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Prenos in multipleksiranje (TM) – Upravljanje prenosne opreme sistema sinhrono digitalne hierarhije (SDH) – Obvladovanje okvar in lastnosti – Funkcijski opis

Transmission and Multiplexing (TM); Management of Synchronous Digital Hierarchy (SDH) transmission equipment; Fault management and performance monitoring; Functional description

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**Transmission and Multiplexing (TM);
Management of Synchronous Digital Hierarchy (SDH)
transmission equipment;
Fault management and performance monitoring;
Functional description**

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Foreword

This European Standard (Telecommunications series) has been produced by ETSI Technical Committee Network Aspects (NA).

The present document specifies the fault management and performance monitoring aspects of the Synchronous Digital Hierarchy (SDH) transmission equipments.

National transposition dates	
Date of adoption of this EN:	7 August 1998
Date of latest announcement of this EN (doa):	30 November 1998
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	31 May 1999
Date of withdrawal of any conflicting National Standard (dow):	31 May 1999

1 Scope

The present document specifies the functional requirements for fault management and performance monitoring aspects of SDH equipments.

The Telecommunications Management Network (TMN) provides management functions which cover the planning, installation, operations, administration, maintenance and provisioning of telecommunications networks and services. ITU-T Recommendation M.3010 [1] proposes five management functional areas identified as follows:

- Fault management;
- Performance management;
- Configuration management;
- Security management;
- Accounting management.

The present document provides guidance and supporting information for the functional specification for the first two of these management areas.

The TMN functionality is realized by means of processes in Equipment Management Function (EMF) in Network Elements (NE), Element Management Systems (EMS) and Network Management Systems (NMS) or Operation Systems (OS).

The present document fully specifies the EMF functionalities. NMS/OS functionalities are described only if needed for clarification.

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2 Normative references

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- a) specific versions of publications (identified by date of publication, edition number, version number, etc.), in which case, subsequent revisions to the referenced document do not apply; or
- b) all versions up to and including the identified version (identified by "up to and including" before the version identity); or
- c) all versions subsequent to and including the identified version (identified by "onwards" following the version identity); or
- d) publications without mention of a specific version, in which case the latest version applies.

A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.

- [1] ITU-T Recommendation M.3010: "Principles for a Telecommunications management network".
- [2] ITU-T Recommendation M.20: "Maintenance philosophy for telecommunications networks".
- [3] ETS 300 417: "Generic functional requirements for Synchronous Digital Hierarchy (SDH) equipment".
- [4] ITU-T Recommendation M.3100: "Generic network information model".
- [5] ITU-T Recommendation X.733: "Data networks and open system communications OSI management. Information technology – Open Systems Interconnection – Systems Management: Alarm reporting function".

- [6] ITU-T Recommendation X.734: "Data networks and open system communications OSI management. Information technology – Open Systems Interconnection – Systems Management: Event report management function".
- [7] ITU-T Recommendation X.735: "Data networks and open system communications OSI management. Information technology – Open Systems Interconnection – Systems Management: Log control function".
- [8] ITU-T Recommendation G.826: "Error performance parameters and objectives for international, constant bit rate digital paths at or above the primary rate".
- [9] ETS 300 416: "Availability performance of path elements of international paths".
- [10] ITU-T Recommendation M.2120: "PDH path, section and transmission system and SDH path and multiplex section fault detection and localization procedures".
- [11] ITU-T Recommendation M.2101: "Performance limits for bringing-into-service and maintenance of international SDH paths, sections and transmission systems".
- [12] EN 301 129: "Transmission and Multiplexing (TM); Digital Radio Relay Systems (DRRS); Synchronous Digital Hierarchy (SDH); System performance monitoring parameters of SDH DRRS".
- [13] ITU-T Recommendation G.707: "Network node interface for the synchronous digital hierarchy (SDH)".
- [14] ITU-T Recommendation M.2110: "Bringing-into-service of international PDH paths, sections and transmission systems and SDH paths and multiplex sections".
- [15] ITU-T Recommendation G.783: "Characteristics of synchronous digital hierarchy (SDH) equipment functional blocks".
- [16] ITU-T Recommendation G.784: "Synchronous digital hierarchy (SDH) management".

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3 Abbreviations

For the purposes of the present document, the following abbreviations apply:

AIS	Alarm Indication Signal
AR	Availability Ratio
AU	Administrative Unit
BBE	Background Block Error
BBER	Background Block Error Ratio
BIP	Bit Interleaved Parity
CSES	Consecutive SES
EB	Errored Block
EDC	Error Detection Code
EMF	Equipment Management Function
EN	European Norme
ES	Errored Second
ESR	Errored Second Ratio
FE BBE	Far-End Background Block Error
FE ES	Far-End Errored Second
FE SES	Far-End Severely Errored Second
FFS	For Further Study
HP	High order Path
LOF	Loss Of Frame
LOM	Loss Of Multiframe
LOP	Loss Of Pointer
LOS	Loss Of Signal
LP	Low order Path

MO	Mean time between digital path Outage
MP	Management Point
MS	Multiplex Section
NE	Network Element
NE BBE	Near-End Background Block Error
NE ES	Near-End Errored Second
NE SES	Near-End Severely Errored Second
NMS	Network Management System
OI	Outage Intensity
OS	Operation System
PJE	Pointer Justification Event
PLM	Path Label Mismatch
PS	Protection Switch
PSC	Protection Switch Count
PSD	Protection Switch Duration
RDI	Remote Defect Indication
REI	Remote Error Indication
RS	Regenerator Section
SDH	Synchronous Digital Hierarchy
SEMF	Synchronous Equipment Management Function
SES	Severely Errored Second
SESR	Severely Errored Second Ratio
STM-n	Synchronous Transfer Module n
TMN	Telecommunication Management Network
VC	Virtual Container
UNEQ	Unequipped
UTC	Universal Time Co-ordinated

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4 Fault management

Fault management is a set of functions which enables the detection, isolation and correction of abnormal operation of the telecommunication network and its environment.

4.1 Purpose

This subclause describes the generic process of alarm handling in SDH network element.

4.2 Additional definitions

These definitions have been derived from ITU-T Recommendation M.20 [2].

fault: A fault is the inability of a function to perform a required action. This does not include an inability due to preventive maintenance, lack of external resources, or planned actions.

anomaly: The smallest discrepancy which can be observed between the actual and desired characteristics of an item. The occurrence of a single anomaly does not constitute an interruption in the ability to perform a required function. Anomalies are used as the input for the performance monitoring process and for the detection of defects.

defect: The density of anomalies has reached a level where the ability to perform a required function has been interrupted. Defects are used as input for performance monitoring, the control of consequent actions, and the determination of Fault Cause (FC).

fault cause: A single disturbance or fault may lead to the detection of multiple defects. A FC is the result of a correlation process which is intended to pinpoint the defect that is representative of the disturbance or fault that is causing the problem.

failure: The FC persisted long enough to consider the ability of an item to perform a required function to be terminated. The item may be considered as failed; a fault has now been detected.

alarm: A human observable indication that draws attention to a failure (detected fault) usually giving an indication of the severity of the fault.

4.2.1 Functional architecture

The functional architecture is depicted in figure 1.

Anomaly processing, defect filtering, consequent action functional blocks are defined in ETS 300 417 [3].

Fault cause persistency, which allows the NE to wait a certain amount of time before to entering in the failure state and therefore it conditions the generation of alarms. The persistency time needed to declare a failure is settable in dependence of defect characteristics (toggling, stable, ...). Only a defect which passes that filter could be subsequently reported as an alarm.

A failure shall be declared if the fault cause persists continuously for X seconds. The failure shall be cleared if the fault cause is absent continuously for Y seconds. X and Y shall be within the range between 100 ms and 30 s in steps of Z ms. The incremental value Z shall follow a logarithmic scale (for further study). It is recommended that $X < Y$.

Severity assignment, which is used to assign the management perception of the severity of a Fault which could depend on the service dependency of the fault, a non service affecting Fault will be alarmed with a severity of Warning or Minor, while a service affecting fault will be reported with a severity of Major or Critical. A service independent fault will be alarmed with any value of the severity. This is an information that is provided by the OS (refer to ITU-T Recommendation. M.3100 [4]).

Station alarm, represents the synthesis of alarm for purpose of audible and visual indication to a human operator in the station. Station alarms can be suppressed by management operations.

Unit alarm represents the synthesis of alarm on replaceable unit basis, the unit could be a board, sub-rack, etc.

Alarm notification, represents the ability to generate alarm. For more details refer to ITU-T Recommendation. X.733 [5].

Alarm filtering, which is used to filter the alarm depending on the contents of the alarm such as the type and cause of the alarm, the source of the alarm, the severity, the correlation information etc. prior to report and/or log alarms. Alarm filtering is different for logging and reporting.

Alarm logging and alarm reporting. alarm reporting allows the reporting of those alarms which have passed the alarm filtering process to a single or multiple destinations. for more details refer to ITU-T Recommendation.X.734 [6] and ITU-T Recommendation. X.735 [7].

4.2.2 Alarm information description and management

This subclause aims to classify alarms in terms of severity, type, probable cause, etc. Furthermore, basic principles of alarm management should be identified.

The above issues need further study.

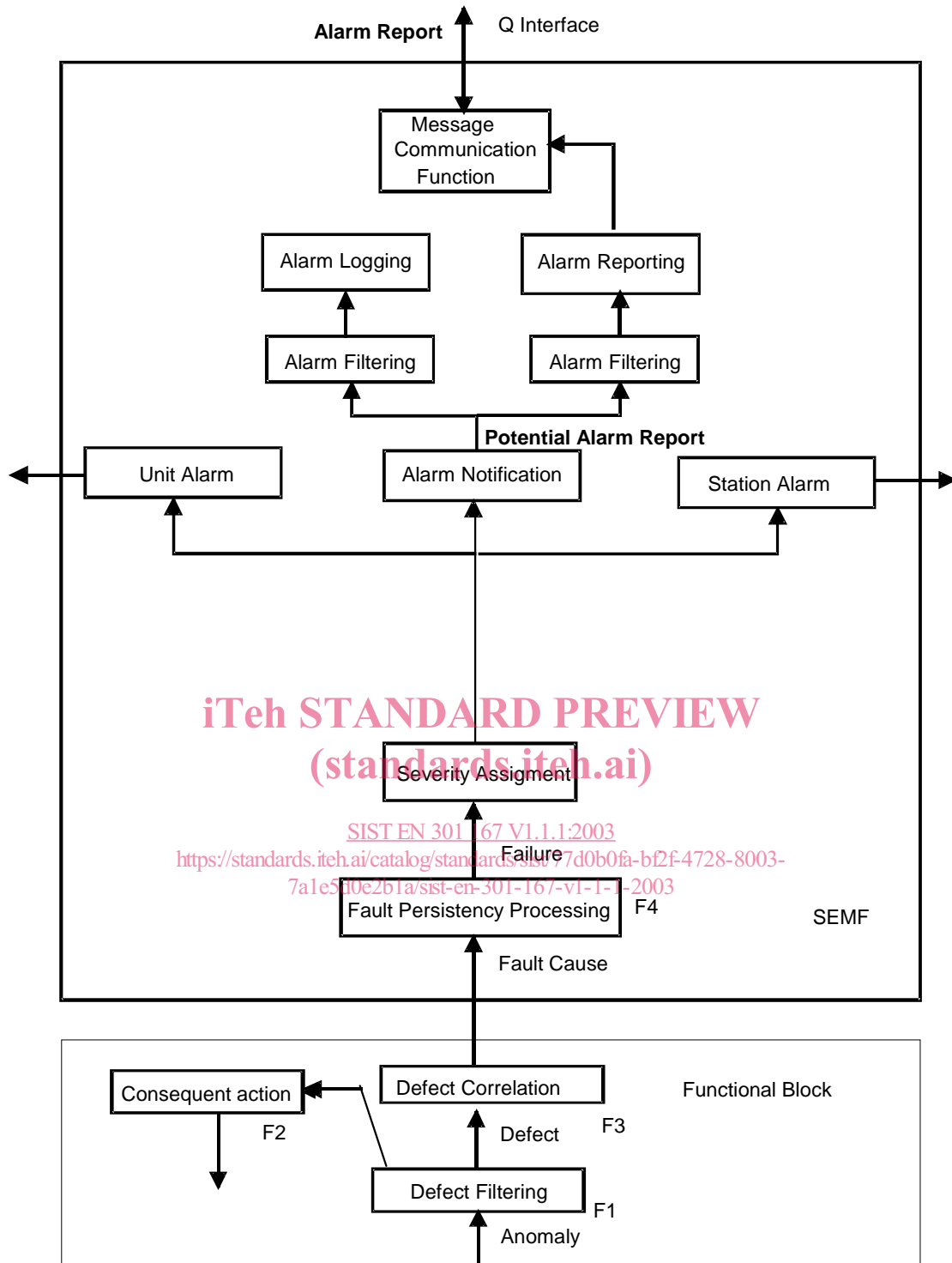


Figure 1: Fault management