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Network Aspects (NA); Functional specification of traffic management on the Network Element/Operations System (NE/OS) interface

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Foreword

This Interim European Telecommunication Standard (I-ETS) has been produced by the Network Aspects (NA) Technical Committee of the European Telecommunications Standards Institute (ETSI).

An ETSI standard may be given I-ETS status either because it is regarded as a provisional solution ahead of a more advanced standard, or because it is immature and requires a "trial period". The life of an I-ETS is limited to three years after which it can be converted into an ETS, have it's life extended for a further two years, be replaced by a new version, or be withdrawn.

Proposed announcement date	
Date of adoption of this I-ETS:	30 August 1996
Date of latest announcement of this I-ETS (doa):	31 December 1996

Introduction

The objective of traffic management is to enable as many calls as possible to be successfully completed. This objective is met by maximizing the use of all available resources in any situation. It is also to be seen as the function of supervising the performance of a network, and to be able, if necessary, to take action to control the flow of traffic for optimizing the utilisation of the network capacity.

The information model given in this I-ETS provides a common view for the performance data retrieval from the Network Element (NE), and for the administration of controls and instructions from the Operations System (OS) to the NE. The performance data provide information for the activation of traffic management controls, for the validation of former traffic management actions, and as input data for future traffic management actions.

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1 Scope

This Interim European Telecommunication Standard (I-ETS) provides an information model which covers the management aspects of the "traffic management" services functions in an exchange, as defined in the ETR 047. The application of this I-ETS is limited only to circuit-switched networks. Traffic management for Signalling System No.7 (SS7) networks and intelligent networks are outside the scope of this I-ETS.

This I-ETS focuses only on the information model at the Q3 interface between Network Element (NE) and Operations System (OS).

The following restrictions to the scope of this I-ETS apply:

- this I-ETS does not cover traffic measurement aspects;
- the handling and processing of traffic management related information on OS level and the forwarding of these data on OS level are out of the scope of this I-ETS.
- network performance data are needed as input for the traffic management controls. Sometimes the same data can be used for traffic measurement, but this coincidence is ignored in this context. The network performance data are identified and modelled as far as they are relevant and when they cannot be retrieved from other documents;
- functions listed in Task Information Base B (TIB B) for traffic management (ETR 047, subclause 5.5) which are supportable by information models defined in other ETSI and ITU-T documents are not redefined in this I-ETS. Those information models are either referenced or, if necessary, inherited;
- as far as possible and sensible, the functions defined in the Open Systems Interconnection (OSI) system management framework are considered.

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2 Normative references

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This I-ETS incorporates by dated and undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this I-ETS only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

[1] I-ETS 300 292 (1995): "Network Aspects (NA); Functional specification of call routing information management on the Operations System/Network Element (OS/NE) interface".

[2] prI-ETS 300 293 (1996): "Telecommunications Management Network (TMN); Generic managed objects".

[3] CCITT Recommendation E.410 (1992): "International network management - General information".

[4] CCITT Recommendation E.411 (1992): "International network management - Operational guidance".

[5] CCITT Recommendation E.412 (1992): "Network management controls".

[6] CCITT Recommendation E.502 (1992): "Traffic measurement requirements for digital telecommunication exchanges".

[7] CCITT Recommendation M.3100 (1992): "Generic network information model".

[8] CCITT Recommendation Q.763 (1992): "Formats and codes of the ISDN user part of Signalling System No.7".

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[9] ITU-T Recommendation Q.822 (1994): "Stage 1, stage 2 and stage 3 description for the Q3 interface - Performance management".

[10] CCITT Recommendation X.720 (1992): "Information technology - Open Systems Interconnection - Structure of management information: Management information model".

[11] CCITT Recommendation X.721 (1992): "Information technology - Open Systems Interconnection - Structure of management information: Definition of management information".

[12] CCITT Recommendation X.730 (1992): "Information technology - Open Systems Interconnection - Systems Management: Object management function".

[13] CCITT Recommendation X.731 (1992): "Information technology - Open Systems Interconnection - Systems Management: State management function".

[14] CCITT Recommendation X.732 (1992): "Information technology - Open Systems Interconnection - Systems Management: Attributes for representing relationships".

[15] CCITT Recommendation X.733 (1992): "Information technology - Open Systems Interconnection - Systems Management: Alarm reporting function".

[16] CCITT Recommendation X.734 (1992): "Information technology - Open Systems Interconnection - Systems Management: Event report management function".

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[17] CCITT Recommendation X.735 (1992): "Information technology - Open Systems Interconnection - Systems Management: Log control function".

[18] ITU-T Recommendation X.738 (1993): "Information technology - Open Systems Interconnection - Systems management: Summarization function".

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[19] ITU-T Recommendation X.739 (1993): "Information technology - Open Systems Interconnection - Systems Management: Metric objects and attributes".

[20] ITU-T Recommendation X.746 (1995): "Information technology - Open Systems Interconnection - Systems management: Scheduling function".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of this I-ETS, the following definitions apply:

answer signal: See CCITT Recommendation E.410 [3].

bid: See CCITT Recommendation E.410 [3].

circuit: See CCITT Recommendation E.410 [3].

NOTE 1: Only the exchange termination point that terminates a circuit is visible on NE management level.

circuit group: See CCITT Recommendation E.410 [3].

NOTE 2: On the NE management level it is represented by the exchange termination point sub-groups addressing the identical adjacent exchange. For traffic management, a circuit group is not visible on NE management level.

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circuit sub-group: See CCITT Recommendation E.410 [3].

NOTE 3: On the NE management level the view on a circuit sub-group is represented by "ITU-T Recommendation M.3100 (1996)": circuitEndPointSubgroup resp. "prI-ETS 300 293 (1996)": exchange termination point sub-group.

destination: See CCITT Recommendation E.410 [3].

NOTE 4: A destination identified by one or more destination codes, i.e. digit combinations.

destination code: See CCITT Recommendation E.410 [3].

seizure: See CCITT Recommendation E.410 [3].

switching node: An exchange represented by an instance of "CCITT Recommendation M.3100 (1992)": managed element or a subclass of it.

congestion level: An indicator for the present congestion situation in an exchange and an indicator for the degree of traffic management actions to be taken. It is expressed by the following Machine Congestion Levels (MCL):

- MCL0: No exchange congestion.
  The exchange works well, no traffic management action needs to be done with respect to the machine load;

- MCL1: moderate exchange congestion, the exchange keeps working. Some calls may get rejected if no traffic management action is taken.
  This is a warning, the exchange may have activated internal traffic control actions. No additional traffic should be directed to this exchange;

- MCL2: serious congestion level, the exchange is no more able to handle all offered traffic.
  More severe traffic management actions are to be performed to reduce the exchange load;

- MCL3: complete inability of the exchange to process calls.
  With high probability, the exchange is not able to handle any calls. No further calls should be directed to this exchange.

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direct routed traffic: A collection of offered calls for which a circuit sub-group would be the first choice.

alternate routed traffic: A collection of offered calls for which a circuit sub-group would be the overflow case.

3.2 Abbreviations

For the purposes of this I-ETS, the following abbreviations apply:

ACC	Automatic Congestion Control
CCS	Common Channel Signalling
DCC	Destination Code Control
HTR	Hard To Reach
MCL	Machine Congestion Levels
M/C/O	Mandatory/Conditional/Optional
NE	Network Element
OS	Operations System
OSI	Open Systems Interconnection
RDN	Relative Distinguished Name
SCR	Selective Circuit Reservation
SS7	Signalling System No.7
TAR	Temporary Alternative Routing
TIB	Task Information Base
TMN	Telecommunications Management Network

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4 Functional requirements

The functional requirements are derived from the TIB A and TIB B specified in ETR 047 for the traffic management service (see annex B). They cover the following management service function areas:

- status monitoring functions;
- performance monitoring functions;
- control functions;
- reference data;
- administrative functions.

The status and performance monitoring functions considered in the model are based on measurement items specified in CCITT Recommendation E.502 [6] (which is internally based on CCITT Recommendation E.411 [4]).

The traffic management control functions considered in the model are based on controls specified in CCITT Recommendation E.412 [5].

4.1 Status and performance monitoring functions

A wide range of status and performance monitoring functions is still covered by the information model provided in ITU-T Recommendation Q.822 [9]. An excerpt of this recommendation is given in annex E.

Therefore this I-ETS contains only those parts of the information model which cannot be referenced to ITU-T Recommendation Q.822 [9].

For the presentation of the performance data at the NE-OS interface the use of the simpleScanner object class and its scan report notification as defined in ITU-T Recommendation X.738 [18] were chosen, as due to the potential amount of performance data their retrieval from one simpleScanner object instance per observed object class is assumed to fit more into a five minute interval of time than their retrieval from one historyData object instance per observed object instance.

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4.2 Traffic management control functions

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The status and performance monitoring functions provide the input data for traffic management decisions which may lead to the initiation of network management control functions.

This I-ETS provides an information model covering network management control functions defined in CCITT Recommendation E.412 [5]. Annex C indicates by which object class the considered network management control functions are covered.

It was recognized that the circuit turndown/busying/blocking traffic control is not to be considered, as this control seems nowadays no longer applicable in a sensible way. More sophisticated controls are available in a Telecommunications Management Network (TMN) environment.

Furthermore it was identified that the circuit directionalization traffic control is covered by the cancel to object class when an instance of cancel to is valid for all traffic types and traffic sources. Therefore this traffic control is not considered as well.

The modelling of the Q3 aspects of the Automatic Congestion Control (ACC) and the automatic destination control are for further study.

NOTE: These controls are being modelled in draft ITU-T Recommendation Q.823 which was elaborated in parallel with this I-ETS.

4.3 Reference data functions

Reference data provides the network traffic manager with information retained by the NE about its resources. This includes information about the topology of the NE and its relationship to the network as well as data on the NEs capacities and capabilities.

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CCITT Recommendations E.411 [4] and E.502 [6] recognize the need for reference data as part of the data required for traffic management.

Reference data is usually long term in nature, that is, it does not change rapidly. However, when changed or modified, this should be reported immediately to the OS. An additional requirement imposed by the OS is the need to resynchonize its database at any time with the data base of the NE. This will allow recovery from events like loss of data link, data base corruption, etc.

The relevant reference data object classes are or will be defined as part of other information models, e.g. like I-ETS 300 292 [1]. Annex G identifies the already defined object classes and corresponding attributes that are relevant for traffic management. In detail, the following minimum set was identified:

- circuitEndPointSubgroup resp. xtpsg;
  - traffic direction;
  - signalling capability;
  - bearer capability;
  - total number of circuits in circuitEndPointSubgroup resp. xtpsg;
  - adjacent exchange id;

- xtpsgComb;
  - xtpsgComb identity;
  - set of corresponding xtpsgs;
  - algorithm used for assigning traffic to the corresponding xtpsgs;

- orderedListXTPSGComb;
  - orderedListXTPSGComb identity;
  - set of corresponding XTPSGCombs;
  - algorithm used for assigning traffic to the corresponding XTPSGCombs.

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Reference data can either be retrieved directly from the NE or from another OS, depending upon the specific implementation.

4.4 Administrative functions

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The administrative functions listed in subclause 5.5 of ETR 047 (TIB B, item 6) are mainly alarm reporting functions, event report management functions, and scheduling functions as defined in CCITT Recommendations X.733 [15], X.734 [16], respectively ITU-T Recommendation X.746 [20] and modelled in CCITT Recommendation X.721 [11]. Some of the administrative functions are covered as well by ETR 088.

The retrieval of routing information is provided by the call routing information model given in I-ETS 300 292 [1].

4.5 Modelling methodology

The modelling techniques described in ETR 078 (Methodology for Specification of TMN Interfaces) and ETR 046 (Modelling Guidelines) have been regarded.

In the modelling work the definitions of the supporting object classes given in the OSI system management framework (X.700 series) and in ETR 088 were adopted.

The managed object classes specified in this I-ETS are defined in line with I-ETS 300 292 [1], prI-ETS 300 293 [2], CCITT Recommendations M.3100 [7] and X.721 [11], and ITU-T Recommendation Q.822 [9].

5 Information model diagrams

5.1 Entity relationship diagrams

Figure 1 gives the entity relationship diagram for the object classes defined in the managed element fragment, and figure 2 gives the entity relationship diagram for the object classes defined in the status and