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Transport Slice Intent
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Abstract

Slicing at the transport network is expected to be offered as part of end-to-end network slices, fostered by the introduction of new services such as 5G. This document explores the usage of intent technologies for requesting transport slices.

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1. Introduction

Network slicing is emerging as the future model for service offering in telecom operator networks. Conceptually, network slicing provides a customer with an apparent dedicated network built on top of logical (i.e. virtual) and/or physical functions and resources supported by a shared infrastructure, provided by one or more telecom operators.

The concept of network slicing has been largely fostered by the advent of 5G services that are expected to be deployed on top of different kind of slices, each built to support specific characteristics (extreme low latency, high bandwidth, etc).

As part of an end-to-end network slice it is expected to have a number of transport network slices providing the necessary connectivity to the rest of components of the end-to-end slice, e.g., mobile packet core slice.

For a definition of a transport slice refer to [I-D.nsdt-teas-transport-slice-definition]. The following paragraph is directly taken from it: "A transport slice is built based on a request from a higher operations system. The interface to higher operations systems should express the needed connectivity in a technology-agnostic way, and slice customers do not need to recognize concrete configurations based on the technologies (e.g being more declarative than imperative). The request to instantiate a transport slice is represented with some indicators such as SLO, and technologies are selected and managed accordingly."

Intent is a high-level, declarative goal that operates at the level of a network and services it provides, not individual devices. It is used to define outcomes and high-level operational goals.

In consequence, it seems very convenient to apply the intent-based mechanisms for the provision of transport network slices, providing the adequate level of abstraction towards the transport network control and management planes.

This document leverages current industry trends in the definition of end-to-end network slices. The final objective is to describe intents that can be used to flexibly declare the operational aspects and goals of a transport network slice, meaning that the customer could declare what kind of transport slice is needed (the outcome) and not how to achieve the goals of the transport slice.

2. Transport slice intent

As stated in [I-D.irtf-nmrg-ibn-concepts-definitions], "Intent is a declaration of operational goals that a network should meet and outcomes that the network is supposed to deliver, without specifying how to achieve them. Those goals and outcomes are defined in a manner that is purely declarative - they specify what to accomplish, not how to achieve it."

When applied to transport networks, this implies that an intent for transport slices should provide the necessary abstraction with respect to implementation details, including the final devices (or resources) involved, and be focused on the characteristics and performance expectations related to it.

With that intent it can be expected that the intent based system can fulfill and assure the requested transport network slice, triggering initial configurations at the time of initial provisioning and corrective actions during the transport slice lifetime.

3. Foundation of transport slice intents

The industrial interest around 5G is accelerating network deployments and operational changes.

With this respect, the GSMA has been developing a universal blueprint that can be used by any vertical customer to request the deployment of a network slice instance (NSI) based on a specific set of service requirements. Such a blueprint is a network slice descriptor called Generic Slice Template (GST) [GSMA]. The GST contains multiple attributes that can be used to characterize a network slice. A

particular template filled with values generates a specific Network Slice Type(NEST).

Such templates refer to the end-to-end network slice, including the transport part. Despite the fact that some of the values would not have applicability for the transport network, others do. An analysis of the relevant attributes is performed in [I-D.contreras-teas-slice-nbi].

According to 3GPP propositions [TS28.541], an upper 3GPP Management System interacts with the transport network for establishing the necessary slices at the transport level. Such interaction can be expected to happen using the transport slice intent, described to an intent-based system (IBS) in the transport network part. Then, according to the intent lifecycle in [I-D.irtf-nmrg-ibn-concepts-definitions], the IBS, after recognizing the intent, will proceed to translate it in order to interact with a transport slice controller by using a NBI as proposed in [I-D.contreras-teas-slice-nbi].

4. Mechanisms for translating transport slice intents

This section describes approaches for implementing mechanisms to translate transport slice intents.

4.1. Translation approaches and interaction with the upper systems

A suite of mechanisms will be required to allow instantiation of the user's intent into a transport slice. In order to be able to deliver an end2end Intent driven slice - a well defined set of context aware attributes that allow unambiguous instantiation of the intent should be agreed upon. A combination of a structured set of attributes communicated between an IBN and an upper layer system with user input would allow an IBN to have intent modeled and reason about its completeness/validity. Translation approaches and interaction with the upper systems might benefit from Natural Language Processing (NLP) technics that are needed for enabling high level expression of requirements found missing. The goal would be to identify and classify the answers for as many fields as possible from the Generic Slice Template (GST), based on the free text / speech provided by the user. As it is highly unlikely that the minimum set of fields to properly define a transport slice (geo-temporal characteristics, performance characteristics, SLO and SLA properties) will be fulfilled in this first step, a follow up two-step approach might need to be implemented.

o The minimum missing fields from the GST have to be identified and appropriate questions have to be generated (e.g. based on a pool

of available questions correlated with each field, or based on AI approaches).

o An iterative interrogation phase will be initiated towards the user using the previously generated questions, until the user provides all the missing information, so the intent can be modeled accordingly.

Interaction with the user and higher-up systems can potentially be further improved by utilizing Machine Learning techniques.

4.2. Intent-based system suite

In order to consolidate on the set of devices, technologies and resources to be used, a combination of deterministic or stochastic computation approaches will be needed. Deterministic approaches will rely on mathematical models and respective algorithms. Stochastic approaches will rely on technologies like machine learning. Their goal will be to learn from experience, so as to optimize future decisions from the viewpoint of speed and reliability. The target of learning will be related to the service behavior and to the anticipated network status in the area and time period of the service provision.

5. Security Considerations

To be done.

6. IANA Considerations

This draft does not include any IANA considerations

7. References

[GSMA] "Generic Network Slice Template, version 3.0", NG.116 , May 2020.

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[TS28.541]
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