**3GPP TSG-SA5 Meeting #142-eS5-222333**

**e-meeting, 4 - 12 April 2022**

**Source: Huawei**

**Title: pCR 28.104 Prediction of service failures**

**Document for: Approval**

**Agenda Item: 6.6.5**

# 1 Decision/action requested

***For approval***

# 2 References

[1] 3GPP TR 28.104 V0.4.0 Management and orchestration; Management Data Analytics (MDA)

[2] Basic Concepts and Taxonomy of Dependable and Secure Computing
www.nasa.gov/pdf/636745main\_day\_3-algirdas\_avizienis.pdf

# 3 Rationale

Clause 7.2.3 of [1] refers to fault prediction, which is not possible. Faults may exist unknown for many years in a system, it is the failure that should be predicted. As an example, a design fault in a protocol buffer may continually exist in a system, but it may cause a failure when the appropoiate conditions (such as traffic overload) occur.

Therefore, this contribution proposes improvements to clause 7.2.3 of [1] to use industry-standard meanings of the terms “fault” and “failure”.

To quote some definitions from clause 2.2 of [2]…

A **service failure**, often abbreviated here to **failure**, is an event that occurs when the delivered service deviates from correct service.

Since a service is a sequence of the system’s external states, a service failure means that at least one (or more) external state of the system deviates from the correct service state. The deviation is called an **error**. The adjudged or hypothesized cause of an error is called a **fault**.

The use case does not explain how failure prediction relates to other management capabilities, new text is proposed to describe this relationship.

# 4 Detailed proposal

This contribution proposes to make the following changes in [1].

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| **1st change** |

### 7.2.3 MDA assisted fault management

#### 7.2.3.1 Failure prediction

##### 7.2.3.1.1 Description

This MDA capability is for failure prediction

##### 7.2.3.1.2 Use case

There are multiple sources of faults which may cause the 5G system to fail to provide the expected service. These faults and the associated failures need extensive troubleshooting. In order to reduce network and service failure time and performance degradation, it is necessary to supervise the status of various network functions and resources, and predict the running trend of network and potential failures to intervene in advance. These predictions can be used by the management system to autonomously maintain the health of the network, e.g., recovery actions on a network function related to the predicted potential failure.

Due to the fact that failure prediction could depend on the existing alarm incidents and relevant historical and real-time data (performance measurement information, configuration data, network topology information, etc.), there is a possibility for MDA to be used in conjunction with AI/ML technologies for model training and potential failures prediction.

In order to avoid the occurrence of failures and abnormal network states, it is necessary for users to obtain the required details of potential failure and the corresponding degradation trend (abnormal KPI, performance measurement information, possible alarm type, fault root cause, etc.). Therefore, MDA, may in conjunction with AI/ML technology, be required to obtain basic health maintenance knowledge (e.g., the relationship between the failures or potential failures and the related maintenance actions) through predefined expertise or model training, so as to effectively predict potential failures. The basic health maintenance knowledge could be updated with feedback.

If necessary, MDA could provide corresponding recommended actions for failure prevention.

##### 7.2.3.1.3 Requirements

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| **Requirement label** | **Description** | **Related use case(s)** |
| **REQ-FAILURE\_PRED\_MDA-01** | MDA capability for failure prediction shall be able to collect, correlate, filter and analyse the required data (including, alarm information, historical and real-time data) as inputs for analytics and provide the analytics output. | Failure prediction |
| **REQ-FAILURE\_PRED\_MDA-02** | MDA capability for failure prediction shall be able to obtain basic health maintenance knowledges (including, the relationship between the failures or potential failures and the related maintenance actions) through predefined expertise or model training. | Failure prediction |
| **REQ-FAILURE\_PRED\_MDA-03** | MDA capability for failure prediction shall be able to provide the analytics output including predictions of potential service failures, as well as the possible recommendation options.  | Failure Prediction |

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| **End of changes** |