**3GPP TSG-SA5 Meeting #140-e *S5-216056rev1***

**e-meeting, 15 - 24 November 2021**

**Source: Huawei**

**Title: Update names for management modes of NPN**

**Document for: Approval**

**Agenda Item: 6.4.1**

# 1 Decision/action requested

***Discuss and approve on the proposal.***

# 2 References

[1] TS 28.557 Management of non-public networks; Stage 1 and stage 2 v1.1.0

# 3 Rationale

It is proposed to add solutions to update the names of management modes of NPN for a better readability in draft TS 28.557 [1].

# 4 Detailed proposal

This document proposes the following changes in TS 28.557 [1].

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| **1st Change** |

### 4.3.2 Management Scenarios

4.3.2.1 General

Different management modes of NPN are listed in table 4.3-1.

4.3.2.2 PNI-NPN

**- MNO Managed**: The NPN operator role is entirely played by a mobile network operator, which also plays the Network Operator (NOP) role (see definition in TS 28.530 [2], clause 4.8) for PLMN. In this case, no specific spectrum resources are required and service continuity (e.g. roaming) with PLMN is ensured by the mobile network operator who manages both PNI-NPN and PLMN.

**- MNO-Vertical Managed**: The NPN operator role is played by two parties: a mobile network operator, which also plays the NOP role for PLMN, and a vertical customer. The mobile network operator performs the main management tasks related to the PNI-NPN, while allowing the vertical to retain some control over this PNI-NPN. To that end, the vertical consumes the management capabilities exposed by the mobile network operator, being this exposure regulated according to the business agreement between the two parties. The mobile network operator shall restrict the types (e.g. provisioning, fault supervision, performance assurance) of management capabilities and corresponding managed network resource (e.g. NRM fragments) exposed to a vertical. In this case, no specific spectrum resources are required and service continuity (e.g. roaming) with PLMN is ensured by the mobile network operator who manages both PNI-NPN and PLMN. The vertical can also outsource its PNI-NPN management tasks to other third party OAM service provider.

4.3.2.3 SNPN

**- MNO Managed**: The NPN operator role is entirely played by a mobile network operator, which also plays the NOP role for PLMN In this case, specific spectrum resources (e.g. unlicensed spectrums) are required, and cooperation with PLMN Operator may be needed if there is requested NPN connectivity to external PLMN resources (e.g. to allow UEs registered into the SNPN to access public network services).

**- MNO-Vertical Managed**: The NPN operator role is played by two parties: a mobile network operator, which also plays the NOP role for PLMN, and a vertical customer. The mobile network operator performs the main management tasks related to the SNPN, while allowing the vertical to retain some control over this SNPN. To that end, the vertical consumes the management capabilities exposed by the mobile network operator, being this exposure regulated according to the business agreement between the two parties. The mobile network operator shall restrict the types (e.g. provisioning, fault supervision, performance assurance) of management capabilities and corresponding managed network resource (e.g. NRM fragments) exposed to a vertical. In this case, specific spectrum resources (e.g. unlicensed spectrums) are required, and cooperation with PLMN Operator may be needed if there is requested NPN connectivity to external PLMN resources (e.g. to allow UEs registered into the SNPN to access public network services). The management tasks for the SNPN are performed mainly by the mobile network operator and the vertical with some management capabilities. The vertical can also outsource its SNPN management tasks to other third party OAM service provider.

**- Vertical Managed**: The NPN operator role is entirely played by a vertical. In this case, specific spectrum resources (e.g. unlicensed spectrums) are required, and cooperation with PLMN Operator may be needed if there is requested NPN connectivity to external PLMN resources (e.g. to allow UEs registered into the SNPN to access public network services). The vertical can also outsource its SNPN management tasks to other third party OAM service provider.

Table 4.3-1: Different management modes of NPN

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| --- | --- | --- | --- | --- |
| Management mode | NPN type | Management of NPN | **NPN Operator** | **Use case** |
| MNO Managed | PNI-NPN | An NPN is fully managed by a mobile network operator which also manages PLMN. | Mobile network operator | 5.1.2 |
| MNO-Vertical Managed | PNI-NPN | An NPN is managed by a mobile network operator which also manages PLMN and a vertical who gets some management capabilities exposed from the mobile network operator according to business agreement between the two parties. | Mobile network operator and vertical  (Note 1) (Note 2) | 5.1.2 |
| MNO Managed | SNPN | An NPN is fully managed by a mobile network operator. | Mobile network operator | 5.1.1.1 |
| MNO-Vertical Managed | SNPN | An NPN is managed by a mobile network operator and a vertical who gets some management capabilities exposed from the mobile network operator according to business agreement between the two parties. | Mobile network operator and vertical  (Note 1) (Note 2) | 5.1.1.1 |
| Vertical Managed | SNPN | An NPN is fully managed by a vertical. | Vertical  (Note 1) | 5.1.1.1 |
| Note 1: The vertical can outsource its NPN management tasks to other third party OAM service provider to manage the NPN based on the management capabilities exposed from the mobile network operator.  Note 2: The mobile network operator shall restrict the exposure of management capabilities and corresponding managed resources to vertical. | | | | |

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| **2nd Change** |

### 4.6.3 5GC related management aspects

As described in clause 5.30.3.1 of TS 23.501[3], the architecture of 5G Core is capable to support SNPN and PNI-NPN.

For SNPN, the architecture depicted in clause 4.2.3 of TS 23.501[3] is extended with the additional features as described in clause 5.30.2 of TS 23.501[3]. The Vertical Managed management mode is considered as essential management mode of SNPN.

The 5GC NRM shall support the network resource model for SNPN,

- N3IWF and service access point of Untrusted Non-3GPP access for UE to access PLMN services via SNPN.

3GPP management system shall support configuration of 5GC NFs (e.g., AMF, SMF, UPF etc.) as network nodes in SNPN. The NID shall be configured to 5GC NFs when 5GC NFs are part of SNPN, in case of both self-assignment and coordinated assignment.

Editor's NOTE: The differences of deployments and particular enhancements to 3GPP management system regarding 5GC for management mode 2a, 2b and 2c are FFS.

For PNI-NPN, there are no further specific 5GC related management aspects apart from those captured in clause 4.5.

Editor's NOTE: The differences of deployments and particular enhancements to 3GPP management system regarding 5GC for management mode 1a and 1b are FFS.

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| **3rd Change** |

Annex A (informative): Deployment considerations on NPN management modes

The applicability of management modes (see clause 4.3) depends on the NPN scenarios under consideration. Different scenarios may exist, depending on the deployment considerations of individual NPN functions. Table A-1 and Table A‑2 capture this variety for SNPN and PNI-NPN scenarios, respectively.

Table A-1: Applicability of management modes in different SNPN scenarios

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| NPN functions | | MNO Managed | MNO-Vertical Managed | Vertical Managed |
| NG-RAN | | indoor; outdoor | indoor; outdoor | indoor; outdoor |
| 5GC | Packet core (AMF, SMF, NRF, ...) | on-premise;  off-premise (deployed on MNO footprint) | on-premise;  off-premise (deployed on MNO footprint) | on-premise;  off-premise (deployed on hyperscaler footprint) |
| Subscription and data-storage manager (UDM, UDR, AUSF, …) | on-premise;  off-premise (deployed on MNO footprint) | on-premise;  off-premise (deployed on MNO footprint) | on-premise |
| UPF | on-premise;  off-premise (deployed on MNO footprint) | on-premise;  off-premise (deployed on MNO footprint) | on-premise |
| NOTE 1: In case of virtualization of 5GC functions, the VISP role is relevant. The VISP is in charge of managing the virtual resources which support the execution of those VNFs, each hosted by one or more VDUs.  NOTE 2: The vertical may play the VISP role for the virtualization of on-premise 5GC functions.  NOTE 3: The MNO may play the VISP role for the virtualization of off-premise 5GC functions in Mode 2a and Mode 2b. These 5GC functions are dedicated to the NPN, and therefore are separated from PLMN functions (used for public use).  NOTE 4: A hyperscaler may play the VISP role for the virtualization of off-premise 5GC functions in Mode 2c.  NOTE 5: Off-premise UPF may need to be deployed at the Telco Edge Cloud, typically due to performance constraints. | | | | |

Table A-2: Applicability of management modes in different PNI-NPN scenarios

|  |  |  |  |
| --- | --- | --- | --- |
| NPN functions | | MNO Managed | MNO-Vertical Managed |
| NG-RAN | | indoor; outdoor | indoor; outdoor |
| 5GC | Packet core (AMF, SMF, NRF, ...) | off-premise (deployed on MNO footprint) | off-premise (deployed on MNO footprint) |
| Subscription and data-storage manager (UDM, UDR, AUSF, …) | off-premise (deployed on MNO footprint) | on-premise;  off-premise (deployed on MNO footprint) |
| UPF | off-premise (deployed on MNO footprint) | on-premise; off-premise (deployed on MNO footprint) |
| NOTE 1: In case of virtualization of 5GC functions, the VISP role is relevant. The VISP is in charge of managing the virtual resources which support the execution of those VNFs, each hosted by one or more VDUs.  NOTE 2: The vertical may play the VISP role for the virtualization of on-premise 5GC functions.  NOTE 3: The MNO may play the VISP role for the virtualization of off-premise 5GC functions in MNO Managed Mode and MNO-Vertical Managed mode.  NOTE 4: Off-premise UPF may need to be deployed at the Telco Edge Cloud, typically due to performance constraints. | | | |

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| **End of change** |