**3GPP TSG-SA5 Meeting #157 *S5-245691***

**Hyderabad, India, 14 - 18 October 2024**

**Source: Samsung, NTT DOCOMO**

**Title: NDT Assisted Network Configuration Generation based on Performance Monitoring**

**Document for: Approval**

**Agenda Item: 6.19.5**

# 1 Decision/action requested

***Group is requested to discuss and agree this document`***

# 2 References

None

# 3 Rationale

This proposes a new use case of NDT.

# 4 Detailed proposal

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| **First Change** |

## 5.5 Use case 5: NDT support to network automation

### 5.5.1 Description

NDTs may be used to support many automation use cases (e.g., MDA, SON, etc.). An NDT may be integrated into a network automation function, or it may be external to the network automation function. In the case where the NDT is external to the network automation function, it could be possible for the network automation function to configure the NDT and the scenario that could be modelled and simulated by the NDT. Then the NDT needs to implement the defined scenario, simulate it, and subsequently provide an output representing the statues of different network metrics for the simulated scenario. NDTs may not make decisions for the configuration of live network but could support to make decision recommendations.

An NDT, depending upon the network or service management use case and scenario to be modelled and simulated, might need data originating from various sources (network data, environment data, analytics, UEs data) and suitable hardware/software resources to function properly. MnS consumers would prefer to specify needed NDT characteristics or configurations to the NDT tailored to fulfil consumer specific needs i.e. to define the consumer preference for the specific NDT. For example, consumer preferences may be related to environment data sources e.g. weather, synthetic data etc, data characteristics (e.g. robustness, data granularity, maximum tolerable latency), required NDT output latency, characteristics of the service to be twinned, resource constraints (HW/SW) etc. Furthermore, in the case that consumer’s preference on NDT characteristics or configuration may change over time and MnS consumer may update the NDT with the needed changes.

The achieved performance by NDT may depend on NDT characteristics such as e.g load; the simulation results would change based on the network load, time; the simulation results would change based on the target time of the day, energy saving state; the simulation results would change considering whether the simulated node is running in energy saving mode.

### 5.5.2 Potential Requirements

REQ-NDT-1: The NDT should support a capability to model the behavior of the network and provide the outcomes of such modelling to consumers.

REQ-NDT-2: The NDT should support a capability enabling an Mns consumer to define the network scenario that should be modelled and simulated.

REQ-NDT-3: The NDT should support a capability to provide an output representing the statues of different network metrics for the simulated scenario.

REQ-NDT-4: The NDT should support a capability enabling an MnS consumer to specify NDT characteristics or configurations

Note: example characteristics include

* environment data sources (e.g. weather, synthetic data etc), and the related data characteristics (e.g. robustness, data granularity, maximum tolerable latency),
* environment characteristics (e.g network load, time of the day and energy saving state).

REQ-NDT-5: The NDT should support a capability to inform the MnS consumer whether a specific set of NDT characteristics or configurations defined by the Mns consumer are feasible or if not what changes could be made to the NDT configurations to make then feasible.

**REQ-NDTN\_PM-1:** The NDT should support a capability to provide a report/output for NDT simulation/emulation achieving certain target performance threshold and QoS.

### 5.5.3 Potential Solutions

* introduce an information object class representing an NDT, say called NetworkDigitalTwin
* introduce a data type representing the network scenario to be modeled and simulated, say called nDTSimulationScope
* introduce a data type representing the output of modelling and simulating a specific network scenario. The datatype may be called nDTSimulationOutput
  + the NDT may have 1 or more nDTSimulationOutput objects with information on the best possible performance data achieved in the simulation.
* introduce a data type representing the performance data and/or KPI that are computed by the NDT for the simulated scenario to report the NDT results.
* introduce a data type representing the characteristics of the ND, say called nDTcharacteristics. This is configurable by the MnS consumer to include the following information:
  + environment data sources (e.g. weather, synthetic data etc,) and the related data characteristics (e.g., data granularity, maximum tolerable latency)
  + PM Threshold: This defines the target thresholds for PMs that should be achieved by the NDT simulation.
  + Target Load: This defines the target load of the simulated network nodes. This can be defined in terms of virtual resource usage or in an implementation specific way with a linear scale from 1 to 10.
  + Target Energy Saving: This defines whether the energy-saving features should be enabled or disabled for the network nodes that are being simulated.
  + TargetTime: This defines the target time at which the performance of the nodes need to be collected. This can be defined in terms time of day. This relates to the Scheduler IOC defined in TS 28.622.
  + Granularity: This defines the granularity to collect performance data. This relates to granularityPeriod attribute defined in TS 28.622.

### 5.5.4 Evaluation of solutions

The solution described in clause 5.5.3 provides the NRM extension needed for the NDT to provide modelling of network behavior that supports network automation. The solution is a general solution for any kind of automation functionality and should be adopted for general support to network automation. The normative work on NDT support to network automation should progress following the outline in solution in clause in 5.5.3.

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| **End of Changes** |