**3GPP TSG-WG SA2 Meeting #154-AH e-meeting *S2-23xxxxx***

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**Title: Resolution of open questions in DetNet TR**

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*Abstract: Resolve the open questions that remain in the DetNet TR 23.700-46*

# 1. The use of NEF for DetNet signalling

The possibility for the optional use of NEF for the DetNet signalling is an open question in the TR. The problem with including NEF, however, is that it implies a high complexity impact.

There could be two alternatives for including NEF between the TSCTSF and the DetNet controller.

* NEF with protocol conversion, where the NEF converts between the IETF based protocols between NEF and DetNet controller, and the 3GPP based protocols between NEF and the TSCTSF. This conversion adds a significant complexity to NEF and requires the NEF to parse the YANG configuration. That implies that the functional split is different depending on whether or not we have NEF, i.e., we would need to implement similar functionality in the NEF as in the TSCTSF when NEF is not used. This is a very high and unnecessary complexity impact and inconsistency which is not justified.
* NEF relays the YANG configuration, where the YANG configuration is carried in IETF protocols between NEF and DetNet controller, and in 3GPP protocols between NEF and TSCTSF. In this case, the complexity impact is smaller, but still new protocol support would be required between the NEF and the TSCTSF to carry such configuration. Today the signalling between NEF and TSCTSF is session based, while in this case we would need to carry information that is not session specific, which is a significant change. Also, the NEF would be required to support Netconf or Restconf protocol, which is a significant impact.

We do not see the justification for any of the alternatives above, and propose not to standardize the optional use of NEF for the DetNet signalling. Note that DetNet would anyway be used only when there is a proper business agreement for DetNet operation, since DetNet controller can influence the QoS for any UE in the given network, and such a function is only possible when the DetNet controller can be trusted. Note also that it is possible, without using NEF, to authenticate and authorize the signalling based on IETF protocols, and only accept configuration which is in accordance with the operator requirements.

In summary, it is proposed not to standardize NEF involvement for DetNet signalling.

# 2. Exposure of uplink routing information

It has been suggested that 5GS may provide a capability to report the N6 uplink routing table to the DetNet controller, which remains an open question in the DetNet TR. In general, for DetNet as defined in IETF, the routing information goes the other way, from the DetNet controller to the nodes, to set explicit flow routes in order to guarantee the low delays. In the case of 5GS in the downlink, the routing is determined by 3GPP mechanisms based on the mapping of the IP address, and the current study has agreed not to change the 3GPP downlink routing behaviour.

So the question only arises in the uplink direction for N6. This is a question only in case there are multiple interfaces on N6 to choose from and there can be multiple routes to the same host; in simpler deployments, the problem would not arise. In case the N6 uplink routing is statically configured, such a static configuration could also be made known to the DetNet controller without additional 3GPP standardization.

The N6 routing is considered out of scope of 3GPP, and it is realized in an implementation specific way. In case there is a need to influence the N6 uplink routing, it can be possible to consider the N6 uplink routing to be logically separate from 5GS, and the DetNet controller may explicitly control the N6 uplink routing in deployments where such functionality is required. It appears that both simpler deployments and more complex, demanding deployments can be handled without requiring the 3GPP standardization of exposure of N6 routing.

In summary, due to the possibility for alternative deployment options, and since the N6 uplink routing is in general considered out of scope of 3GPP, we propose not to standardize 3GPP functions to expose the N6 uplink routing table.

# 3. YANG extension for 5GS specific delay requirement

Currently, the DetNet YANG model only includes the end-to-end delay requirement of a flow, while 5GS would need the delay requirement that is specific to 5GS. (Same applies to the maximum loss.) The IETF LS response indicates that this is because DetNet YANG model can be used in combination with other configuration to set DetNet node parameters that influence the delay. However, that approach is not applicable to 5GS. Currently, there is no IETF work ongoing to specify the DetNet node specific delay requirement, and there are no plans to conduct such work in the future (LS reply [Ref]).

Therefore, it is proposed to specify the YANG extension in 3GPP. In general, YANG has been intentionally designed for easy extensibility, and it is possible to define extensions not only by IETF by any other group. Since the 5GS specific delay and loss appears to be a 3GPP specific requirement, is can be relevant to specify such an extension in 3GPP. If later the IETF decides to specify such parameters, the YANG models in the TSCTSF can easily be updated, but currently such parameters do not seem likely in the near future.

A 3GPP-specific YANG extension would also allow for 3GPP specific status codes that allow more information to be provided to the controller in case a request is rejected.

# 3. Text Proposal

It is proposed to capture the following changes to TR 23.700-46.

\* \* \* \* First change \* \* \* \*

## 7.1 General

The following bullet points summarize the principles for the way forward:

- YANG models over Netconf or Restconf are used between the TSCTSF and the DetNet controller.

- 3GPP does not standardize any signalling mechanism to include the NEF into the signalling path between the TSCTSF and the DetNet controller. If NEF functionality is desired, the relevant functions such as the authentication, authorization and potential throttling of signalling can be achieved by including such functionality in the TSCTSF depending on the needs of the given deployment.

- The TSCTSF terminates the interface towards the DetNet controller. The TSCTSF collects and provides exposure information to the DetNet controller. The TSCTSF collects the information from the UPF/NW-TT and the SMF with extensions to the 5GC data models or information elements as required. The entity reporting UPF N6 interface related information to the TSCTSF is NW-TT as in Rel-17 TSC.

- The TSCTSF may use the e2e traffic requirements in the YANG configuration, and based on a pre-configured mapping, derive 5GS requirements from them.

- YANG extensions are to be defined by 3GPP that allow the DetNet controller to explicitly provide (5GS) DetNet Node traffic requirements for max-latency and max-loss.

- It can be possible for the 5GS to verify in the TSCTSF whether the explicit routing information provided by the DetNet controller is in line with the 5GS mapping of IP addresses to PDU sessions. Apart from the verification, the 5GS routing is not modified by the DetNet controller in line with the agreed scope of the work.

- Based on existing specifications, 5GS DetNet Node can forward via its UE side interface IP packets destined not only to the UE's IP address or prefix but also to other IP prefixes according to 3GPP framed routes or prefixes delegated to the UE by Ipv6 prefix delegation. To facilitate this, the additional IP addresses used for framed routes and Ipv6 prefix delegation are exposed by the SMF to the TSCTSF and by TSCTSF to the DetNet controller.

The following figure illustrates the DetNet architecture.



Figure 7.1-1: DetNet Architecture

\* \* \* \* Next change \* \* \* \*

## 7.2 Key Issue #1: 5GS DetNet node reporting

The 5GS is exposed by the TSCTSF to the DetNet controller as a router on a per UPF granularity. The node may be identified by a Node ID. The interfaces correspond to the PDU Sessions (and to the network side interfaces (i.e. including the interfaces of UPF and NW-TT). Each interface is identified by an interface identifier.

The following information may be reported from TSCTSF to DetNet controller for each interface.

- Type of interface.

- IP address.

- subnet (prefix length).

- Neighbour address (in case of network side interfaces).

- MAC address (in case of network side interfaces).

- MTU size.

The TSCTSF collects the information from the UPF/NW-TT and the SMF re-using the existing procedures in Rel-17 TSC, with the addition of new parameters as needed.

\* \* \* \* End of changes \* \* \* \*