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Terminal Equipment (TE); Study and investigation into the feasibility of further harmonization of the requirements and associated tests of ETS 300 001 (Candidate NET 4) Part 1: Overview and conclusions

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Contents

Foreword

ETSI Technical Reports (ETRs) are informative documents resulting from ETSI studies which are not appropriate for European Telecommunication Standard (ETS) or Interim Telecommunication Standard (I-ETS) status. An ETR may be used to publish material which is either of an informative nature, relating to the use or application of ETSs or I-ETSs, or which is immature and not yet suitable for formal adoption as an ETS or I-ETS.

This ETR has been produced by the Terminal Equipment (TE) Technical Committee of the European Telecommunications Standards Institute (ETSI).

This ETR comprises three Parts:

ETR 075: "Terminal Equipment (TE); Study and investigation into the feasibility of further harmonization of the requirements and associated tests of ETS 300 001 (Candidate NET 4).

Part 1: Overview and conclusions,

Part 2: Comprehensive study [2],

Part 3: Special studies [3]".

Part 1 contains a summary of the overview and conclusions of the main ETR (ETR 075-2 [2]) and is provided for those readers who do not need the detail which is contained in that Part.

Part 2 (ETR 075-2 [2]), the main Report, contains the body of the ETR and gives a detailed analysis of the content of ETS 300 001 [1] together with findings and recommendations.

Part 3 (ETR 075-3 [3]), contains clauses which give the results of some detailed technical studies which formed part of the work of the Project Team.

To assist the reader to associate the comments in this ETR with the relevant requirements of the original ETS, some clauses are presented in a structure which retains the original numbering of ETS 300 001 [1].

Introduction

This ETR considers the feasibility of harmonizing the technical content of ETS 300 001 [1]. During its production, it was identified that many of the constraints to harmonization were not just technical but arise from disparities in the regulatory regimes within the contributing administrations. It was considered unhelpful to ignore these matters since they would re-emerge from time to time as impediments to harmonization. As such, when recommending a course of action that might achieve further harmonization, it was thought to be helpful to indicate the actions which administrations might care to take in order to improve the level of harmonization achievable. These can be found in the findings and recommendations contained in clauses 7 and 8 respectively of Parts 1 and 2 [2] to this ETR.

Summary of recommendations

The recommendations are grouped into four classes:

1) Structure and format (recommendations 1 to 4)

   ETS 300 001 [1], as a whole, needs restructuring and a reconsideration of its requirement and test text alongside a harsh review of the use of tables, technical simplification of the common text, and transfer of requirements concerning terminal equipment specificity to other more relevant standards. This is, of course, collective work which is, perhaps, suited in the main to be undertaken by an ETSI Technical Committee.

2) Context (recommendations 5 and 6)

The perception of market re-definition considered in conjunction with the existing type approval procedures by each Administration sets a context within which the technical nature of an Administration's responses are generated. For a standard to support a pan-European market, a common understanding of how that market is defined and regulated is required, and there is a clear need for procedures to be set out which develop that understanding.

3) The techno-regulatory environment (recommendations 7 to 11)

Even the most harmonized of standards cannot be used to support a pan-European market unless that market has a consistent legal and regulatory structure.

4) Specific technical work (recommendations 12 to 17)

It is clear that a number of technical issues previously considered from a national point of view need to be reviewed in light of the European dimension. This implies, in certain cases, collective collaboration and perhaps action by appropriate ETSI Technical Committees.

Structure of the ETR

This ETR comprises 3 Parts. Part 1 provides an overview of the analysis and conclusions, Part 2 [2] contains the detailed analysis of the findings and Part 3 [3] is a set of special studies in connection with investigations into the DC characteristics, reference impedance for input impedance, unbalance about earth and a number of aspects of testing.

Method of study and investigation

The tasks to be performed by the Project Team were identified in the guidelines provided by the Public Switched Telephone Network Full Steering Group (PSTN-FSG, see annex A). This required the analysis of the feasibility of harmonizing the technical content of ETS 300 001 [1] on a chapter by chapter basis, requirement by requirement, but considering the requirement, and its associated test as a single entity. The FSG assigned priority to Chapters 2, 3, 4, 5 and 6 and instructed the Project Team not to study Chapters 1 and 8. During its studies, the Project Team investigated all the Chapters (with the exception of Chapters 1 and 8) taking note of any relevant parts of Chapter 10, along with relevant technical comments from PT 26, which were contained in document TE(90)30. This analysis is given in full in clause 6 of ETR 075-2 [2] and is summarized in clause 6 of Part 1. The FSG, grouped the content into a number of areas of study which, on the face of it, could be seen to be contradictory to the earlier instructions. However, having studied all the relevant Chapters, the Project Team believes that it has discharged this task.

A crucial area which gave significant problems was the analysis of Cost-benefit. A paper identifying some of the difficulties encountered can be found in annex B. For each requirement/test, a broad assessment of the potential costs and benefit has been made. Finally, having recommended a course of action likely to produce further harmonization, a "first pass" estimate of the potential resources that might be employed in performing this work has been provided. This estimate is based on further harmonizing the entirety of ETS 300 001 [1], not simply requirements which appear to have the potential for selection as being essential, but ignores the fact that at least four other administrations have now joined ETSI and their input is not reflected in ETS 300 001 [1].

ETR 075-2 [2] contains the comprehensive analysis of the feasibility of harmonization and within the analysis of each requirement, a statement, or statements, identifying the implications for administrations is provided. In general, this is discussed under the heading of national inputs, but occasionally remarks can also be found in the paragraphs entitled comments. Although previous attempts to produce "target" common requirements met with some opposition, where a meaningful target for harmonization could be identified this "target" has been suggested. It is clear that some administrations believe it to be inappropriate for such suggestions to be made.

Some areas have been identified where further studies might identify potential "targets" for standardization.

Analysis of the feasibility of further harmonizing the technical content of ETS 300 001 [1]

After review of the report, ETSI TC-TE considers that it is possible to classify the prospects into three categories of a different nature:

1) techno-regulatory: further harmonization seems difficult because of existing national regulations;

2) technically complicated: further harmonization might require very substantial work by each administration to determine whether margins are available to permit changes. Such requirements are normally determined by the physical attributes of, for instance, the shortest or the longest line and if such changes result in the need for modification of the network or replacement of the existing population of terminal equipment, then the costs are likely to be high and, as a result, unacceptable;

3) technically less complicated: further harmonization would require re-expression of the requirement based on other criteria. Such changes should actually retain the status quo so far as the terminal supplier and network operator are concerned and, therefore, should be more easily achieved.

It should be noted that, for the most part, requirements embraced by categories 1) or 2) are also likely to be deemed essential.

The following indicates into which of the above categories the current requirements and tests fall.

Category 1) Techno-regulatory	
a)	Ringing detector characteristics (including sensitivity/insensitivity), Quiescent state impairments, Instructions for use.
b)	Parameters values are representative of a TE rather than access.
c)	Number of wires and which ones are used to carry particular signals.
d)	How many items of series or normal TE in total?
e)	Insulation between user accessible parts and earth (Is this safety or not?).
f)	Liability for damage as a result of DC or AC overload.
g)	What types of terminals are covered by ETS 300 001 [1], can it be modified and if so how? Are speech telephony levels embraced by transmission levels in subclause 4.4?
h)	Loop current detection.

Category 2) Technically complicated	
a)	DC characteristics and series resistance, Transients.
b)	Input impedance (Loop condition), Unbalance about earth, Series insertion loss, Transmission levels, Noise levels.
c)	Tone harmonization and detection, MFPB (DTMF) dialling.
d)	Power failure (in particular the definition).
e)	Register recall, meter pulses.
f)	Harmonization of testing and consideration of the effects of the testing methodology.

Category 3) Technically less complicated	
a)	Polarity independence.
b)	Switching after dialling, automatic calling, repeat call attempt algorithms, call duration control (clearing).
c)	Auto-answering, call control (clearing).
d)	Echo control, detection of remote party signals.

1 Scope

This ETR contains an analysis of the feasibility and cost and benefits of further harmonization of values in ETS 300 001 [1] and its testing methods. Guidelines for the work were provided by the PSTN-FSG (see annex A).

2 References

This ETR incorporates by dated and undated reference, provisions from other publications. These 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 ETR only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

[1] ETS 300 001: "Attachments to the Public Switched Telephone Network (PSTN); General technical requirements for equipment connected to an analogue subscriber interface in the PSTN (Candidate NET 4)".

[2] ETR 075-2 (1994): "Terminal Equipment (TE); Study and investigation into the feasibility of further harmonization of the requirements and associated tests of ETS 300 001 (NET 4), Part 2: Comprehensive study".

[3] ETR 075-3 (1994): "Terminal Equipment (TE); Study and investigation into the feasibility of further harmonization of the requirements and associated tests of ETS 300 001 (NET 4), Part 3: Special studies".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of this ETR, the definitions given in ETS 300 001 [1] apply, in addition to the following:

interface: A shared physical boundary between two functional units across which electrical signals originating from either of the units may pass to the other.

inter-operability: The ability to exchange across an interface electrical signals which convey information to/or from a terminal equipment and a network.

inter-working: The action of exchanging electrical signals which convey information between two or more terminals, all of which are connected to each other by means of intervening networks and associated interfaces.

techno-regulatory: A description of any technical matter which of itself also has implications of a legal or regulatory kind.

3.2 Abbreviations

For the purposes of this ETR, the abbreviations given in ETS 300 001 [1] apply, in addition to the following:

CEC	Commission of the European Community
PE	Public Enquiry
PSTN-FSG	Public Switched Telephone Network Full Steering Group
QoS	Quality of Service

4 Basis of the study

4.1 Background

The European Public Switched Telephone Network (PSTN) terminal market is one which is large in its own right and capable of significant expansion in a number of dimensions. As such, it was an early candidate for re-definition within the context of the Single European Act, and both the European Commission Telecommunications Green Paper and a number of Directives emphasize its importance. A necessary pre-requisite to the re-definition of the market is the existence of transparent objective requirements and associated compliance tests capable of being used by Administrations to re-structure, orderly and rationally, market entry rules.

Work began in late 1985 to set out PSTN access requirements; this work centred upon the declaration by Administrations of requirements and tests based on the content and form of an early CEPT recommendation (T/CS 30-02). The original attempts to independently set out terminal equipment requirements quickly revealed a diversity of treatment and approach to terminal equipment technical evaluation which defied a common approach, and several years of successive work to re-cast requirements and tests to a common structure followed this first attempt. This work began in CEPT and continued within ETSI after its formation and assumption of much of the CEPT technical work programme.

The result of the drafting and requirement definition activities was the presentation of draft prETS 300 001 for approval to ETSI Technical Committee TE in the autumn of 1989. This committee received the draft and, in light of the significant effects on existing commercial markets in the participating countries, called for a European-wide workshop to be held on the general question of terminal equipment requirements and tests to be applied to market entry conditions. This workshop was held in March of 1991.

In parallel with this work, ETSI commissioned a strategic study into the question of basic architecture and structure of standards to be used in establishing market entry of analogue terminal equipment, and this study proposed a number of methods which might be applied to the question and set out a number of recommendations for further work.

The results of this study were incorporated into the ETSI workshop mentioned above.

The results of this work, coupled with Administration review of their technical scope and content of analogue terminal equipment requirements gave rise to the generation of a mandate from the Commission of the European Community (CEC) to study and to investigate analogue terminal equipment requirements for market entry contained within ETS 300 001 [1]. This mandate is the basis for the study and investigation presented in this ETR.

4.2 Mandate BC-T-167

The determination of technical targets to be applied to terminal equipment seeking market entry is an activity with many dimensions. In order to identify and fully to consider each, this mandate was proposed initially by the CEC and due to the economic importance of its scope, the mandate was debated unusually widely before its final content was determined and ratified by the ETSI Technical Assembly.

The mandate recognizes the technical diversity of the existing analogue PSTN in the various countries concerned, and acknowledges the need to adopt a common approach in setting out and using terminal equipment requirements and tests. The mandate called in general for four activities:

- the consolidation of analogue standards work into a co-ordinated group or groups within ETSI;
- the investigation into the diversity of current analogue terminal equipment requirements and tests;
- the generation of harmonized analogue testing methods;
- the development of a comprehensive standards architecture and common set of technical constraints to be applied and to be used for market definition and entry.

This ETR covers one part of the activities commissioned under this mandate, and it relates specifically to point "b" of the mandate.

The mandate takes into account the many areas of concern in re-defining the methods of determining and managing the existing European analogue terminal equipment market. It also takes into account the current nature of ETS 300 001 [1] and the environment within which its requirements and tests were identified by the participating Administrations. In this light, it was considered important to establish a steering group of individuals representing the wide range of interests encompassed by the mandate scope. It is the responsibility of this group to prosecute, within ETSI, the activities suggested by the mandate, and this steering group was influential in determining the work performed to produce this ETR.

4.3 The Project Team and its work

An ETSI Project Team was set up to perform the drafting of this ETR.

4.3.1 Terms of reference

The Project Team terms of reference were generally set out by an interim steering group and agreed at the first meeting of the FSG mentioned above. Those terms of reference were subsequently agreed by the ETSI Technical Assembly and the Project Team began work late in 1991.

The scope of the terms of reference and relevant study items applicable to this Project Team's work make reference to the final report of the PSTN workshop, and note has been taken of those sections of that report which relate to the determination of harmonization feasibility of the requirements and tests in ETS 300 001 [1].

Moreover, during the first and second meetings of the mandate steering group, the Project Team was asked to consider requirement testing and testing methodology as a priority item, whilst treating each requirement and its associated test as a technical whole. The work has attempted to reflect this request throughout.

In assessing the harmonization feasibility of the content of ETS 300 001 [1], a number of principal areas of study naturally arise, and the Project Team has cast its considerations in these areas taking due note of the terms of reference initially set out and further clarified by the steering group. These areas include:

a) the technical rationale of common text requirements;

b) the extent to which Administrations make use of common text requirements and tests;

c) the character and extent of national variations or exceptions to common text;

d) a "best guess" assessment of costs and benefits which might arise from uniform technical content and application of common text requirements and associated tests;

e) where possible or relevant, comments relating to the nature of national variations from any given common text test or testing method.

During the course of its work, specific in-depth investigations of certain key technical parameters have also been carried out to the extent allowed by the resources available. Those investigations highlight factors which are fundamental to the development of harmonized requirements and tests or testing methods appropriate to PSTN access.

4.3.2 Management procedures

On occasions it was found necessary to consult with various Administrations' technical experts for clarification or elaboration of nationally-provided text, and this liaison was effected directly by the various members of the Project Team specifically concerned with the topic in hand.

The analysis of the content of ETS 300 001 [1] has been incrementally evaluated by the Administrations, the Commission, the steering group, and concerned ETSI members in a way which has provided for debate, refinement and change where appropriate as the work progressed.

4.3.3 Method of working

The analysis of the content of ETS 300 001 [1] is a task which requires an international awareness of Administration policies and the technical history of their PSTN architecture's. Effective technical analysis of nationally-specific requirements insists upon the presentation of independent critical review. It is thus a task requiring other than wholly conventional skills, knowledge and expertise. Effort to sustain and achieve a balanced European-wide view during the production of this ETR was maintained throughout.

The analysis of both the common part and national parts of ETS 300 001 [1] has been undertaken jointly in all cases, and the technical and European-wide aspects of the analysis have been discussed and, on numerous occasions, debated in depth. The results reflect, to the greatest extent achievable, a technical and international balance appropriate to the objectives originally defined.

4.3.4 The role of the steering group

The mandate steering group was made up of members aware of, concerned with, and involved in virtually every aspect of the PSTN environment; its constitution was multinational and well-balanced across the telecommunications resource triangle. The procedures established, which allow for effective liaison between the steering group and the Project Team, ensured that the work maintained a consistent direction and breadth of treatment appropriate to the mandate objectives intended to be addressed.

This has meant that, on a number of occasions, general guidance sought by the Project Team was forthcoming, resource review was prompt and effective, and detailed key studies were able to be identified and undertaken as the analysis proceeded. In consequence, the synergy between the analyst and those seeking the analysis meant that the work of the Project Team was been able to benefit from the changing perceptions of the steering group as the implications of the analysis became clearer.

5 The nature and analysis of ETS 300 001

5.1 Structure and content of the ETS

ETS 300 001 [1] contains common text (generated by ETSI) and national contributions (attributable to specific Administrations) which either add to, modify, or ignore the common text as it is intended to be applied by each Administration. This mixture of content is distributed throughout the ETS and has the effect of "tuning" each requirement and its associated test to a national situation which reflects the *status quo.*

The common part has had virtually no technical changes since late 1989; Administrations have continued to review the nature of their contributions and have submitted various changes and additions since that time. Following adoption of the document as acceptable to go for voting in late 1991, the voting period (essentially the first half of 1992) was also allocated as a further (and final) period during which Administrations could yet further add to or modify national parts, and many of these changes were not received until the Project Team analysis of the ETS as sent for voting was substantially complete.

It was decided at the outset of Project Team work that the set of national variations due at the end of the voting period would not be considered; following on from this decision, it should be noted that this ETR deals with the analysis of an ETS the contents of which are, in part, current to 1990 (common text) and in part current to 1991 (National parts).

5.2 National parts and their role

Over two-thirds of the content of ETS 300 001 [1] consists of national remarks, alternative requirements and tests, special normative tests, and requirements additional to the common text. The consideration of this component has suggested that, requirement upon requirement, some collective grouping of national comments might be appropriate. In the main, this was achievable; attempts to derive a logical technical grouping of variations or additions to the common text also revealed anomalies related to, but not strictly within, the technical boundary of a given requirement or testing methodology. It is common to find, for certain requirements or tests, "unclassified" content (contained in Chapter 10) which could have been incorporated more usefully into the common text structure.

5.3 Administration-specific issues

The study of common text and of related national parts revealed a significant number of instances of apparent confusion arising from (presumably) Administrations' interpretation of the common text or from ambiguities within the common text itself. These factors have been, as far as possible, identified in the analysis.

5.4 The techno-regulatory environment

The extent to which this ETS might legally be used in a current legal system particular to the Administration itself is unclear and is one of the key factors determining the content which an Administration might consider appropriate. A consequence of this situation is asymmetry of technical and technically-related content. Until there is harmonization of method and scope of legal application of the ETS, there can only be incomplete harmonization of its content. A number of issues relating to this problem arose during Public Enquiry (PE) in 1990 and still awaits resolution. These matters are discussed in greater detail in clause 7.

5.5 Cost benefit analysis

A key point arising from the PSTN Workshop was that of assessing cost and benefit which might arise from further harmonization of various requirements. An attempt to apply such treatment quickly foundered: cost-benefit is very much related to commercial interests, and these in turn depend upon whether, for example, the interests are those of network provider, his network equipment supplier, or a terminal equipment supplier or user. In any case, a deterministic analysis requires technical and commercial data which is often held confidential to the party concerned.

Specific comments regarding this issue have been made and are given in annex B.

5.6 Testing

Much has been said about testing and its role in further harmonizing the content of ETS 300 001 [1]. There can be no doubt that the lack of harmonization in this area has significantly impeded the uniform presentation of the content of the ETS as a whole. The analysis caters for a number of factors in this area, including:

a) differences in interpretation of the common text tests which gives rise to differences in the type of tests declared;

b) differences in testing methods and tolerances;

c) variability of legal application across Administrations;

d) use of normative testing by Administrations, presumably in an attempt to preserve their *status quo;*

e) use of Administration-specific requirements and tests in place of common text.

Where possible, these instances have been analysed for relevance and technical content, and a special study on testing is presented in ETR 075-3 [3].

6 Study of the feasibility of harmonization

This clause of this Part of the ETR presents a summary of the detailed analysis of ETS 300 001 [1] on a Chapter by Chapter and clause by clause basis that is given in the equivalent clause of ETR 075-2 [2]. It identifies major comments on the ETS itself and makes brief observations on the feasibility of harmonization of individual requirements.

For ease of reference, the original Chapter and clause numbering of ETS 300 001 [1] are retained in this clause of the ETR.

6.1 Chapter 1

1 General

The Project Team was instructed not to consider this Chapter.

6.2 Chapter 2

2 DC Characteristics

2.1 Polarity

This requirement is already significantly harmonized.

There are a small number of comments relating to certain terminal equipment functions and to the method of network presentation and attachment which require clarification.

2.2 Insulation resistance

There is a general requirement (terminal equipment shall not be modified prior to test) which might sensibly be reconsidered to be a part of the general text of the ETS.

In addition, there is a general problem in a number of Administration's statements in that certain network termination methods give rise to additional wires specific to a particular installation, and the role of these wires in the determination of insulation resistance values is unclear.

There is also a lack of uniform treatment of how many terminals may be connected in a typical installation: if the requirement is per terminal, then the installation configuration needs to be set out; if per installation, then the per-terminal figure needs to be derived from the installation rules.

2.2.1 Equipment in quiescent condition

A number of Administration's contributions incorporate the three different parameters of user safety, leakage current (current lost because of imperfect insulation), and current to be provided from the line for use in powering circuitry in terminal equipment during its quiescent state.

Subject to clarification of these parameters, the feasibility of harmonization of requirements relating to each is high once the installation configuration has been identified. It is assumed that safety requirements could be removed and reference to the already harmonized safety standard could be substituted.

2.2.2 Equipment in loop condition

Subject to the general comments concerning this section, and bearing in mind that only a few Administrations require insulation resistance tests in the loop condition, the feasibility of harmonization of this requirement seems to be high. It is assumed that safety requirements could be removed and reference to the already harmonized safety standard could be substituted.

2.3 Loop condition DC Characteristics

This requirement includes network-related requirements (maximum loop resistance values) and terminal-specific requirements particular to installation practice (minimum loop resistance values concerned with more than one terminal in parallel in one installation).

Consideration of the data provided, exposes a part of the DC mask which is common for all countries. However, due to conflicts in some national requirements, it is unlikely that this could be exploited practically.

The following principal constraints to harmonization in this area include:

1) the terminal voltage limits at low currents (on long lines);

2) conflict between the requirements of some countries for the feeding current to be limited by the TE in case of short line connections, and others where current limiting is provided by the characteristics of the exchange feed.

In addition, Administrations provide information which does not appear to be sufficiently comprehensive to permit a full harmonization feasibility study; technical questions such as network tolerances and the DC requirements during various phases of call progress need answers before such work can begin.

Due to the importance and complexity of this subject a separate study which presents a detailed analysis of the DC mask requirement is included in ETR 075-3 [3].

2.4 Transient response

2.4.1 Quiescent to loop state

The submissions made by the various Administrations are varied in technical scope and meaning. There seems to be no common understanding of the basis on which the contributions were submitted; seven Administrations do not consider the requirement even to be of voluntary status.

Until the meaning behind the various submissions is clearly understood, harmonization feasibility cannot be assessed.

2.4.2 Loop current transfer

The technical content of this requirement is largely accepted (all but four Administrations have found the common text sufficient for their needs). It would appear, subject to certain technical clarification, that harmonization feasibility is high.

2.5 Series resistance

This requirement is linked technically to subclause 2.3, and forms a statement of additional resistance which might be introduced into the DC loop formed by the local exchange, intervening line plant, and equipment comprising an installation at the subscriber's location. Although this requirement in itself would appear to offer harmonization possibilities, it cannot, with any technical credibility, be divorced from the overall consideration needed to be made of the DC loop and hence the requirement in subclause 2.3.

Hence the harmonization feasibility remains a matter to be clarified further during the review of subclause 2.3.

2.6 DC Overload susceptibility

Contributions by Administrations under this heading fall broadly into two different technical areas. Firstly, some contributions assume the TE to be protected against network faults; others relate to overload of the terminal equipment given normal network parameters. Seven Administrations consider the requirement to be not mandatory and a majority consider that normal testing gives sufficient protection against overload.

Harmonization cannot be achieved until all submissions relate to the same concept or until the requirement itself is determined to be acceptable as one with voluntary status (harmonization by removal).

6.3 Chapter 3

3 Ringing signal characteristics

3.1 Input voltage - Current characteristics

The technical content of this subclause reflects two linked factors.

Firstly, the nature of the termination interface of the a and b wires emanating from the exchange to which the wires of the installation connect is nationally-specific and technically variable. It is common to find that this interface gives rise to extra wires particular to the regulations for supply of service in a given Administration.

Secondly, ringing detectors in use by Administrations may generally be classified as either a low impedance or a high impedance. In the former case, installation practice for multiple terminals arranges detectors electrically in series; in the latter case, installation practice arranges detectors electrically in parallel. In some Administrations, a mixture of the two types requires installation practice that is area specific within one country.

Until these factors are harmonized (and this suggests a harmonization of Administration Regulations for supply of service) there cannot be a single technical solution for the connection of terminal equipment.

Various approaches to this problem are set out.

It should be noted that the use of any option requires a pre-determined European standard to exist.

3.2 Overload susceptibility

This requirement is terminal equipment specific and relates to the ability of equipment to function when subjected to certain network ringing signals. The requirement may be seen as one which is interpreted by various Administrations in different ways, but is, in any case, related to terminal equipment performance or reliability and perhaps to safety issues.

6.4 Chapter 4

4 Transmission Characteristics

Many of the requirements of this Chapter are dependent on both the permitted arrangements for connection and limitations placed on the number of terminals per PSTN line. Stated another way, what is important to the network is the cumulative effect of all TEs connected to a single line. This is a complex matter which is probably in need of considerable study in order to provide a European solution.

4.1 Input Impedance

4.1.1 Input Impedance in the quiescent condition

Proposals for harmonizing the values for this requirement cannot be made until the problems highlighted above have been resolved. It should be noted that when a number of terminals are connected to the same line, it is the combined effect of all terminals which is important.

4.1.2 Input Impedance in the loop condition

Most network operators will probably consider this, along with the DC mask and transmission levels, as one of the most important requirements. Many networks, following the lead of CCITT, are changing to a complex capacitive termination (input) impedance. As such changes are for most countries still under consideration, it is possible by judicious choice to produce a single harmonized value of complex impedance.

Any change of terminal impedance that requires changes to the public telephone network in order to maintain acceptable levels of transmission quality is likely to prove astronomically expensive. Provided that the changes are small and they embody suitable arrangements to manage an appropriate transition the costs should be small.

4.2 Unbalance about Earth

This is a complicated subject which has been further complicated by the confusing structure of this subclause. The requirement can clearly be split into two sets; firstly, the generation by the terminal of unbalanced signals about which the network (and other users) know and care, and secondly, the ability of the terminal to reject unbalanced signals (about which the network operator, the terminal supplier and the user may care, but the network almost certainly will not care).

In general, this requirement is another which is related to connection methods and terminal limits. This coupled with large differences in the national values and poor definition of the tests, in particular for the physical position of the Terminal Equipment Under Test in relation to earth, means that repeatable results are unlikely to be obtained, particularly for the more onerous values.

Given further study to provide a harmonized test arrangement, and perhaps the use of a questionnaire to be completed by administrations, and thereby the identification of a relevant value for the requirement, harmonization should be possible.

4.3 Series-connected TE insertion loss

The requirements dealing with ringing and speech-band frequencies appear to be capable of harmonization. However, the requirements also need to address 12 kHz and 16 kHz meter pulses that are specific to administrations. The requirements in this area have generally been written in terms of not attenuating meter pulses although a need for a series TE specifically designed to attenuate these frequencies can be envisaged.

4.4 Transmission levels

These requirements have been complicated by poor wording, leading to confusion and over complication, particularly in relation to the application of the standard to live speech and dialling (loop disconnect or MF or perhaps both). In particular, it is not clear whether the use of MF during an established call is subject to this subclause or subclause 5.4.4. The common text, in particular for non-speech devices, is not in alignment with CCITT Recommendations and although a reduction in the variations may be achievable, harmonization will probably not be possible without further study to align the requirements and methods for power level measurement.

4.5 Noise level

Analysis suggests that in the loop condition there is no need for a requirement. In-band noise is considered a terminal quality matter whilst any out-band noise requirements can be dealt with within subclause 4.4.3.

The requirements for quiescent condition are however more complex and are related to the number of terminals connected to the line and the connection method. The in-band noise needs to be limited so as not to degrade the signal-to-noise ratio of a terminal in the loop condition and the out-of-band noise needs to be constrained so that the network is not filled with noise by the many terminals connected to it. It is thought that determination of acceptable limits may require further study especially in the light of Electro-Magnetic Compatibility (EMC) requirements.

Testing

Studies show that in many cases the feeding bridges and other components would have an adverse effect on the precision of the results of many of the tests for Chapter 4. It should be possible to choose a set of harmonized feed currents in a range that is representative of normal network feeding conditions. Further study will be required in order to establish the limit of acceptable precision.

6.5 Chapter 5

5 Calling Function

This Chapter covers various mechanisms and aspects related to the "Calling Function". It consists of seven main clauses covering: general aspects (in effect an introduction to the Chapter), Dial Tone detectors, Decadic (or loop-disconnect) dialling, Tone dialling, switching into transmission phase, Automatic calling and identification signals. It could be said that effort should not be expended on harmonizing decadic dialling, since the basis for the requirements is, in most cases, heavily historical and is becoming obsolescent. To a greater or lesser extent the possibilities for harmonizing the requirements rely on harmonizing dc feeding conditions during the dialling condition, producing a harmonized measuring method and then as a result recasting the values for each requirement. Such work is likely to require significant effort over an extended period and as a result the costs, overall, are likely to be large, although probably not astronomical. It is therefore suggested that all the effort for harmonization should be directed at MFPB dialling and that steps be taken positively to encourage a move away from decadic dialling.

In some of the clauses, in particular subclause 5.6, it is obvious that some confusion has arisen and as a result the values provided both in the tables and also in the national remarks are less meaningful than they could have been.

5.1 General

This simply provides an introduction to the Chapter and could easily be absorbed as text or a note directly under the Chapter heading.

5.2 Dial Tone detection

The possibilities of harmonizing this concept of dial tone detection as a whole are restricted because of the differences in the frequency or frequencies of dial tone and the severity of the requirement imposed by the insensitivity requirement. Assuming harmonization of such a requirement to be both desirable and meaningful, either Europe needs to adopt a single dial tone or the insensitivity requirements need to be relaxed. Exactly the same result can be expected for the requirements for the other tone detectors in Chapter 9. The cost will depend on the final solution but is unlikely to be large and the benefits might include a common detector unit.

5.3 Decadic dialling

Most of the things to be said about this have been said in the introduction. It needs to be noted that if this requirement is harmonized, the cost of which will not be insignificant, the result is likely to be that it would be more difficult to encourage obsolescence of this dialling method.

5.4 Dialling with MFPB (DTMF)

Harmonization of this requirement still requires the solution of a few minor problems. These are, however, far from insurmountable and should be achievable at small cost. There are one or two requirements which originate from the days when MFPB was generated using discrete components, which are largely obsolete. The benefits of high availability of MFPB is likely to be an increase in "kiosk" and other services, with an associated increase in the use of the network. Therefore, any costs to the network operator might well quickly be repaid by increased traffic revenue.

5.5 Switching after dialling condition

With decreasing call set-up times, the ability for the user or the TE to monitor call progress could be beneficial in reducing over provision of common network equipment used during call establishment. Harmonization of this requirement seems possible by simply specifying that some time (2 seconds is suggested) after completion of dialling the "transmission circuitry" should be connected.

5.6 Automatic Calling functions

The intention of most of the requirements of this Chapter are to prevent abuse of the use of the PSTN and to maintain general aspects of Quality of Service (QoS). Other requirements deal with the control of the duration of a call so as to protect the user. This could however be extended to cover all parties (network operator, service provider and user) since disputes over bills and the subsequent legal actions are generally best avoided.

The use of automatic call establishment (and answering) is likely to increase in the future as TEs become more sophisticated and their cost falls. It can be expected that these terminals will enter the market and generate significant extra revenues for the network operators and service providers whilst at the same time providing services which are desired by the user. Such services may well include security, remote surveillance and alarms.

These requirements should be sufficient to prevent unacceptable disturbance to the PSTN as a result of growth of such equipment and services in the future.

The cost of harmonization is small and benefits for all substantial.

Comments concerning subclause 5.6 and implications for Chapter 6

This subclause attempts to deal with all aspects of Automatic Calling and as a result covers not only call establishment but also whether a call is successful and, if not, clearing the call. Chapter 6 provides similar information for the Automatic answering of calls. Determination of whether a call is successful and resulting actions to clear the call have many common aspects and it therefore seems wrong to re-iterate the same concepts with the probability of introducing incompatibility. Without considering whether such requirements are essential or not, it is suggested that it might be better to restructure the existing ETS so as to contain a separate Chapter for automatic calling or Chapters for automatic call establishment, automatic call answering, maintaining a call, and clearing.

5.7 Identification signals

It is considered that these requirements are too terminal specific to be considered in a general standard for connection to the PSTN. They should be deleted from this ETS and, if necessary, other more appropriate requirements included in terminal specific standards.

6.6 Chapter 6

6 Answering function

This Chapter gives requirements dealing with the answering phase of a call and the retention of the line after answer. It consists of four main subclauses, one General and the other three covering Ringing signal reception, Automatic answering function, and Automatic control of the loop condition.

6.1 General

This subclause, intended as an introduction to the Chapter, introduces an ambiguity that requires correction in order to ensure a uniform application of the requirement by all administrations.

6.2 Ringing Signal Reception

The intent of this subclause is to ensure that when ringing is applied to indicate an incoming call, either a discernible signal is given to the user or an automatic detector responds correctly. It is also intended to ensure that the detector does not respond to false signals.

Uniform application of this requirement cannot be guaranteed, as "correct" operation is difficult to define for varied equipments, and there are also difficulties in determining the timing of the operation when, in automatic equipment for instance, there may be no immediate external indication.

The requirements have been complicated by differing National methods of specifying the drive signal. The actual signal applied to the ringing detector is also dependent on the National installation practice.

This ETR suggests a simplified means of describing the applied signal (see the detailed Chapter 3 analysis in ETR 075-2 [2]).

Harmonization of this requirement is not possible until detector insensitivity, connection methods and rules have been harmonized.

6.3 Automatic answering function

This subclause lists auto-answering equipment requirements that are additional to those given in subclause 6.2 and Chapter 3.

Sensitivity, time to answer, and insensitivity to spurious signals are dealt with, and a requirement is given for the TE to generate an answer message or tone within a specified time after seizing the line.

Harmonization of the sensitivity and insensitivity requirements will be difficult because of the range of National values given. It will not be possible until connection methods and rules have been harmonized. Harmonization of the timings should be straightforward.

The requirements in this subclause facilitate end-to-end interworking, and although in the main they do not involve interaction with the network, they can be considered appropriate to a reserved telephony service because of human factors.

For data equipment such as facsimile machines, voluntary harmonization has occurred by following CCITT Recommendations. It is important that any answering signal should not replicate a network tone.

6.4 Automatic control of the loop condition

It needs to be noted that the requirements expressed in this subclause are, for the most part, related to network access and are highly dependant on terminal design. The requirements are intended to aid the prompt clearing of completed calls or ineffective connections.

Some of the requirements are wholly impractical to test when the TE is in its normal operating condition. It is, therefore, necessary to make special modifications to the test sample or its software. Tests under such conditions can give no assurance that terminal equipment in the field operates to specification.

The requirements for code related signals cannot be tested on certain types of modem, and are inappropriate to other types.

A few countries provide DC signals from the network to indicate that a call has cleared, and where these are available they provide a useful feature. As so few networks are thus equipped, harmonization of this requirement may not be appropriate.

Many countries have quite restrictive requirements for call clearing. It is suggested that the primary need is to clear unsuccessful calls, and the requirements should be restructured in a form which permits alternative technical solutions. The content of this chapter is restricted to current technology and hence may inhibit innovation.

In general, the tests in this Chapter are nationally specific because of the diverse nature of the requirements. Moreover they are terminal specific as the tests vary according to the type of terminal. Effort should not be expended on harmonizing these tests.

6.7 Chapter 7

7 Power failure

This Chapter covers the operation of TEs during conditions of Power Failure. In this context Power Failure is considered to be failure of any power source other than the power normally supplied on the PSTN connection by the network operator. It is suggested that the distinction between TEs in the quiescent condition and those in any other condition is not warranted. This is supported by the fact that for most nations the requirement values and any national remarks are generally the same for both conditions.

Where a TE is mains powered, it seems realistic to expect it to meet any relevant requirement at any value of mains voltage and frequency which is still within the nominal limits for the mains supply.

For other forms of power failure, such as the failure of internal batteries, only the supplier knows at what values his power supply will cause his TE to contravene any relevant requirements of ETS 300 001 [1] and, therefore, he needs to declare the values at which his apparatus will not seize, or if in loop condition will release the line. At any value of voltage or current greater than this, the TE should be able to comply with any relevant requirement, chosen at random, and confirmed by the appropriate test.

Special requirements to cover the effect on other TEs in the same installation should be unnecessary as protection should be provided by the requirement to restore to the quiescent condition.

The remainder of the national comments, in the main, deal with what a TE is permitted to do when its power supply is restored. Any function which has been corrupted (or would fail to comply with ETS 300 001 [1]) by the failure of a power supply, should be inhibited until the equipment has been reset so as to be compliant. It is also considered pragmatic to request that, for instance, the answering tape on answering and recording machines be rewound to the start of a message.

The common text and the national comments illustrate two common threads:

- to cause the TE to be quiescent whenever, due to power failure, it is unable to comply with any relevant requirement (for a TE in the loop condition) of ETS 300 001 [1];

- to ensure that the terminal is restored so as to operate correctly before any function that might be impaired is utilized.

Harmonization may well be possible at negligible or small cost, provided that the principles outlined above are followed.

6.8 Chapter 8

8 Connection methods

This Chapter was not considered.

6.9 Chapter 9

9 Special Functions

Various assorted terminal functions in this Chapter are gathered together that did not fit into other Chapters of the ETS. It consists of six main subclauses covering Register recall, Meter pulse reception, Disabling of echo control devices, Loop current detection, PSTN tone detection and Detection of remote party signals. Most of the requirements of this Chapter may be considered to be terminal specific. Harmonization of many of the requirements of this Chapter would be difficult without significant network changes particularly in the area of tone generation and meter pulsing.

9.1 Register recall

This facility is related to interworking with the network and will have greater importance as new value added services spread throughout Europe.

Break times are specified but they cannot properly be compared one with another because they are not defined at the same current thresholds. Nevertheless, it can be said that the two distinct groupings (approximately 100 ms and approximately 250 ms) would prevent full harmonization.

The pre-break and post-break requirements are not useful and have no significant relevance to network operation.

9.2 Meter pulse reception

Harmonization cannot be achieved with the given values for the 12 kHz and 16 kHz meter pulses. Further study, and the co-operation of National administration bodies, will be necessary before common values of requirements for sensitivity, selectivity and timings can be determined.

It is considered that 50 Hz meter pulses are unlikely to become more widespread, and should be treated as National variations.

Manufacturers of pay phones have little interest in the harmonization of meter pulses whilst the means of payment (e.g. prepayment cards, coins) are not yet harmonized.

The harmonization costs could be significant for the network operators.

9.3 Disabling of echo control devices

The characteristics of the tone, and the procedures and timings required to disable PSTN based echo suppressors and cancellers are terminal specific requirements which are already substantially voluntarily harmonized as a result of being well described in the relevant CCITT/ITU-T G and V series of Recommendations.

If any requirement is necessary it should be located in a terminal standard.

9.4 Loop current detection

These requirements exist in the ETS mainly to support the particular installation practices used in Germany and Italy. Austria and France have requirements for auto-calling apparatus.

Most countries describe the requirements as "non-mandatory" and they perhaps belong solely in National parts of terminal standards.

9.5 PSTN tone detection

This subclause gives requirements for the detection and non-detection of call progress tones by automatic equipment so that it can determine when the network is ready or whether a call has failed.

Special dial tone, busy tone, congestion tone, ringing tone and special information tone appear in this subclause. Other tones such as call progress tone, number unobtainable tone and howler are not dealt with. Normal dial tone detection appears in Chapter 5.

There are significant differences in the characteristics of tones in different countries, and terminal harmonization will not be possible unless the network tones are harmonized. For ease of terminal operation it may be more important to harmonize the tone cadences than it is to harmonize their frequencies.

When considering the harmonization of network tones it will be important to take into account the human factors. It should also be noted that any changes to existing National tones will affect the operation of existing terminals.

An analysis of the existing network tones is given in the detailed discussion of Chapter 9 in ETR 075-2 [2].

For all of the tones, less than 50% of the countries consider the requirements to be mandatory. For some, far less.

Many of the requirements may be considered to be terminal specific.

9.6 Detection of remote party signals

The only item of substance in this subclause deals with detection of echo suppressor tone for modem interworking under the title of Answering tone detection. As the facility is only required for interworking it would be better placed in a terminal standard.

Although speech and data signals and remote activation tones are referred to, they are actually dealt with in Chapter 6 of ETS 300 001 [1].

Testing

The register recall test needs further study as the present test gives results that vary with the feed conditions.

The test given for the return loss of meter pulse detectors specifies a circuit that makes automatic testing difficult.

For some types of equipment it may be necessary to perform special actions to set them into the correct mode for the tone or pulse detector to operate. It may also be difficult to determine directly the operation of the detector without modification to the apparatus or its software. Such problems, which are terminal specific, are not dealt with in the test descriptions.

6.10 Chapter 10

10 Additional unclassified requirements

The contents of this Chapter in ETS 300 001 [1], are grouped into nine subclauses numbered 10.1 to 10.9 relating to the subject matter of Chapters 1 to 9.

In this ETR, the subclauses of Chapter 10 have been dealt with in the reports of each relevant Chapter and so do not appear as separate items.

7 Findings

The results of the analysis of ETS 300 001 [1] can be grouped logically into four main sets of issues which are related in various ways to the harmonization feasibility of the document. These are as follows:

a) issues of a general nature which arise throughout the ETS and which concern its presentation;

b) the context of its requirements and tests;

c) matters concerning policy of use, legal status, and maintenance;

d) technical issues which might represent impediments to harmonization.

These issues are summarized below according to these groupings.

7.1 General presentation of the ETS

The format of ETS 300 001 [1] attempts to create and control an absolute separation of every requirement from its associated test. Each requirement contains a brief statement indicating how compliance of equipment to that requirement is to be determined.

Although this structure is in some ways helpful, many technical parameters concerned with setting out precisely a requirement and its associated test can be placed in either or perhaps in varying proportions split between the requirement and its test. Often there are sound engineering reasons, given a particular point of view, for either choice.

In the main, the common text follows a consistent approach to the assignment of parameters, but the incorporation by Administrations of national remarks or alternative requirements or perhaps only a special (normative) test disrupts this consistency. Often it is difficult to identify the total set of technical parameters which make up a given Administration's requirement; often this set is not the same as the common text set.

This gives rise to uneven technical treatment from Administration to Administration of a single requirement or test, and asymmetric technical rigour required by a given Administration from requirement to requirement.

A second common theme throughout the ETS is that of variable technical precision from requirement to requirement or from test to test. In many instances, common text requirements and tests have a single interpretation; in others, the meaning is unclear or ambiguous. There are many occasions in which national remarks or additions compound the problem by adding yet another set of possible meanings to interpret.

Finally, the use of tables in which Administrations might declare values, applicability of a requirement or test, or testing conditions is irregular and sometimes perhaps unnecessary; many tables have few entries or perhaps no entries at all. It is usual to find tables which repeat, or appear to repeat, testing parameters in requirement tables and *vice versa*.

7.2 The context of ETS 300 001

It is clear that ETS 300 001 [1] is a vehicle, in the main, for setting out, in a common structure, the *status quo* of terminal equipment type approval requirements in many of the participating Administrations.

Since the procedures and constraints concerned with type approval vary widely across the participating Administrations, the content reflects that asymmetry. Some Administrations incorporate requirements ranging from what could arguably be termed safety matters to highly-specific details which relate to certain types of terminal equipment functionality or construction. Others treat aspects concerned with network access and with terminal-to-terminal interworking with similar rigour.

Although the context **for a given Administration** appears to be consistent and can be assumed to be in line with its existing type approval environment, the context across ETS 300 001 [1] as a whole is mixed. The context intended to be set out and controlled by the common text alone is largely lost.

It is, given this situation, easy to understand why parameter values (and in many cases, the number of parameters as well) are not only mixed between requirement and test but often depict ranges of variation within a single requirement or test either of which is technically difficult to understand.

This background of dissimilar environment and context variability also enshrines national methods of test and test rationale. An important component of a national test (historically-based and perhaps reflecting the technology of 40 years ago) is the tolerance within which parameter values are said to be acceptable, which parameter values might be examined, and the method used in that examination. In many cases, the diversity of test methods and testing tolerances those methods require would seem to be the only reason for national variation of a given parameter within a requirement or test.

There are many such variations: their presence significantly impedes harmonization.

7.3 The wider role of ETS 300 001

It is widely recognized that a standard intended for use as part of a legal procedure should be written with that application in mind from the outset. ETS 300 001 [1] has not and could not have benefited from such a procedure; the bulk of its content was generated within CEPT by engineers skilled in drafting European technical recommendations and at a time when the full implications of writing and using regulatory standards were unknown. It then follows that the ETS is less suited for the purpose it is expected to support than might otherwise be the case, and this reality formed a central theme amongst comments arising from its Public Enquiry period held during 1990. Some of these concerns, dealing with the regulatory role of the ETS, appear to remain unresolved.

The application of this ETS to market entry rules for terminals requires a clear and unequivocal definition of the infrastructure to which terminals relate and a (pre-determined) comprehensive set of procedural rules which describe that relationship. Whilst it might be said that these matters are outside the standards-writing environment, it also needs to be said that a certain interaction is inevitable.

A number of such factors arise from the analysis of ETS 300 001 [1]; they are concerned in the main with the two aspects of network definition and legal application of the ETS.

It has already been mentioned that the method of presentation of the network and a clear and consistent technical treatment of the installation which connects to that network presentation is a necessary pre-requisite to harmonization of technical requirements and tests to be set out and to be applied to terminal equipment. This matter encompasses, however, issues beyond physics. It is clear, for example, that a network "end" is a point of service delivery which incorporates some guarantee of availability of that service; similarly, the provider of the service has good reason to expect that connection to its network end is likely to be safe and to be made in such a way as to allow the service to be delivered. Issues of liability are assumed by the parties either side of the network end or interface; rules of presentation and attachment need to reflect the technical and legal precision implied.

Any standard is organic: it needs to alter and evolve alongside the development and change of the technology it describes. This reality does not sit comfortably in the lap of regulatory use of a standard; the rule of Law is, of necessity, reactive and relies on a certain delay to ensure stability. In that light, the methods of updating the content of the ETS, some of which is the communal property of ETSI members (the common text) and much of which is Administration determined (the national parts) are crucial to an effective and symmetric application throughout Europe.

Matters outside the locus of ETSI but related to its area of responsibility need to be addressed and resolved.

7.4 Technical issues

There are technical variations within ETS 300 001 [1] which, largely because of differing historical reality amongst Administrations, confound harmonization. Of these, the method of presentation of the network and the terminal, or terminals which might be connected to that presentation, is perhaps the single most important issue. A discussion of this matter is set out separately. Other factors include disparities concerned with the loop condition DC parameters a terminal needs to exhibit, certain variations in various

ac (within the speech-band as well as out-band) parameters, and a host of protocols concerning inter-operability (the terminal signalling to or receiving signals from the network) and interworking (terminals exchanging information between themselves via an electrically transparent network path). These factors are discussed in the following subclauses.

7.4.1 Network presentation and connection rules

A fundamental aspect of the technical requirements with which a terminal equipment needs to comply is that of the technical environment (or environments) in which the terminal equipment is expected to function. This environment is largely set by the way in which that terminal attaches to the network and hence in the way (or ways) in which that network affords attachment. It is technical fact that the effects upon the network of only one terminal which is attached needs to be different from those effects created by the simultaneous connection of a number of terminals; moreover, in such a situation, the effect of one terminal upon others also may well be a matter of concern.

ETS 300 001 [1] is hopelessly vague on this point. Some connection arrangements permit a number of terminals, yet the requirements apply to only one; others permit multiple terminals to be connected in certain terminal states only; still other connection arrangements appear only to relate to the connection of a single terminal with little or no mention of what the extent of the related installation might be.

Clearly, this wide range of options creates, of itself, a divergence in the technical meaning of any number of requirements with the ETS.

Since the effect of terminal equipment characteristics upon other terminals is most significant when the terminals are in the same states or conditions, the technical implications of terminal parameter interaction are predominant when all are in the quiescent condition, or when two or more are in the loop condition or when the installation itself receives ringing current from the exchange. Consequently, virtually all quiescent condition requirements and tests are affected by this diversity.

Perhaps the most significant parameter, however, is that of the ringing signal detector. Detectors can be connected and multiply in parallel, excited by a a common voltage, or can be connected in series, excited by a common current. There is precious little commonality between such types of ring detection circuits and, since the type of detector is related intimately to the electrical design of the installation, one finds a significant diversity across Administrations in this area.

Such a diversity of network installation characteristics and, in consequence, related terminal equipment requirements, cannot fall within any harmonization environment.

7.4.2 DC Characteristics

Technical variations of the terminal equipment loop condition DC voltage-current characteristics also present harmonization difficulties of a different kind. If one assumes the voltage-current characteristics declared by each Administration relate to a single terminal, certain common factors emerge. There appear to remain, however, fundamental technical differences from network to network which are concerned with how that network delivers current to the terminal and how the terminal inter-operates with that network current source.

7.4.3 AC Characteristics

Signals within the speech-band, whether received from, or transmitted to, the network by a terminal equipment, form the basis of a number of speech-band requirements which range from the frequency distribution of out-band noise power to the instantaneous peak voltage of signals generated by a telephone. It is also in this area that other technical characteristics of terminal equipment determine in large measure the ability of the terminal equipment and the network together to form a partnership which enables the terminal to send and receive information and the network to carry that information.

This technical area has received much expert attention in the past; there is a host of CCITT Recommendations which, in the main, assist in providing a common international understanding of the various aspects of the relevant requirements and tests. To some extent, this influence is clearly seen within ETS 300 001 [1]; yet national networks each have their own history, and that fact is clearly supported by national variations to the common text both in requirements and in tests. It needs to be said, however, that the variations which are obvious may well stem from historical normative methods of test and it may well be that there is much common ground in many of the speech-band requirements.

A particular problem concerns the variation of values of reference impedance used by Administrations as a benchmark against which a number of requirements are evaluated. This is a key matter and the subject of a special study set out in ETR 075-3 [3].

7.4.4 Terminal-network inter-operability

Network inter-operability attracts much attention in the content of ETS 300 001 [1]; this subject alone forms over half of the ETS (Chapters 5, 6, 7, and 9).

It is in this area that the divergence of context is most prominent; apart from fundamental sections dealing with 'dialling', or signalling to the network, there is a vast range of complication and detail which in many cases confounds the technical mind.

Signalling to the network, clearly a key parameter, is set out in two separate sections, one dealing with the traditional "pulse dialling", or loop current interruption method, and the other dealing with "tone dialling". The latter method has been the subject of much international standardization effort since the early 1950s, and this effect is clearly seen. Pulse dialling, on the other hand, is highly dependent upon the type of local exchange equipment to which a terminal equipment is attached as well as the installation of which that terminal equipment is a part. There is much tradition incorporated in such technology.

Overall, this area of the technical content of ETS 300 001 [1] appears to be one of the most likely candidates for extensive review and in any case needs a good sweep with a broom of reality.

8 Recommendations arising from the study

The development of a standard suitable for re-defining market entry rules and hence for regulatory use in a re-regulated European PSTN terminal equipment market hinges upon the resolution of a number of issues; this is not meant to imply that ETS 300 001 [1] as it stands cannot be used to sustain the existing (asymmetric) national terminal equipment markets. Tasks which might be undertaken to support market re-definition and to enable in part an orderly transition from the nationally-based markets of today to a single European-wide market environment concern the refinement of the presentation of ETS 300 001 [1], the resolution of certain technical dilemmas and the definition of procedures relating to techno-regulatory aspects of its legal application. Recommendations for action are set out in that order.

8.1 Recommendations concerning the structure and format of ETS 300 001

ETS 300 001 [1] as a whole needs restructuring and a reconsideration of its requirement and test text alongside a harsh review of the use of tables, technical simplification of the common text and transfer of requirements concerning terminal equipment specificity to other more relevant standards. This is, of course, collective work which is perhaps suited in the main to be undertaken by an ETSI Technical Committee. In detail, it is recommended that:

Recommendation 1: **The content be re-defined to include only those network access requirements and tests which are determined to be essential as defined in Article 4 of Directive 91/263/EEC.**

Recommendation 2: **Procedures are defined which are likely to ensure that a common technical understanding of the purpose of each requirement is achieved and that a common understanding of the regulatory implications exists across Administrations.**

Recommendation 3: **Relevant common text be re-worded and cast in a way which is likely to limit national variations to parameter values alone.**

Recommendation 4: **Clear rules concerning the allocation of technical content to a requirement or to a test be set out and applied to the content of the common text.**

8.2 Recommendations concerning the context of ETS 300 001

It has been explained that the perception of market re-definition considered in conjunction with the existing type approval procedures by each Administration sets a context within which the technical nature of an Administration's responses are generated. For a standard to support a pan-European market, a common understanding of how that market is defined and regulated needs to exist, and there is a clear requirement for procedures to be set out which develop that understanding. Specifically, it is recommended that:

Recommendation 5: **Administrations are invited to take steps to ensure that compliance testing is re-structured where required to make use of a common or European test method.**

Recommendation 6: **Administrations are invited to arrange locally for a re-appraisal of their technical requirements which will match the common test methods.**

8.3 Recommendations concerning the techno-regulatory environment

Even the most harmonized of standards cannot be used to support a pan-European market unless that market has a consistent legal and regulatory structure. The following recommendations are therefore made:

Recommendation 7: **A highly-specific and technically simple definition of the technical nature and physical presentation and location of a PSTN network end be determined.**

Recommendation 8: **A clear set of definitions of network-provided services and how and where they are delivered to terminal equipment installations is defined.**

Recommendation 9: **Issues of second- and third-party legal liability either side of the network interface are clarified.**

Recommendation 10: **The legal issues concerning privacy rights of a user who makes use of an installation which may include multiple terminal equipments are clarified.**

Recommendation 11: **A workable method of maintaining the standard (both within ETSI and within Administrations) is set out.**

8.4 Recommendations for specific technical work

It is clear that a number of technical issues previously considered from a national point of view need to be reviewed in light of "The European dimension". This implies, in certain cases, collective collaboration and perhaps action by appropriate ETSI Technical Committees. It is recommended that:

Recommendation 12: **Having reached a common understanding of the purpose of each requirement, a common test method needs to be derived which fits this purpose.**

Recommendation 13: **The technical nature and extent of an installation which might connect to a network end be defined, and in particular:**

- **a) a common method for connecting the TE and its ringing detector be established;**
- **b) a common approach to multiple terminal connection be agreed.**

Recommendation 14: **Studies be initiated within and across Administrations to determine the extent to which network parameters are able to support the development of a common DC characteristic. In the case of those Administrations with clearly defined technical impediment, a migration strategy needs to be determined for adopting, in the medium term, that common DC characteristic.**

Recommendation 15: **Studies be initiated on a basis similar to Recommendation 14 above to determine:**

- **a) a common requirement for signal balance;**
- **b) a common technical target for a reference speech-band impedance;**
- **c) a common set of requirements for MFPB (DTMF) signalling. Such requirements should also address the potential use of MFPB as an end-to-end signalling system;**
- **d) a common approach to the measurement of noise and signal power.**

Recommendation 16: **Efforts be undertaken to simplify and to realign requirements for terminal equipment interworking with the network, considering in particular the principal components which include:**

- **a) procedures for automatic answering;**
- **b) procedures for automatic calling;**
- **c) procedures for automatic call clearing;**
- **d) network tone detection.**

Recommendation 17: **A study be undertaken to specify and to set out migration procedures for adopting a consistent European-wide tone plan.**

Annex A: Terms of Reference and Guidelines

Terms of reference for Project Team 17 V

1 Reasons for proposing a Project Team: to examine the current ETS 300 001 [1] and to identify the possibilities for further harmonization of values taking into account the cost and benefit. This will involve also consideration of relevant testing methods.

2 Consequences if not agreed: lack of harmonization of parameters and testing methods of Terminal equipment for PSTN.

3 Detailed description:

3.1 Subject title: Feasibility of harmonization of PSTN attachment standards.

3.2 Reference TC: TE.

3.3 Other interested TC: NA, BT, TM.

3.4 Duration: 9 months.

3.5 Target date for start of work: July 1991.

3.6 Necessary manpower: 18 man-months.

3.7 Context of the study: examination of feasibility of further PSTN requirements harmonization as set out in relevant Mandate previously accepted by the Technical Assembly.

3.8 Related activities in other bodies and necessary co-ordination of schedules: TRAC: current elaboration of regulatory framework; ETSI: other work underway in connection with PSTN Mandate.

3.9 Scope of the Terms of Reference and relevant study items: To execute relevant tasks identified in ETSI PSTN workshop final report.

3.10 Reference specification(s) and existing documents including member contributions: ETS 300 001 [1].

3.11 Part of the ETSI Work Programme (EWP) for which the PT is required: To be defined.

3.12 Deliverables: A report analysing the feasibility and cost and benefits of further harmonization of values in ETS 300 001 [1] and its testing methods.

Report of ETSI workshop on PSTN attachment standards

(14 - 15 March 1991)

Summary

The workshop noted that according to a Euro-strategies report, the European market for terminals for attachment to PSTN is growing at 10 % and shows no sign of falling.

The representatives of industry emphasized the cost of the present fragmented regulatory arrangement which includes a different regime in each country containing discriminative regulations, complex administration and lack of visibility.

Whilst different technical requirements in each country cause some difficulties, the major restriction on trade is caused by unnecessarily complex procedures.

The European Commission stressed the importance of the PSTN market. A mandate given to ETSI provides an opportunity to develop a strategy to further harmonize the PSTN access standards. The non-technical problems are being dealt with by the Terminals Directive and the ONP Policy related to PSTN.

As result of extensive discussion and analysis during the two-day workshop, a number of technical problems were identified which must be solved before a satisfactory harmonization of national requirements can be achieved.

Six drafting groups prepared reports on the discussions and these reports as amended and approved by the workshop are attached.

It was generally agreed that ETS 300 001 [1] (candidate NET 4) should be implemented forthwith in order to gain practical experience of the results achieved so far.

A programme of on-going studies was proposed to define an architectural model for PSTN attachment standards (noting that a regulatory model is also necessary), to identify and to define the PSTN terminations appropriate for the attachment of terminals apparatus and to specify the essential requirements for protecting the network and its users form harm.

An interim procedure will be required to provide a more open market in the short term.

It was also agreed that an important objective should be to identify and to standardize relevant PSTN terminations and to harmonize the basic access requirements as a target CTR for implementation in the longer term bearing in mind the trend towards the universal use of digital local exchanges.

The workshop proposed that a Steering Group should be established to manage and co-ordinate this programme.

ANALOGUE NETWORK PRESENTATIONS

A ROUTE TO HARMONIZED ACCESS

It is accepted that the analogue PSTN subscriber lines will continue to be used as an access method for many years to come.

Consequently, the analogue PSTN attached terminal equipment will continue to have a significant market position until the year 2000 at least.

The mutual recognition of conformity required by the draft council directive is based upon the timely availability of Common Technical Regulations (CTRs).

Consequently, the available NETs will have to reviewed in the light of the requirements of the new directive.

The Commission's view of draft NET 4 gives rise to the following remarks:

- the definition and cost justification of "no harm to the network" is not in harmony amongst the participating Administrations/PNOs;

- many requirements have unnecessarily extensive national details preventing harmonization;

- many requirements or associated tests can be re-stated in a different technical manner for the purpose of producing increased harmonization and at the same time ensuring the safety of the network.

These are problems that need to be solved, particularly to satisfy the Commission's and Industry's need to create an open market as soon as possible.

During the meeting, the strategy shown in figure 1 was proposed and was accepted as a reasonable basis on which to start work.

The activities are discussed under their titles:

USE NET4 NOW

It was agreed that further effort should not be expended on ETS 300 001 [1] to try and harmonize it further. It was essential to gain experience by using it as it is now, so as to determine what flaws existed in the standard, the test methods and the approval process.

IDENTIFY/AGREE ESSENTIAL REQUIREMENTS

It is suggested that this work is restricted to identifying no more than the clause headings necessary to satisfy the essential requirements set out in the draft Directive as follows:

ESSENTIAL REQUIREMENTS

- User safety (in so far as this is not covered by the low voltage directive);

- Safety of employees of the public telecommunications network operators;

- Protection of the public telecommunication network from harm;

- Electro-Magnetic Compatibility requirements (in so far as it is particular to telecommunications terminal equipment);

- Interworking with the network;

- Interworking via the network (in justified cases);

- Effective use of the radio frequency spectrum.

Before this can be done it is necessary to decide what aspects of network harm are to be considered essential. Is it considered to be just physical damage or does it include operational harm, economic harm or prevention of fraud? If operational harm is included it must be noted that essential requirements will be different for voice or non-voice equipment.

Before it is possible to quantify essential requirements it will be necessary to decide where the end of the network is and how complicated the end is allowed to be (e.g. how many sets are allowed in series/parallel).

It is necessary to define the end of the network for both legal and technical reasons. Where does the network operators responsibility end? Is the cable inside or outside the network? Is the installation wiring inside or outside the network? Where is the terminal interface for test purposes?

It is suggested that at first, only the standard analogue interface is dealt with.

Consideration of other presentations would delay the work. They could for the present be dealt with by ensuring visibility of existing national standards.

FOR TERMINAL, VOICE, NON VOICE

The next stage would be to define additional terminal specific requirements. This could be done by making those present requirements visible that are classified as essential.

This would provide working documents as rapidly as possible with the least possible effort.

HARMONIZE TERMINAL ESSENTIAL REQUIREMENTS

This work cannot be done until a harmonized network presentation is available. It is expected that a harmonized Target presentation can be derived by the parallel "for Network" activities shown in figure 1.

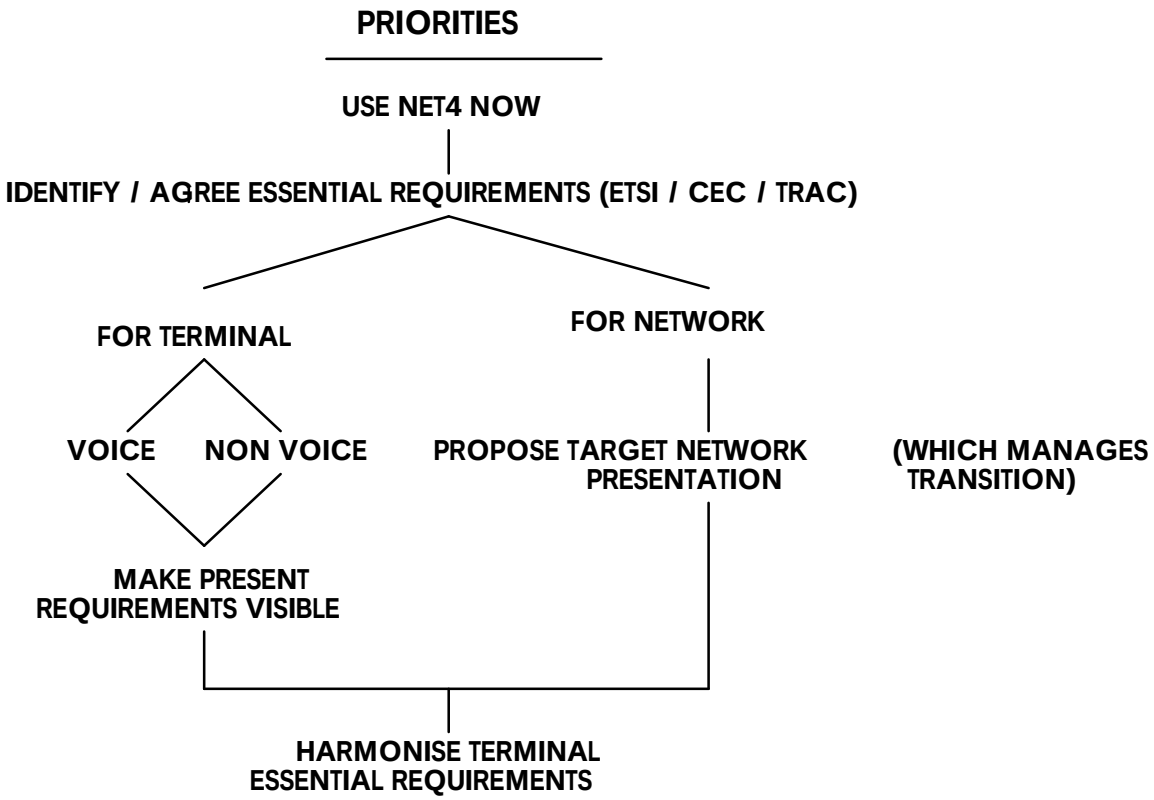
PRIORITIES
USE NET4 NOW
IDENTIFY / AGREE ESSENTIAL REQUIREMENTS (ETSI / CEC / TRAC)
FOR TERMINAL
FOR NETWORK
VOICE
NON VOICE
PROPOSE TARGET NETWORK PRESENTATION
(WHICH MANAGES TRANSITION)
MAKE PRESENT REQUIREMENTS VISIBLE
HARMONISE TERMINAL ESSENTIAL REQUIREMENTS

Figure 1

A Task allocation

The Project Team should, according to the expertise of its members, proceed through ETS 300 001 [1] on a chapter-by-chapter basis, taking due note of relevant text in Chapter 10.

Priority should be given to the consideration of requirements in Chapters 2, 3, 4, 5, and 6, the content of Chapter 1 shall not be studied under this mandate.

The Project Team shall consider each requirement and its associated test as a technical whole, and shall place as a priority the harmonization possibilities of tests and testing methods associated with each requirements.

B

The core reference document for this Project Team's work is ETS 300 001 [1]. Parts of permanent document TE(91)30 relevant to further harmonization should be taken into account. Tasks are set out to concern themselves with:

1) out-band access requirements (DC and signalling), Chapters 2 and 3;

2) pass-band access requirements, Chapter 4;

3) inter-operability requirements, Chapters 5, 6, 7, and 9.

C

In order to allow work to proceed without ambiguity, it is necessary clearly to define for the Project Team which technical content contained within ETS 300 001 [1] is included in certain definitions. (This has significant bearing upon the extent to which harmonization might be studied and upon the related market-oriented cost-benefit analysis).

1) Network access: (out-band):

   For the purpose of this study, technical requirements included within the definition above are those which involve:

   a) powering by the network of the TE (DC);

   b) use of the network-provided electrical excitation by the TE to signal to the network for loop seizure and clear only and to signal to the user an incoming call (DC, ac ringing).

2) Network inter-operability:

   For the purpose of this study, technical requirements included within the definition of "network inter-operability" are those which involve:

   a) use of network-provided electrical excitation by the TE:

      - to signal to the network (network address required or invocation of special services);

      - to receive signals from the network and originating within the network other than out-band ac ringing (tax meter pulses, etc.).

   b) transmission to the network by the TE of pass-band signals for network addressing or invocation of special services.

3) Network access (pass-band):

   For the purpose of this study, technical requirements included within the definition above are those which involve:

   a) within the speech-band, the extraction of such energy (or power) from the network;

b) within the speech-band, the application of such energy (or power) to the network.

D Cost-benefit analysis:

The Project Team should approach this task incrementally (requirement to requirement) and set out briefly for each requirement the market consequences and network implications of:

1) removing the requirement from mandatory status;

2) further convergence of National variations;

3) leaving the requirement as it stands.

E Network presentation (ETS 300 001, Chapter 8):

The Project Team should not study the requirements concerned with the mechanical (plug/socket or fixed wiring) attachment of TE to the PSTN, and should not concern itself with adapters capable of providing a necessary and sufficient mechanical and electrical interface from each National network connection point to a common interface.

F Deliverables:

Reports concerned with the implications of requirements convergence and harmonized testing methods should set out clearly:

1) the implications, Administration by Administration, of the above (tables or lists could be used);

2) where appropriate, proposed common requirements;

3) outlines of the technical studies and evaluations required to implement requirement convergence.

Interim reports are expected, Chapter by Chapter, as the work proceeds (the findings of one Chapter's work may have a bearing upon subsequent work).

Annex B: Cost benefit analysis

B.1 General

The PT was given the task to examine the current text of ETS 300 001 [1] for technical content in order to determine whether there was scope for more harmonization. Whilst making this examination, the PT was requested to make an analysis to determine the costs and benefits resulting from restating and restructuring the requirements and associated tests in a more harmonized form.

ETS 300 001 [1] currently contains a statement from each Administration of those requirements it considers that terminal equipment should meet in order to attach to its national analogue interface together with a physical description of the presentation of that interface. It does not characterize directly the network itself.

B.2 Costs and benefits

Changing presently stated terminal equipment requirements and the tests to determine whether they are met, has an effect on all members of the Telecommunications resource triangle of supplier, provider, and user. There will be costs to weigh against benefits. The relationship may not be linear. There are a number of second and higher-order effects which are, or may be, prominent.

The cost-benefit analysis of any one requirement is different for virtually every interest. Moreover, it is not possible to identify a particular cost-benefit analysis which cover all the parties involved. One is reduced to attempting to determine the various components contributing to the cost-benefit. It is not possible to quantify the total effect on the market of these separate components.

Since the harmonization of standards is but one (perhaps minor) factor determining the overall effect of re-structuring the market, any cost-benefit analysis taking into account only that aspect is certainly not comprehensive and is likely to be at the least incomplete if not misleading.

B.3 Balances

There are a number of factors to be taken into account when determining on which side the balance falls when weighing the cost to any party against his benefit. The overall balance of the differing net cost-benefits to Supplier, Network Operator and User is probably impossible to quantify. It is necessary to recognize the complexity of the problem so as to avoid statements such as on the one hand "there is no point in harmonizing history" or, on the other hand, "all harmonization must increase the market opportunity and hence be beneficial".

A list below gives examples of some of the more notable factors that affect the cost benefit analysis of the harmonization of the access requirements for telecommunications terminal equipment.

It should be noted that some of the entries in the columns may be difficult to quantify and some may be considered controversial depending on the perspective of the interest concerned.

COSTS	BENEFITS
<u>To Suppliers</u>	
Cost of writing standard	Benefit to those not taking part
Initial cost of change	Benefit of standard design
Likely increase in extra-European competition	
Possibility of insignificant saving	
<u>To Network Operators</u>	
Cost of network change	Possibly cheaper equipment
Loss of profit due to increased competition	Possibly increased business
Cost of writing standards	
Possible loss of national suppliers	
<u>To Users</u>	
Cost of scrapping obsolete equipment	Cheaper equipment
Possible loss of equipment quality	Possibly more facilities
Possible loss of national facilities	Portability throughout Europe
Possible loss of flexibility	
No perceived improvement in service	

B.4 Conclusions

The view of the PT was that the assessment of the cost-benefit ratio arising from the factors above, and what that ratio might be for any number of market participants, requires resources and detailed knowledge that are not available to the PT.

It was therefore decided, with the endorsement of TC-TE, to do no more than identify the most important factors that affect who benefits or loses, together with vague indications of the magnitude of their costs and benefits.

Whenever a clearer picture of a net monetary cost or benefit is required, then it was the belief of the PT that it would be more appropriate to seek information from those directly affected. This net effect could not be deduced by the PT and, it could be argued, should not be so deduced.

History

Document history	
November 1994	First Edition
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