecture evolving toward virtualization, openness and intelligentization. Therefore, in order to adapt to the network architecture evolution, new service requirements, interfaces and signalling protocols for border network gateway need to be defined to support the multi-services, as well as BNG's capabilities need to be enhanced to provide better QoS, reliability and security for bearing multi-services.

When introducing the software-defined networking (SDN), network function virtualization (NFV) and network intelligence technology into access network, it is required to define new interfaces for open network capabilities, define new protocol to control underlay physical transfer devices, define new protocol interactive process to communicate between controller and transfer devices, define new protocols and procedures to improve reliability, resource utilization and flexibly distribute user's policies among the multiple BNGs. Also new protocol procedures are required to enable the rapid provisioning of services over customer IP networks, the services to the customer through multiple border network gateways and the open networking value added service (VAS).

With the introduction of the emerging technologies, the carrier's network architecture is also gradually evolving. The border network gateway is required to have the capabilities to bearer multi-service, and implement functions such as a fixed network (e.g., BRAS), a mobile network (e.g., PDN Gateway), an IoT service gateway, and Space-terrestrial network gateway, etc. The BNG's functions can be implemented by loading virtual network functions (VNFs) onto the virtualized telecom-cloud infrastructure. It is necessary to study the functional requirements of the border network gateway according to the different scenarios, the user access control, the service distribution and provision process, the signalling protocol and QoS guarantee mechanism for flexible resource scheduling when different forwarding performance requirements and security features are needed.

In addition, in order to realize the network automation operation and efficient and flexible scheduling of the network resources, artificial intelligence technology is introduced into the network. It is required to acquire the real-time network status data of the whole network from the key network elements (e.g., BNG) to achieve intelligent control decision to provide users with higher QoS guarantee. The data model, the data interaction process, and the signalling protocol need to be defined, so that the AI decision entity can acquire the real-time network status data, and deliver the optimized policy to the network elements (e.g., BNG) to implement efficient bearing the user services.

2 Question

Study items to be considered include, but are not limited to:

– What new protocols and procedures need to be specified to enable rapid provisioning of services over customer IP networks adopting emerging technologies (e.g., SDN/NFV, cloud computing, IoT, AI, MEC, etc.)?

– What new protocols and procedures need to be specified to enable services and policies to the customer through broadband network gateways adopting emerging technologies?

– What new protocols and procedures need to be specified to enable computing power network among multiple border network gateways?

– What new interfaces, protocols and functions need to be implemented for border network gateway to support emerging technologies?

– What new interfaces, protocols and functions need to be implemented for border network gateway to support the convergence of multiple access network technologies (including. fixed access, mobile access, IoT access and space access, etc.)?

– What new mechanisms, protocols and procedures need to be specified to distribute user's policies to control user's access and ensure user's QoS?

– What new protocols and procedures need to be specified to enable open networking value added service (VAS)?

– What new protocols and procedures need to be specified in border network gateway for bearing multi-services?

– What new protocols and procedures need to be specified to enable the AI-assisted network management and resource orchestration among multiple border network gateways?

– What new data model, protocol and interaction process to be specified to enable the AI decision entities acquiring the real-time status data from border network gateways?

## 3	Tasks

Tasks include, but are not limited to:

– develop service descriptions for the services, which are not described in other SDOs, and define terms as needed;

– develop new protocols and procedures to enable rapid provisioning of services over customer IP networks;

– develop new protocols and procedures to enable service to the customer through border network gateways adopting emerging technologies;

– develop new protocol and procedures to enable computing power network among multiple border network gateways;

– develop new requirements, protocols and functions for border network gateway to support emerging technologies (e.g., SDN/NFV, cloud computing, IoT, AI, MEC, etc.);

– develop new requirements, protocols and functions for border network gateway to support the convergence of multiple access network technologies (including fixed access, mobile access, IoT access and space access, etc.);

– develop new protocols and procedures for border network gateway to improve network resource utilization by intelligent network control;

– develop new protocols and procedures to enable the management and distribution of user's policies by SDN technologies;

– develop new protocols and procedures to enable open networking value added service (VAS);

– develop new protocols and procedures for bearing multi-services on BNG;

– development of methodology for security testing and test specification for security testing of protocol procedures relating to services provided by broadband network gateways;

– develop new protocol and procedures to enable the AI-assisted network management and resource orchestration among multiple border network gateways.

An up-to-date status of work under Q5/11 is contained in the SG11 work programme (https://www.itu.int/ITU-T/workprog/wp_search.aspx?sp=17&q=5/11).

4   Relationships

Recommendations:

–   Q, Y and H-series

Questions:

–   1/11, 2/11 and 4/11 on policy control

–   3/11, 7/11 and 16/11

Study Groups:

–   ITU-T SG13 and other Study Groups working on NGN, FNs, IMT-2020 and broadband
network gateways

–   ITU-T SG20

Other bodies:

–   Broadband Forum

–   IETF

–   ETSI

Open Source:

–   ONAP

WSIS action lines:

–   C2

Sustainable Development Goals:

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