**3GPP TSG-SA5 Meeting #158 *S5-247221***

**Orlando, USA, 18 - 22 November 2024**

**Source: China Mobile**

**Title:** **New WID on management aspects of Network Digital Twin**

**Document for: Agreement**

**Agenda Item: 6.2.1**

3GPP™ Work Item Description

Information on Work Items can be found at <http://www.3gpp.org/Work-Items>
See also the [3GPP Working Procedures](http://www.3gpp.org/specifications-groups/working-procedures), article 39 and the TSG Working Methods in [3GPP TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm)

Title: Management aspects of Network Digital Twin

Acronym: NDT

Unique identifier:

Potential target Release: Rel-19

# 1 Impacts

{For Normative work, identify the anticipated impacts. For a Study, identify the scope of the study}

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Affects: | UICC apps | ME | AN | CN | Others (specify) |
| Yes |  |  | X | X |  |
| No | X | X |  |  | X |
| Don't know |  |  |  |  |  |

# 2 Classification of the Work Item and linked work items

## 2.1 Primary classification

### This work item is a …

|  |  |
| --- | --- |
|  | Study  |
| X | Normative – Stage 1 |
| X | Normative – Stage 2 |
| X | Normative – Stage 3 |
|  | Normative – Other\* |

**\* Other = e.g. testing**

## 2.2 Parent Work Item

|  |
| --- |
| Parent Work / Study Items  |
| Acronym | Working Group | Unique ID | Title (as in 3GPP Work Plan) |
| FS\_NDT | SA5 | 1020018 | Study on management aspects of Network Digital Twin  |

### 2.3 Other related Work Items and dependencies

|  |
| --- |
| Other related Work /Study Items (if any) |
| Unique ID | Title | Nature of relationship |
|  |  | {optional free text}  |

# 3 Justification

Digital twin technology provides robust support for emerging technologies by creating a comprehensive virtual mapping of the corresponding physical network process, utilizing models, operational history, and additional data. A Network Digital Twin (NDT) is a virtual replica of mobile network or part of one, that captures its attributes, behaviour and interactions.

Existing automation capabilities include analytics services and decision-making capabilities, assuming that knowledge about network behavior is available within the automation functions. Accordingly, the unaddressed gap in network automation is the capability to represent the behavior of the network and may provide results supporting further automation of the network. This knowledge of how the network behaves or will behave is the new value provided by digital twins, which understand and model the behavior of the network. Its benefits are for efficiently verifying network operations by validating and/or recommendation network configurations and policies before they can be deployed. It can construct a comprehensive view of network topology and traffic to aid in fault localization, prediction and etc.

The NDT can be consumed by various consumers, for instance the MFs (i.e., MnS service producers/consumers for network and service management), NFs (e.g., NWDAF), MDAS, SON functions, network and service optimization tools/functions, SLS assurance functions, human operators, etc.

The NDT can consume management services exposed by different MFs to provide required NDT outputs.

SA5 has conducted a study on NDT in TR 28.915, which described the terms, concepts of NDT, NDT role in the management loop and relationship with the existing network functions/entities including e.g., NWDAF and MDAS. The TR also identified and documented the use cases and corresponding potential requirements, possible solutions.

This work item is proposed to aim at specifying 5G management system enhancements to support using of Network Digital Twin. The solutions to support this feature have been studied and concluded in TR 28.915.

# 4 Objective

The objective of this work item is to specify the following aspects:

* WT1: Specify the terms and concepts of Network Digital Twin in 3GPP management system.
* WT2: Specify the use cases, requirements for Network Digital Twin in 3GPP management system. The following use cases are considered:
	+ WT2.1 Usage of an NDT instance and Life-cycle management of an NDT instance as a general use case, including creating, configuration, activation, de-activation, re-configuration and termination of an NDT.
	+ WT2.2 NDT application specific use cases to address following:
		- WT2.2.1 NDT support for network automation, including “signalling storm analysis”, “emergency preparedness”, “network failure and risk prediction” and “network issue inducement”.
		- WT2.2.2 NDT support for verification, including “RAN energy saving policy verification”, “configuration verification”.
		- WT2.2.3 NDT support for generation, including “generating data for ML model training” and “measuring customer satisfaction with the network services”.
		- WT2.2.4 Advanced NDT capabilities, including “nested NDTs”.
* WT3: Specify the solutions for NDT to support above use cases, which includes the procedure, management operations and management information (e.g., NDT modelling).
	+ WT3.1 Generic operations and generic information model for NDT.
	+ WT3.2 NDT application specific solution extending the generic information model with NDT application specific modeling information for the above use cases.

Corresponding work in other groups should be considered, if appropriate in the normative work.

## TU estimates and dependencies

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Work Task ID** | **TU Estimate****(Normative)** | **RAN Dependency****(Yes/No/Maybe)**  | **SA Dependency****(Yes/No/Maybe)** | **Non-3GPP Dependency** |
| WT-1 | 0.5 | No | Yes | Yes (ZSM) |
| WT-2 | 1.5 | Yes | Yes | Yes (ZSM) |
| WT-3 | 1 | Yes | Yes | Yes (ZSM) |

Total TU estimates for the normative phase: 3

# 5 Expected Output and Time scale

***{If this WID covers both stage 2 and stage 3, clearly indicate the different completion dates.}***

|  |
| --- |
| New specifications {One line per specification. Create/delete lines as needed} |
| Type  | TS/TR number | Title | For info at TSG#  | For approval at TSG# | Rapporteur |
| *TS* | *28.xyz* | Management aspects of Network Digital Twin | Jun 2025 (SA#108) | Jun 2025 (SA#108) |  |
|  |  |  |  |  |  |

|  |
| --- |
| Impacted existing TS/TR {One line per specification. Create/delete lines as needed} |
| TS/TR No. | Description of change  | Target completion plenary# | Remarks |
|  |  |  |  |

# 6 Work item Rapporteur(s)

# 7 Work item leadership

SA WG5

# 8 Aspects that involve other WGs

None

# 9 Supporting Individual Members

|  |
| --- |
| Supporting IM name |
| CMCC |
| China Telecom |
| ZTE |
| Huawei |
| AsiaInfo |
| CATT |
| China Unicom |
| NTT DOCOMO |
| Intel |
| Deutsche Telekom |
| Telecom Italia |
| NEC |
| Telefonica |
| Samsung |
| Rakuten Mobile |