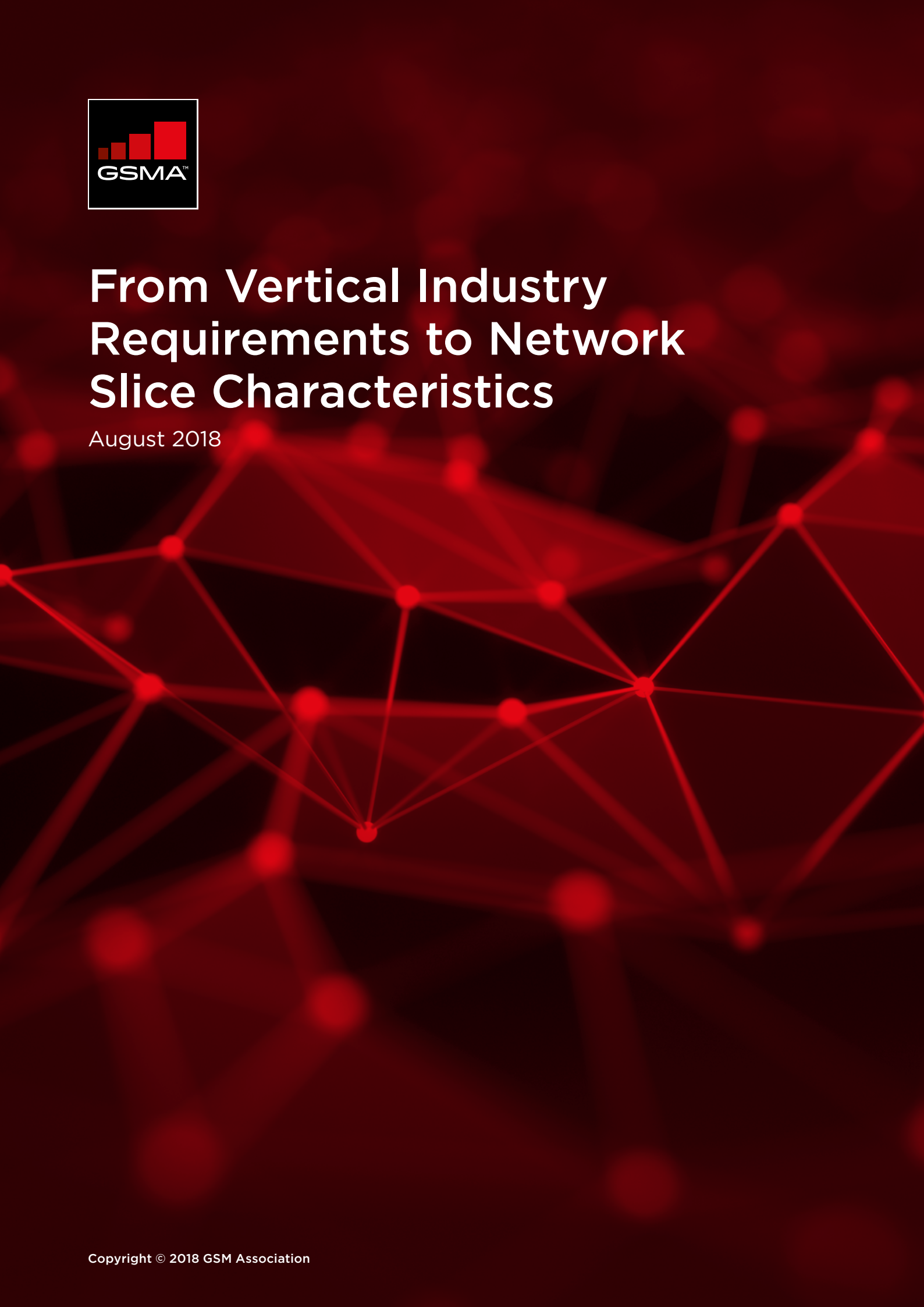

From Vertical Industry Requirements to Network Slice Characteristics

August 2018

About the GSMA

The GSMA represents the interests of mobile operators worldwide, uniting more than 750 operators with over 350 companies in the broader mobile ecosystem, including handset and device makers, software companies, equipment providers and internet companies, as well as organisations in adjacent industry sectors. The GSMA also produces industry-leading events such as Mobile World Congress, Mobile World Congress Shanghai, Mobile World Congress Americas and the Mobile 360 Series of conferences.

For more information, please visit the GSMA corporate website at www.gsma.com. Follow the GSMA on Twitter: @GSMA.

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About the Future Networks Programme

The GSMA's Future Networks Programme guides the mobile industry on how to use Internet Protocols (IP) to reduce the cost of transferring data, while meeting customers' expectations around reliability, security and interoperability.

The Programme is making it easier for operators to deploy Rich Communications Services (RCS); an evolution in mobile messaging, and is working closely with operators, aggregators, brands and technology providers to ensure that RCS is the future of brand communications.

The GSMA's holistic approach to 5G will ensure that vertical markets and consumers benefit from the opportunities created within the 5G Era. To meet user data demand and vertical capabilities, Future Networks will encourage innovative ways to reduce the capital intensity of the next generational step.

For more information, please visit the Future Networks website at: www.gsma.com/futurenetworks

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Contents

1 Introduction

Network Slicing is set to be a prominent feature of 5G to allow connectivity and data processing tailored to specific customers' requirements. Mobile communications provided by smart networks will enhance the efficiency and productivity of business processes and will open up opportunities for operators to address the Business-to-Business segment more effectively.

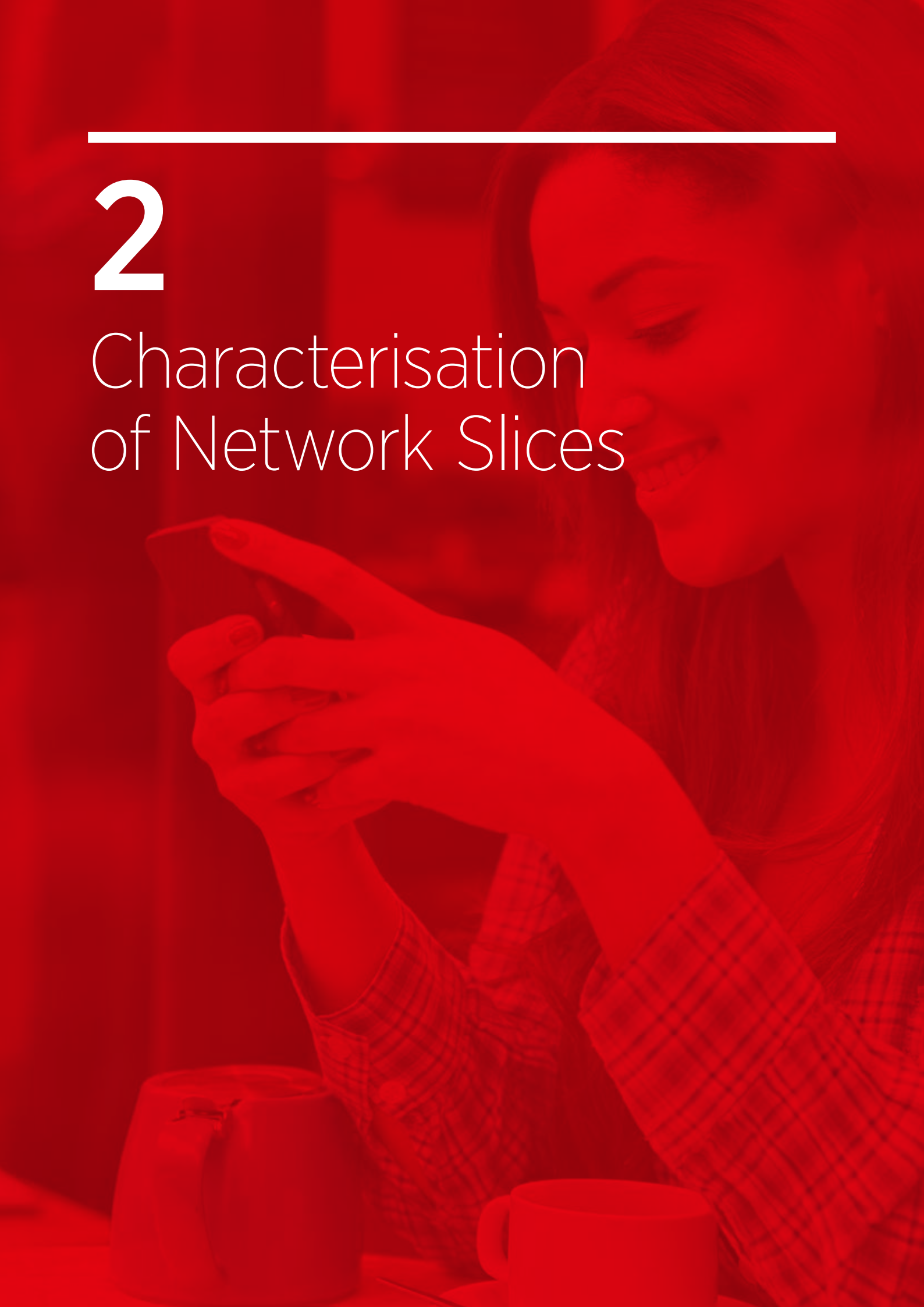
This paper proposes the adoption of a Generic Slice Template (GST) that defines a set of common slice attributes the industry can use on which to base the description of a network slice type. These attributes can be used by vendors, mobile network operators and slice customers, in addition to other proprietary attributes if custom slices are desired. By filling the GST with values for all or a subset of the attributes concrete slices can be described. A GST filled with values is called the NEtwork Slice Type (NEST), which serves many purposes:

- Vendors can use a NEST to define the features of their products
- Vertical Industry customers (slice customers) can use a NEST as a reference to understand the contractual agreements with the network operator
- Network operators (slice provider) can use a NEST with their roaming partners facilitating the definition of network slices in roaming agreements.

This document aims to describe the concept of the GST and NEST and how they are used to create commercial slice deployments. The following basic assumptions and definitions must be understood and agreed within the whole network slicing eco-system in order to guarantee global and high quality service availability.

2

Characterisation of Network Slices



Network slicing will be relevant for various use cases from vertical industries and might be applied in all future networks around the world. Therefore, it is essential to have a common method that the industry can refer to in order to describe the characteristics of any slice.

Figure 1 places the GST in context of the network slice lifecycle. It is fundamental to understand the use cases and requirements of the slice customers and to represent them in a common language using the Generic Slice Template (GST) and the NEtwork Slice Type (NEST). The GST is a set of attributes (e.g. supported throughput, supported functionality, provided application programming interfaces (APIs), etc.) that characterise any slice. It contains the attribute names, definitions and units. The NEST is a GST filled with values and/or ranges based on specific vertical industry use cases. A NEST is essential for a network operator to instantiate equivalent slices, e.g. in terms of performance, functions, etc.

We consider these concepts to be the baseline for the network slice provisioning, so that:

- the slice customer knows how to express the service requirements and is assured that such requirements can be met;
- the slice provider knows what to deliver,
- there is a sound basis for a contractual agreement between the slice provider and the slice customer,
- UEs can roam into another network, but maintain access to the services that require particular network capabilities e.g. by allowing a home network operator to buy a slice in a visited domain or by having commonly defined slices available in each network.

The NEST is input to the network slice preparation where the Network Slice Template (NST) is created, which is defined in 3GPP TS 28.531. The NST contains the network functions, their interconnection and configuration to deliver functionality and meet the service requirements according to the information included in the NEST. The NST is a template from which Network Slice Instances (NSIs) are created. A NSI is a set of network function instances and the required resources (e.g. compute, storage and networking resources) which form a deployed network slice.

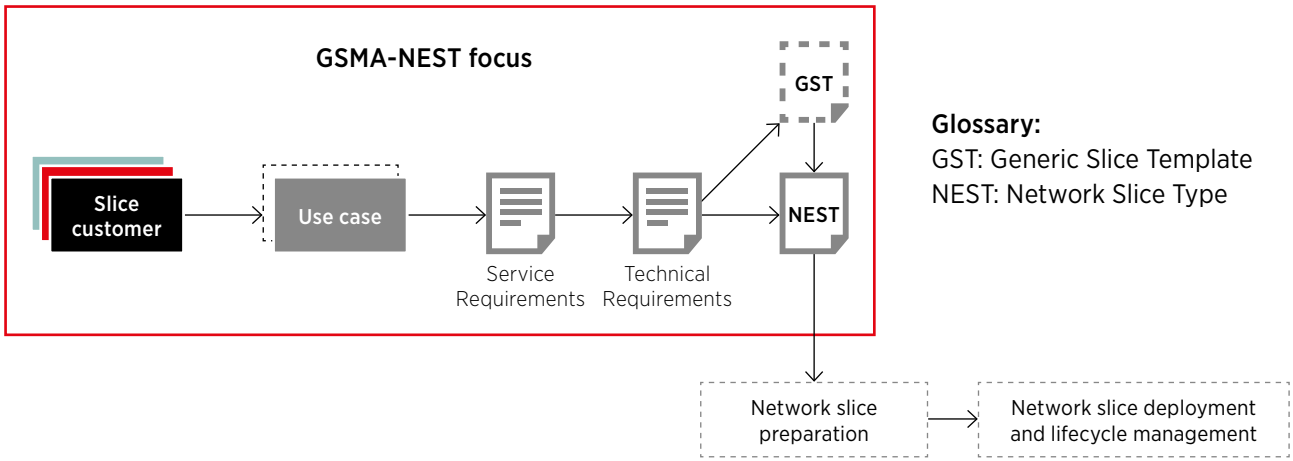
In order to create the NST, the network slice preparation takes the NEST as well as information about the network and infrastructure into account. For an MNO that wishes to support a NEST based slice, it is expected that one or more NSTs are derived from a NEST.

It is up to the network operators to instantiate one or multiple NSIs of an NST, e.g. to run isolated logical networks for different customers (if they have the same requirements).

The focus of the GSMA Network Slicing Taskforce (GSMA-NEST) is two-fold: (1) the definition of the GST and (2) the identification and definition of a basic set of slices with industry accepted slice characteristics. NESTs with industry accepted characteristics are defined as filled-in versions of a GST, with specific values or value ranges that have been commonly agreed by the GSMA-NEST and can be used by operators if they consider it appropriate.

In the following sections, more details about the GST and NEST are provided.

Figure 1: Focus of GSMA-NEST is on the definition of the GST and the identification and definition of a basic set of standardized NESTs



2.1 Generic Slice Template (GST)

The GST is a set of attributes that characterise any slice. It contains the attribute names and their definitions. Such attributes could be for instance the supported throughput in up- and downlink, the supported E2E delay, the coverage area of the slice, etc.

The GST as the name says is generic and not specific for any vertical industry, but it is usable by any vertical industry's current or future 5G services. Also from the network point of view, the GST is generic and is not tied to a specific network design, implementation or deployment.

2.2 Network Slice Type (NEST)

The NEST defines the characteristics of a network slice by means of filling the GST with values and/or ranges based on specific use cases and customer requirements. The GST attributes are envisioned to be sufficient to describe network slice types in that they can be fully constructed by allocating values (or ranges of values) to each relevant attribute in the GST. NESTs are used by a network operator to identify the network resources and functions needed to instantiate network slices. As like the GST, also the NEST is not tied to a specific network design, implementation or deployment.

The process to fill in the GST and to create a NEST comprises three steps:

1. Study use cases and derive service requirements based on discussions with the slice customers, e.g. vertical industries, enterprises, etc.
2. The service requirements identified in (1) are converted into technical requirements
3. The technical requirements produced in (2) are documented using the NEST by filling in the values of each of the attributes of the GST

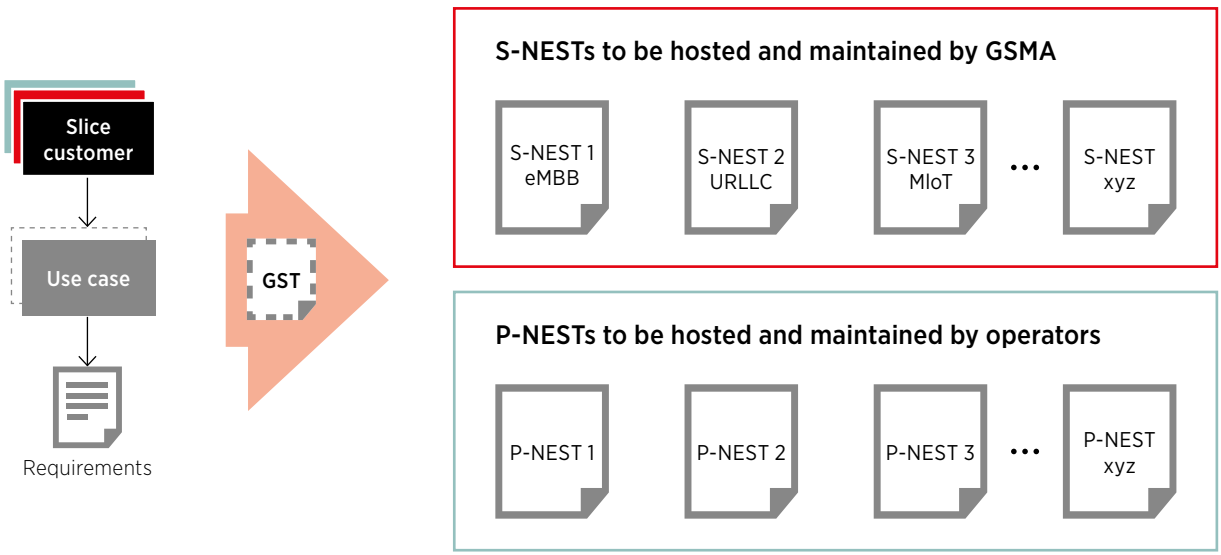
GSMA-NEST aims to deliver a set of NESTs with industry accepted slice characteristics (S-NESTs), which will be shared between all network operators. A set of industry wide S-NESTs are beneficial in order to replicate slice behaviour across network boundaries, to unlock "basic" roaming models and to simplify network slicing rollout. S-NESTs would for instance be beneficial to manufacture products that work on any network or to support basic roaming as it would be as simple as agreeing on the S-NEST to be provided to an inbound roamer, e.g. in roaming agreements S-NEST can be used as fall-back (closest slice to the one provided in the home network) or directly.

Besides that, network operators are free to define operator-specific (private) NESTs (P-NESTs), see Figure 2. GSMA-NEST is not going to specify P-NESTs but the specification of P-NESTs is done based on negotiations between the network operator and its customers.

It should be clear that the instantiation of network slices from a NST that matches an S-NEST is not mandatory but is decided by the network operators themselves, e.g. based on business related aspects.

A NSI instantiated from a NST that corresponds to one or multiple NESTs is expected to serve a variety of use cases if the attributes are ranges rather than strict values. For example, two use cases where the only difference is the maximum throughput could be served by the same NSI if it was possible to set attributes based on e.g. subscription information.

Figure 2: Standardised and private NESTs



3

Commonly Defined Slice Characteristics Across Networks Boundaries

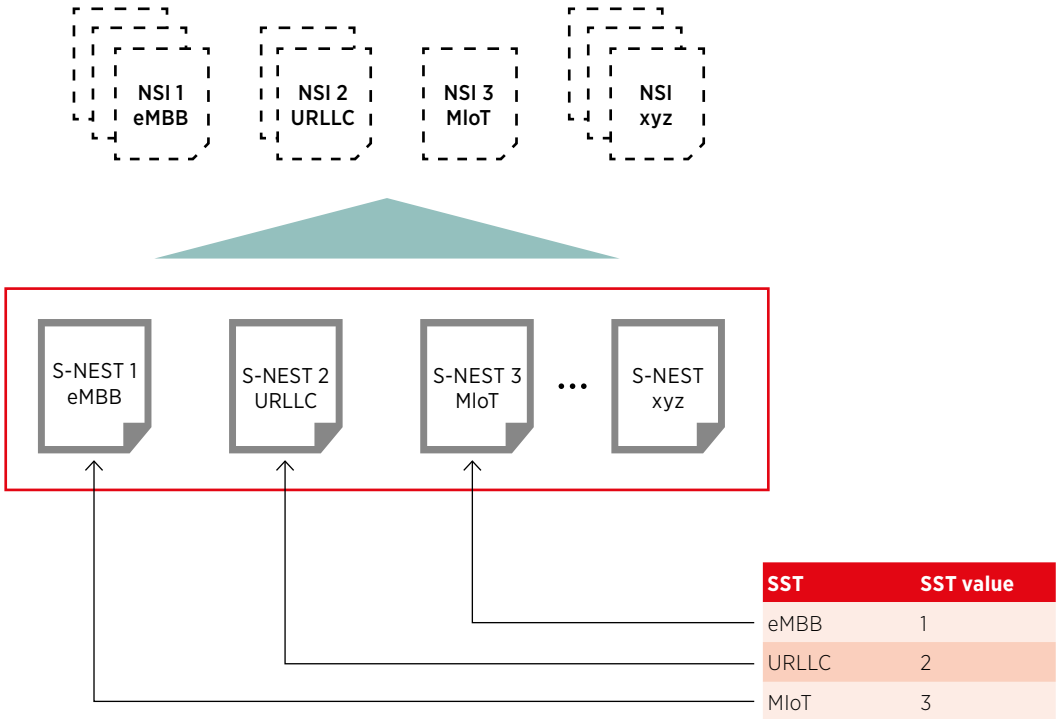
NESTs with industry accepted slice characteristics, specified by the GSMA, are associated with one or multiple standardised Slice/Service Type values in order to identify them uniquely around the world and to guarantee global and high quality service availability.

In 3GPP TS 23.501, the Slice/Service Type (SST) is used to refer to an expected network slice behavior in terms of features and services. Standardized SSTs assigned by the 3GPP are used in order to identify slices uniquely around the world. The following SSTs and their respective values are defined for now:

1. Enhanced Mobile Broadband – eMBB
2. Ultra reliable low latency communication – URLLC
3. Massive Internet of Things – MIoT

However, 3GPP does not specify the characteristics of these SSTs. These characteristics are to be specified in the S-NESTs. Therefore, an S-NEST is associated to one or multiple standardized SST values in order to identify it uniquely around the world, see Figure 3.

Figure 3: S-NESTs are associated to standardised SST values in order to make the globally available and to identify them uniquely



SST	SST value
eMBB	1
URLLC	2
MIoT	3

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