**3GPP TSG-SA5 Meeting #141-e *S5-221547***

**e-meeting, 17 -26 January 2022**

**Source: Ericsson España S.A.**

**Title: Discussion paper on definition of tenant**

**Document for: Endorsement**

**Agenda Item: 5.2**

# 1 Decision/action requested

**Agree on a definition and usage of the tenant concept.**

# 2 References

[1] 3GPP TS 21.916: " Release 16 Description; Summary of Rel-16 Work Items"

[2] 3GPP TS 22.261: "Service requirements for the 5G system; Stage 1"

[3] 3GPP TS 22.804: "Study on Communication for Automation in Vertical Domains"

[4] 3GPP TS 22.821: "Feasibility Study on LAN Support in 5G"

[5] 3GPP TS 22.830: "Feasibility Study on Business Role Models for Network Slicing"

[6] 3GPP TS 23.700-24: "Study on support of the 5G MSG (Message) Service"

[7] 3GPP TS 23.740: " Study on Enhancement of Network Slicing"

[8] 3GPP TS 23.764: "Study on enhancements to application layer support for V2X services"

[9] 3GPP TS 23.795: "Study on application layer support for V2X services"

[10] 3GPP TS 28.201: " Charging management; Network slice performance and analytics charging in the 5G System (5GS); Stage 2"

[11] 3GPP TS 28.202: "Charging management; Network slice management charging in the 5G System (5GS); Stage 2"

[12] 3GPP TS 28.530: "Management and orchestration; Concepts, use cases and requirements"

[13] 3GPP TS 28.533: "Management and orchestration; Architecture framework"

[14] 3GPP TS 28.550: " Management and orchestration; Performance assurance "

[15] 3GPP TS 28.552: "Management and orchestration; 5G performance measurements"

[16] 3GPP TS 28.804: "Study on tenancy concept in 5G networks and network slicing management"

[17] 3GPP TS 28.809: "Management and orchestration; Study on enhancement of Management Data Analytics (MDA)"

[18] 3GPP TS 32.291: "Telecommunication management; Charging management; 5G system; Charging service, stage 3"

[19] 3GPP TS 38.300: " NR; NR and NG-RAN Overall Description; Stage 2"

[20] 3GPP TS 38.832: "NR; Study on enhancement of Radio Access Network (RAN) slicing"

[21] 3GPP TS 23.003: "Numbering, addressing and identification"

[22] 3GPP TS 23.501: " System architecture for the 5G System (5GS); Stage 2"

# 3 Rationale

The use and definition of the tenant concept is unclear and have inconsistencies that need to be resolved or at least described how it is to be treated.

# 4 Detailed proposal

## 4.1 Current definitions

TS 21.916 [1] clause 16.2: “In 3GPP management system, tenant is type of communication service consumer and tenant represents a group of MnS consumers associated with the management capabilities they are allowed to access and consume.”

TS 22.261 [2] annex F.1: “Network diagnostic information needs to be generated automatically and, in case of a hosted or virtual network deployment, be made available to the tenant of the network via a suitable API.”

TS 22.804 [3] clause 3.1: “**private slice:** a dedicated network slice deployment for the sole use by a specific tenant.”

TS 22.821 [4] clause 5.5.2: “All the tenants of OfficeSpace are subscribers of a private data communication service from their favourite mobile network operator.”

TS 22.830 [5] annex A: “Replacing tenant with 3rd party”

TS 23.700-24 [6] clause 6.6.1: “Editor's Note: Any solution needs to distinguish between UE charging and vertical/tenant charging and all charging solutions for MSGin5G services should be specified in SA5 which should be involved at some stage.

TS 23.740 [7] clause 6.1.3.2: “Those slices that can be used simultaneously with any other slice of the same SD filed (e.g. all slices from same tenant, e.g. from same vertical customer) by a the UE and e.g. can share same AMF dedicated for the SD in the CN.”

TS 23.764 [8] clause 5.3: “Network slicing is a set of technologies to support network service differentiation and meet the diversified requirements from tenants like vertical industries as specified in clause 5.15 of 3GPP TS 23.501 [11]. Network slice is a logical network that provides specific network capabilities and network characteristics. The application support for slices is a standardized feature in 3GPP 5GS and mainly involves the interaction between the 5GS (e.g. slice management system) and the 3rd party (tenants) for the pre-commissioning, operation and management of the slice end-to-end as specified in 3GPP TS 28.530 [14].”

TS 23.795 [9] clause 5.3: “Network slicing is a set of technologies to support network service differentiation and meet the diversified requirements from tenants like vertical industries as specified in subclause 5.15 of 3GPP TS 23.501 [11]. Network slice is a logical network that provides specific network capabilities and network characteristics. The application support for slices is a standardized feature in 3GPP 5GS and mainly involves the interaction between the 5GS (e.g. slice management system) and the 3rd party (tenants) for the pre-commissioning, operation and management of the slice end-to-end as specified in 3GPP TS 28.530 [21].”

TS 28.201 [10] clause 6.1.1.2: “Tenant Identifier: This field if present is the identifier of subscriber of network slice.”

TS 28.202 [11] clause 5.1.1: “The network slice subscriber is the tenant, i.e. the party for which the network slice instance(s) is(are) created, satisfying the requirements of subscribed-to service(s).

NOTE 1: these service(s) requirements may take the form of Service Level Specification (SLS) per TS 28.530 [251] definition, supplied by external service providers (e.g. MVNO, Verticals, enterprises), in which case the tenant is the external service provider.

NOTE 2: these service(s) requirements may be built by a MNO for its own operational needs, in which case the tenant is the MNO itself, and the tenant id may not be present.

Depending on the relationship and deployment model between the tenant and the party owning the MnS producer, the MnS consumer of the provisioning MnS may be the tenant.”

TS 28.202 [11] clause 6.1.1.2: “Tenant Identifier: This fields holds the identifier of the tenant the network slice instance is created for.”

TS 28.530 [12] clause 4.1.9: “Tenant information purpose is to support multiple tenant environment in 5G network management. The 3GPP management system may use tenant information for the following:

- Associating service(s) provided by 3GPP system, e.g. network slice(s), with the tenant.

- Controlling management capabilities access by the tenant.”

TS 28.530 [12] clause 4.8: “A tenant might take the role of a NSC.”

TS 28.533 [13] clause 4.8: “In 3GPP management sytem, tenant represents a group of MnS consumers associated with the management capabilities they are allowed to access and consume. The 3GPP management system provides multi-tenancy support, by associating different tenants with different sets of management capabilities. Every tenant may be authorized to access and consume those MnSs that the operator makes available to this tenant based on SLA.”

TS 28.550 [14] clause 4.4: “The MnS consumer, acting on behalf of a tenant, may get the performance measurements of a network slice.. Performance measurements specified in TS 28.552 [1] can be split into sub-counters per S-NSSAI. 3GPP management system can use these sub-counters to distinguish performance measurements for different tenants, which might be required when performance measurements are exposed as part of Network Slice as a Service (NSaaS) specified in TS 28.530 [23].”

TS 28.550 [14] clause 5.1.7: “To enable the tenant obtain their own network slice performance data in the Network Slice as a Service (NSaaS) scenario. Tenant plays the role of network slice performance data consumer. The tenant related S-NSSAI(s) is configured for network slice. The authorized network slice performance data consumer(s) (i.e. tenant) request the network slice performance data provider to report his own performance data.”

TS 28.552 [15] clause 4.1: “When providing a communication service to a tenant, the performance indicators can be derived from corresponding performance indicators related to network slice, network slice subnet and NFs and they can be made available via the corresponding performance management service, consumed by a tenant. Tenant(s) may be associated with S-NSSAI or sNSSAIList in which case, the performance indicators are split into subcounters per S-NSSAI for individual tenant.”

TS 28.804 [16] clause 3.1: “**Tenant in 3GPP management system:** A group of 3GPP management system users associated with the management capabilities they are allowed to access and consume.”

TS 28.804 [16] clause 4.1: “As described in Figure 4.1-1 and Figure 4.1-2, for fulfilling the tenancy concept, operators' can have different options to share their management resources between multiple tenants (e.g. operator's business customers)”

TS 28.804 [16] clause 4.3: “Tenant concept can be considered as a group of user in software and virtualization context. The 3rd party consumer using 3GPP management capability can represent a tenant that use communication service (e.g. an enterprise user).”

TS 28.804 [16] clause 4.1: “When the 3rd party consumer is represented as group of users, identified as tenants (e.g. enterprises that consume V2X service), tenants should be able to consume management services that are exposed to them.”

TS 28.809 [17] clause 6.1.2.1: “In providing a network slice, a 3rd party (i.e. slice tenant) issues a slice request indicating the desired SLA, which includes among other parameters as indicated in GSMA NG.116 [32], the slice coverage (also referred to as coverage area of the network slice or area of service as per GSMA NG.116 [32]).”

TS 32.291 [18] clause 6.1.6.2.7.1: “tenantIdentifier: This field contains the identification of the subscriber of the network slice”

TS 38.300 [19] clause 16.3.1: “Network Slicing is a concept to allow differentiated treatment depending on each customer requirements. With slicing, it is possible for Mobile Network Operators (MNO) to consider customers as belonging to different tenant types with each having different service requirements that govern in terms of what slice types each tenant is eligible to use based on Service Level Agreement (SLA) and subscriptions.”

TS 38.832 [20] clause 6.2.1.1.1: “This option assumes that the remapping policy is rather static because it should have been validated by the tenant or the operator.”

## 4.2 Analysis

From the definitions above there seems to be five main uses of tenant:

- A 3rd-party from an operator perspective

- A vertical industry

- A subscription when the subscriber is an enterprise

- A group of users

- A representation of the SLA i.e., technical part of the service level specification

All except the definition as a vertical industry can be combined, since all the others are representations of a subscription when the subscriber isn’t an individual but an enterprise. A group of users would belong one enterprise, but the enterprise could have several groups of users. The reason for this is that an enterprise in many cases have a hierarchical structure where each department may be separate groups or even different subscribers. The technical part of the service layer specification is closely connected to the subscription however, several subscriptions will share the same service level requirements and it may there for not specific for a subscription.

This means that the tenant, as used today, can represents a: a subscription, a group of users, a service level specification, or an enterprise.

In 5G there are several identifiers that could identify a subscriber, but the main ones are the Subscription Permanent Identifier (SUPI, TS 23.003 [21] clause 2.2A) and Generic Public Subscriber Identifier (GPSI, TS 23.003 [21] clause 28.8). Neither of these states if they are intended for enterprises or individuals, meaning that they can be used in either context.

There are two major identifiers for groups: external group identifier (TS 23.003 [21] clause 19.7.3) and internal group identifier (TS 23.003 [21] clause 28.9). There are more groups defined that have more specific usage like closed groups etc. The main use of these two groups have been in the exposure domain to be able to address several UEs at the same time, but they could be used for other purposes.

For the technical part of the service level specification there are several identifiers that could be considered, like information stored together with the subscription in the UDR or the network policy rules from the PCF. In the case of network slicing the closest identifier is the S-NSSAI which is associated with the service requirements that needs to be fulfilled by the network slice selected.

There is no generic representation of an enterprise or individual in 3GPP, only when they take the role as a subscriber, will they have a representation and then in the form of a subscription. The reason for this might be that 3GPP doesn’t (currently) handle the any interaction before the customer have bought a product offering.

## 4.5 Conclusion

There is a need to decide if the tenant represents: a subscription, a group of users, a service level specification, or an enterprise. Since this will make it clearer what type of attribute that may be reused and what it should be associated with.

If it is seen as a subscription something similar to the SUPI/GPSI could be considered.

If it seen as a service level specification (representation of the technical part), then for network slicing the closes is the S-NSSAI which indicates the requirements that is needed to be fulfilled by the network slice to be selected.

If it is seen as a group of users, then the group identifiers should be considered since one enterprise would have several groups of users depending on role and authority.

If it is seen as the actual enterprise this would be something completely new in 3GPP and would probably require study with use cases etc.

## 4.6 Recommendation

The recommendation would be to see it as a subscription type of identifier, since this is how it is currently used in the charging specifications.