**3GPP TSG-SA5 Meeting #145-e *S5-225422***

**e-meeting, 15th Aug 2022 - 24th Aug 2022**

**Source: Nokia, Nokia Shanghai Bell**

**Title: pCR TR 28.830 Add clause Background**

**Document for: Approval**

**Agenda Item: 6.7.7.1 - FS\_FSEV\_WoP#1**

# 1 Decision/action requested

***The group is requested to discuss and approve the pCR below***

# 2 References

None.

# 3 Rationale

This pCR adds background information on the current state of the art as to alarm management and oulines the study scope.

# 4 Detailed proposal

The following changes are proposed for TR 28.830 [1].

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| **Begin of modifications** |

# 2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

[1] TR 28.830 “Fault Supervision Evolution”

[2] ITU-T Recommendation X.731 (1992) | ISO/IEC 10164-2 : 1992, Information technology – Open Systems Interconnection – Systems Management – State management function.

[3] TS 28.625 State Management Data Definitions

[4] ITU-T Recommendation X.733 (1992) | ISO/IEC 10164-4 : 1992, Information technology – Open Systems Interconnection – Systems Management – Alarm reporting function.

[5] TS 28.532 Generic management srvices

[6] ITU-T Recommendation X.739 (1993), Information technology – Open Systems Interconnection – Systems Management – Metric Objects and attributes.

[7] ITU-T Recommendation E.880 (1993), Telephone network and ISDN Quality of service, network management and traffic engineering. Field data collection and evaluation on the performance of equipment, networks and services

[8] TS 28.552 5G performance measurements

[9] TS 28.554 5G end to end Key Performance Indicators (KPI)

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| **Next modification** |

### 4 Background

Since several decades the telecommunication management network offers a multitude of possibilities to inform about specific states of the system [2, 3], errors and faults by using alarms [4, 5], and about the performance related indications like counters, KPIm gauges, aggregations, statistics, and thresholds, e.g [6 - 9].

Already the first paragraph on the model of alarm reporting [4, clause 7] describes the importance to use thresholds and to detect trends in order to provide warnings to the managers. This means the managed systems are encouraged to use means to detect abnormal conditions as early as possible in order to inform the management system by standardized means about the situation. The level of severity can be described generically and criteria specified based upon the level of degradation that the fault causes to the service: Critical, Major, Minor or Warning. Any new proposal has to consider already existing solutions in order to avoid diverging, non-interoperable frameworks.

[4, clause 7] also highlights the importance to correlate multiple events, a single incident may cause the generation of several notifications. While the correlation is an internal function of management systems, the interfaces are supporting the correlation by specific fields to associate multiple events to each other. This also is true for the corresponding 3GPP specifications, which to a large extent are based on the specifications by ITU-T. Correlation in existing specifications mainly covers alarm notifications, although other type of data e.g. normal performance measurements, KPIs, historical data etc could also be considered for more comprehensive analysis and reporting.

The combination of alarm reporting and state managent would be able to reduce the number of alarm messages very efficiently if certain best practices are followed: If alarms are used to indicate that a resource requires maintenance, and states are used to inform about the well-being of a resource.

For example, in case a backhaul link towards a gNB has a problem, many logical and physical interfaces of the gNB, many protocol layers, and all cells will experience certain abnormal conditions. If all these resources are raising alarms, then the management system will choke in alarms -although none of these alarms requires any maintenance, since the problem is caused by the link, while the base station as such has no problem at all.

If in such situation the resources would consider the rule to issue alarms only in case they require maintenance, then the base station would not send any alarm, while all affected resources would set their operational state to “disabled” and the availability state to “dependency”. In this case the human operator would be aware that the base station does not work as expected and would be also aware of the fact that the base station as such does not require any maintenance. However, although the mechanism described above have been standardized by ITU-T in 1992, such mechanisms are not applied in currents systems. Reducing the number of alarms in the network elements by simple filtering of alarms imposes the risk to miss important information that might be needed by other management functions. Therefore it requires the network elements to perform thorough correlation of notifications and state information in order to suppress redundant information only, but not to suppress information that is needed by higher level management tools. Sometimes it may be not applicable to perform correlation by a single network elements when the alarms are associated with multiple managed objects. For this case, the concerned managed objects should be considered altogether. The management system is also expected to be able to handle such situation automatically and report the whole picture as an integral notification instead of many individual alarms to the consumer, e.g. the name of the situation, the related managed objects, the relations and the corresponding states of the managed objects, the potential impacts to the network and services etc. The management system also tries to recover the issues and report the updated situation to the consumer.

It is an unfortunate fact that -since ever- the management systems as well as the human operators are choking in alarms, although a combination of alarm reporting and state management would offer a technical means to reduce the number of alarms. As a matter of fact that the decision whether an abnormal behavior is caused by another entity (or subsystem) requires sophisticated correlation functions, that must be able to prevent from false correlations. The management system could consider to provide potential management and interface requirements for additional reporting and recovering aspects. Implementation of such functions could leave for vendor selection if it is considered to require high implementation effort to have the knowledge of all corresponding dependencies.

An additional problem is that TS 28.532, clause 11.2, which defines the Fault Supervision MnS, does not provide the necessary definitions and descriptions required to understand the current state of art as to alarm management. This is because much of the material specified and available for the IRP Framework was not moved to SBMA.

For that reason, this study investigates which definitions and descriptions need to be added to TS 28.532, clause 11.2 to make this clause understandable without need to consult other specifications. Besides descriptions for alarm management, the role and importance of state management shall be highlichted as well

It is also in scope of this study to look at possibilities to clarify in TS 28.532 that internal behaviour of functions is not subject to standardization. For example, the algorithm used to accomplish alarm correlation is outside the scope of standards. This implies that deliberations on if AI/ML is used for correlation or not is also outside the scope of standards. It is a vendor decision to use AI/ML or not.

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| **End of modifications** |