

MR-522

Mobile-transport network slice instance Management Interfaces (MMI)-Overview

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1 Executive Summary

5G Network Slice facilitates multiple logical self-contained networks on the top of a common physical infrastructure platform enabling a flexible stakeholder ecosystem that allows technical and business innovation. In realizing a 5G Network Slice, the 3GPP management system needs to be aligned with the corresponding transport network management in order to ensure that the desired performance, functionality, and connectivity is fulfilled.

Broadband Forum specifies the interface between 5G Network Slice Orchestrator and transport network manager, refers to Mobile – transport network slice instance Management Interface (MMI) to enable 5G Network Slice in broadband networks.

2 Motivation

In order to meet the diverse needs of 5G services, network slicing came into being. Operators provide flexible deployment of limited network resources through network slicing application, and on-demand virtual network customization services to meet the differentiated needs of customers, improve customer experience, and potentially reduce network operating CAPEX and OPEX when used for convergence.

Network slice is known as a deployed or customized logical network provided to customers with end-to-end network capability guarantee. In the context of 5G, an end-to-end network slice is comprised of RAN slice and CN slice and its corresponding transport network connections (is referred to as IETF Network Slice) between RAN and CN. RAN and CN slice are maintained in 3GPP mobile network management system, while the IETF Network Slice is maintained in transport network management system. In realizing a 5G end-to-end slice, the 3GPP mobile management system needs to be aligned with the corresponding transport network management in order to ensure that the desired performance, functionality, and connectivity is fulfilled. There are some related works on network slice management and related service interfaces in other SDOs (e.g., 3GPP, IETF, etc.) the detailed information can refer to section 8.1 of TR-522. There is still a gap in the realization of communication between mobile and transport network slice management system in existing standards. To fill this gap, BBF specifies the Mobile and transport network slice Management Interface (MMI) in broadband network and service and function requirements on MMI in support of 5G network slice.

3 Introduction on MMI Interfaces

3.1 Reference Architecture of 5G Network Slice Management

A 5G Network Slice is comprised of RAN slice subnet and CN slice subnet. The transport slice subnet is considered to be the connection between or within RAN and CN slice subnets with performance guarantees. These network slice subnet(s) are managed by different subnet domains. The transport slice subnet is managed by transport network slice controller which is defined by IETF (refer to IETF draft-ietf-teas-ietf-network-slices [1]). This document uses IETF terms “5G Network Slice Orchestrator” for “NSMF” and “IETF Network Slice Controller” for “NSSMF”. For RAN Slice Controller and CN Slice Controller, the document refers to “Other External Controllers”. This term is similar to the informally used industry term {NSMF, NSSMF}. For an informative example of industry usage of those terms, see 3GPP TR 28.801. To implement 5G Network Slicing services with connectivity and performance guarantees, the following problems need to be solved: (1) To implement the IETF network slicing operation request (including SLO/SLE requirements) from 5G Network Slice Orchestrator to the IETF Network Slice Controller; (2) IETF Network Slice mapping or stitching with RAN slice subnet and CN slice subnet. The mobile transport network slice management interface (MMI) is required to solve the problems listed above.

The reference architecture of MMI interfaces is shown in figure 1:

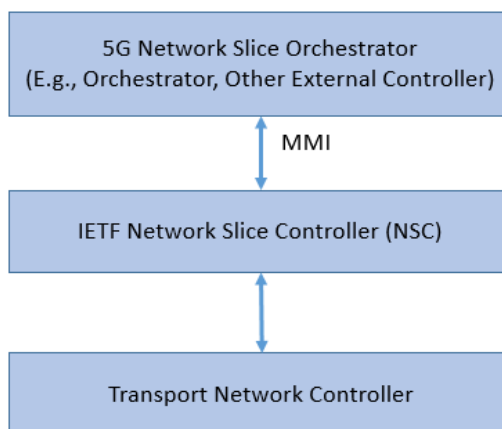


Figure 1 Architecture for MMI interfaces

The MMI is a set of interfaces that provide communication between 5G Network Slice Orchestrator and IETF Network Slice controller, in the context of 5G, the 5G Network Slice Orchestrator is a 3GPP network slice management system. The 5G Network Slice Orchestrator realizes automation and optimization of IETF network slices through the MMI interface.

The 5G Network Slice Orchestrator can request management of IETF Network Slice connected between RAN and CN slice subnet, or 3GPP RAN Slice Controller for requesting management of IETF Network Slice connected between RAN nodes, or CN Slice Controller used to request management of IETF Network Slice connected between CN nodes.

The IETF Network Slice Controller is responsible for the implementation of IETF Network Slice. It receives slice SLO parameter requirements through the MMI interfaces, and maps SLO to specific transport

technology requirements, and exposes the abstract data of the underlying transport network capabilities to the upper orchestrator, to providing necessary network resource to meet customer service requirements.

3.2 Functions for MMI interface

The operations of IETF Network Slice include: creation, modification, deletion, etc. Its instantiation and life-cycle management requirements are passed and processed through the MMI interface between Orchestrator (in case of 5G Network Slice) and IETF Network Slice Controller; see Figure 2 below.

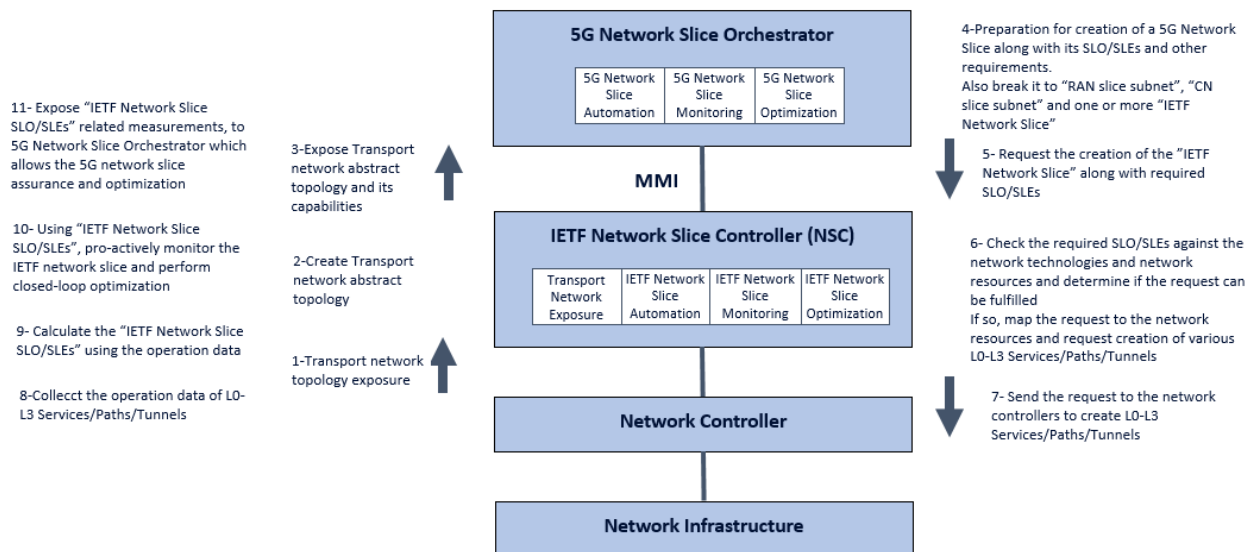


Figure 2 High-level functions for MMI interfaces

Steps 1-3 show how the abstract topology of transport network will be discovered by 5G Network Slice Orchestrator via MMI interfaces.

Steps 4-7 show how the 5G Network Slice Orchestrator will request enablement (i.e., creation, modification, deletion) of IETF Network Slices via MMI interfaces.

Steps 8-11 show how the IETF Network Slice monitoring data will be exposed to 5G Network Slice Orchestrator via MMI interfaces.

An IETF Network Slice is a virtual network with a set of connections among endpoints; it is abstract and agnostic with technology. Operators (managed IETF Network Slice Controller) can provide network slice service to satisfy the requests for specific network capability through MMI interfaces to customers.

The IETF Network Slice Controller receives requests for operating the IETF Network Slice with SLO requirements through MMI interface, then maps the SLO requirements to underlying specific network resources to realize the instantiation and activation of the IETF Network Slice. After receiving requests from the IETF Network Slice Controller, the underlying Network Controller will calculate the path according to the network attributes (such as link delay, metric, bandwidth, and other constraints) and provide necessary connectivity that meet customer requests such as low latency or high bandwidth service. As defined in ongoing IETF work, the IETF Network Slice Controller is responsible for the interaction with the underlying

network controllers. The IETF Network Slice Controller exposes the abstract network topology to 5G Network Slice Orchestrator through the MMI interfaces.

3.3 MMI Data Models

Referring to the MMI architecture, as defined in [section 3.1](#), the data model for MMI interface is a service model which is hosted by Operators (manage IETF Network Slice Controller) receiving requests for network slice and providing necessary network slice service to customers with SLO requirements guarantee. The MMI data models refer to IETF Network Slice service model.

4 Summary

Network Slicing is a significant capability for the delivery of innovative, ultra-fast, hyper-connected, and value-added services. At present, other SDOs (including 3GPP, IETF, ITU-T, ETSI, etc.) also have many standard specifications for network slicing, but there is a lack of specifications on network slicing for realizing multi-domain connectivity across network slice management domains.

BBF is leading the effort to specify the MMI and identify its corresponding service and functional requirements to be supported in the context of 5G Network Slice. This will provide vendors with technical guidance on equipment R&D and deployment and address interoperability, and enable operators to plan and deploy 5G Network Slicing services to satisfy customer's SLAs.

5 Terminology

5.1 References

The following references are of relevance to this paper. At the time of publication, the editions indicated were valid. All references are subject to revision; users of this paper are therefore encouraged to investigate the possibility of applying the most recent edition of the references listed below.

A list of currently valid Broadband Forum Technical Reports is published at www.broadband-forum.org.

Document	Title	Source	Year
[1] draft-ietf-teas-ietf-network-slices-10	Framework for IETF Network Slices	IETF	2022

5.2 Abbreviations

This paper uses the following abbreviations:

CapEx	Capital Expense
CN	Core Network
MMI	Mobile-transport network slice instance Management Interface
OpEx	Operating Expense
RAN	Radio Access Network
SLA	Service Level Agreement
SLE	Service Level Expectation
SLO	Service Level Objectives

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