**3GPP TSG-SA5 Meeting #155 *S5-243181***

Jeju, South Korea, 27 - 31 May 2024

**Source: China Mobile**

**Title: Add solution of Network failure and risk prediction for TR 28.915**

**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 add solution of network failure and risk prediction for TR 28.915 based on SP-231727 [2]

# 4 Detailed proposal

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| **First Change** |

## 5.4 Use case4: Network failure and risk prediction

### 5.4.1 Description

Each operations for network optimization and maintenance on mobile network may cause potential network failures and risks, especially high-risk operations, such as potentially dangerous configuration modification, policy modification, software version upgrade, and board switching, which may cause network congestion and network breakdown. To avoid any impact on the physical network, we can’t carry out the potential high-risk network operations in the physical network directly without concerning any consequences, and we can’t use the physical network to evaluate possible network optimization strategy and solution directly. Therefore, it is the better way that these network operations and possible network optimization solutions can be simulated and evaluated using network digital twin.

Using NDT, high-risk operations can identify whether these operations may cause potential network failures and risks by performing necessary digital twin related operations, e.g. simulation, verification and evaluation. The NDT can also optimize, verify and evaluate possible network policies and solutions for the further risk avoidance. After simulating and evaluating by the NDT, the results of high-risk operations prediction and evaluation should be notified back to 3GPP network system.

In addition, SLA degradation and failure of single node in mobile network can also be predicted using the NDT. When it is predicted that the network resources in the network domain are not enough to maintain the SLA or hardware resources failure at some time in the future, the NDT should warn 3GPP management system to take actions for network failure and risk avoidance.

Another scenario of network slice risk prediction is described in clause 5.2[1]. Using the NDT to predict risks, the ZSM framework can identify risks of specific service or network slice profile parameters not being met due to changing traffic and network conditions (e.g. a MD not being able to provide the network slice latency it committed for) and the NDT supports the ZSM framework to take actions before these risks materialize and therefore before the committed SLA/SLS are broken.

Therefore, 3GPP network system has needs to use network digital twin to predict and evaluate potential network failures and risks based on operator’s requirements, such as predict possible network failures and risks posed by the high-risk operation. 3GPP management system can also use the NDT to evaluate and verify possible network policies and solutions to minimize the impact of high-risk operations.

### 5.4.2 Potential requirements

**REQ-NDTN\_Failurerisk-1:** The NDT should have the capability allowing the consumer to request evaluation of the risk level for high-risk operations.

**REQ-NDTN\_ Failurerisk-2:** The NDT should have the capability to provide the results of evaluation of risk level for high-risk operations.

**REQ-NDTN\_ Failurerisk-3:** The NDT should have the capability to simulatethe behaviour of historical network failure.

**REQ-NDTN\_ Failurerisk-4:** The NDT should have the capability to report the simulated results of historical network failure .

### 5.4.3 Potential solutions for historical network failure

This solution addresses the following issues of use case 4 . The historical network failure simulated by using NDT with the following approach:

Figure 5.4.3: NDT for historical failure analysis

Editor’s Note: Figure will be provided later.

1. The MnS consumer sends a request to NDT for historical network failure, including the simulated network objects for the historical network events and incidents(e.g., related network functions, S-NSSAI, the time of the historical event to be analysed, the duration of the analysis, etc).
2. The NDT as the provider provides a response to MnS consumer indicating the status of the request based on a feasibility check (success orfailure).
3. The NDT as the consumer synchronizes the related data indicating the specific historical network events and incidents from MnS providers for network simulation and validation.
4. The NDT executes the network simulation and validation.
5. The NDT as the provider sends the reports of historical network failure to MnS consumer. The report can include

- Simulated behavior: Simulate historical network events and incidents, including network configurations before and after faults, network performance, network operational traffic load data, and the effects of faults during the chosen historical period.

- Validation Results: Based on the behavior of simulation, report the evaluation results.

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| **End of Changes** |