**3GPP TSG-SA5 Meeting #157 *S5-246052***

Hyderabad, India, 14 - 18 October 2024

**Source: China Mobile, Nokia, Samsung, Huawei**

**Title: Add the evaluation, conclusion and recommendation for TR28.915**

**Document for: Approval**

**Agenda Item: 6.19.5**

# 1 Decision/action requested

***In this box give a very clear / short /concise statement of what is wanted.***

# 2 References

[1] 3GPP draft TR 28.915: “Management and orchestration; Study on management aspects of Network Digital Twin v0.1.0”.

[2] SP-231727 "New Study on management aspects of Network Digital Twin"

# 3 Rationale

This contribution proposes to complete the evaluation, conclusion and recommendation of the use cases studied in TR 28.915 based on SP-231727 [2].

# 4 Detailed proposal

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| **First Changes** |

# 3 Definitions of terms, symbols and abbreviations

## 3.1 Terms

For the purposes of the present document, the terms given in 3GPP TR 21.905 [1] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in 3GPP TR 21.905 [1].

**example:** text used to clarify abstract rules by applying them literally

**Network Digital Twin (NDT):** virtual replica of mobile network or part of one, that captures its attributes, behaviour and interactions

NOTE: Mobile network includes both RAN and Core.

## 3.2 Symbols

Void.

## 3.3 Abbreviations

For the purposes of the present document, the abbreviations given in 3GPP TR 21.905 [1] apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in 3GPP TR 21.905 [1].

DT Digital Twin

ES Energy Saving

NDT Network Digital Twin

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| **Second Changes** |

## 4.3 Potential uses of NDTs

NDTs may support many use cases in network management and automation. In all the use cases, NDTs provide modelling capabilities that are then applied by the network management and automation functions or applications to achieve the desired outcomes.

Use cases where NDT may provide support include:

- Verification:

- RAN energy saving policy verification (see clause 5.1).

- Signalling storm analysis (see clause 5.2).

- Emergency preparedness (see clause 5.3).

- Configuration verification (see clause 5.9).

- Network issue inducement (see clause 5.10).

- Measuring customer satisfaction with the network services (see clause 5.11).

- Visualization:

- Network topology and traffic visualization (see clause 5.8).

- Prediction:

- Network failure and risk prediction (see clause 5.4).

- Simulated data generation:

- ML model training data generation (see clause 5.6).

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| **Third Changes** |

## 5.4 Use case4: Network failure and risk prediction

### 5.4.4 Evaluation of potential solutions

The solution described in clause 5.4.3 provides the NRM extension needed for the NDT to provide modelling of network behavior that supports network failure and risk prediction.

The normative work on NDT network failure and risk prediction should progress following the outline in solution in clause in clause 5.4.3.

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| **Fourth Changes** |

# 6 Conclusions and Recommendations

This technical report is the output of a study on management aspect of Network Digital Twin (NDT). It describes the terms and concepts of NDT. It also identified and documented the use cases and corresponding potential requirements, possible solutions by using the NDT.

There are multiple valid and valuable use cases which may benefit from NDT. Solutions are proposed which are based on a new Management Service and associated network resource modelling.

1) Scenario group 1: Generic capabilities:

- NDT support to network automation.

 - Signalling storm analysis

 - Emergency preparedness

 - Network failure and risk prediction

 - Network issue inducement

- Network topology and traffic visualization.

2) Scenario group 2: Verification: (checking a given policy, configuration, etc):

- RAN energy saving policy verification.

- Configuration verification

1. Scenario group 3: Generation

- Generating data for ML model training

- Measuring customer satisfaction with the network services

 4) Scenario Group 4: Advanced Generic Capabilities

 - Nested NDTs.

2. Develop the new proposed Management Service to support above scenarios by using the NDT.

3. Develop the detailed datatypes to support the new proposed Management Service.

It is recommended for the normative work to:

- Specify the terms and concepts of Network Digital Twin in 3GPP management system

- Specify the use cases, requirements for using Network Digital Twin (e.g., for NDTs a means for modelling the behavior of networks). The following use cases are categorized into major groups, to address the issues on how to conduct an NDT, focusing on checking for what happened in a given network scope and how, checking how a given configuration would impact a network scope, and checking for how a network scope would respond to events within that scope. If the NDT application use case demand specific characteristics it should be defined separately.

- Specify the procedures and management services for NDT management to support above scenarios, which may include the management operations and management information (e.g., NDT modelling).

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| **End of Changes** |