

**Access and Terminals (AT);
Broadband access to the Public Telecommunications Network;
Publication of interface specification under
Directive 1999/5/EC, art. 4.2;
Guidelines for describing Multimedia Cable Network Interfaces**



Reference

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Intellectual Property Rights

IPRs essential or potentially essential to the present document may have been declared to ETSI. The information pertaining to these essential IPRs, if any, is publicly available for **ETSI members and non-members**, and can be found in ETSI SR 000 314: *"Intellectual Property Rights (IPRs); Essential, or potentially Essential, IPRs notified to ETSI in respect of ETSI standards"*, which is available from the ETSI Secretariat. Latest updates are available on the ETSI Web server (<http://www.etsi.org/ipr>).

Pursuant to the ETSI IPR Policy, no investigation, including IPR searches, has been carried out by ETSI. No guarantee can be given as to the existence of other IPRs not referenced in ETSI SR 000 314 (or the updates on the ETSI Web server) which are, or may be, or may become, essential to the present document.

Foreword

This Technical Report (TR) has been produced by ETSI Technical Committee Access and Terminals (AT).

Introduction

The Radio Equipment and Telecommunications Terminal Equipment (R&TTE) Directive 1999/5/EC [1] introduces a fundamental change in the area of terminal equipment interworking with public telecommunications networks. Formerly there were specifications that applied to terminal equipment ensuring, to varying degrees of confidence, interworking with and via different networks.

As a consequence of the R&TTE Directive an obligation is placed on Public Network Operators (PNO) to publish specifications of network interfaces they provide to the end user, whatever is the connection of the end user with the PNO, direct or indirect. Consequently Public Service Providers (PSPs) such as Internet Service Providers (ISPs) should also publish their interface specifications.

Article 4.2 of the Directive states:

"...Member States shall ensure that such operators [operators of Public Telecommunications Networks] publish accurate and adequate technical specifications of such interfaces before services provided through those interfaces are made publicly available, and regularly publish any updated specifications. The specifications shall be in sufficient detail to permit the design of telecommunications terminal equipment capable of utilizing all services provided through the corresponding interface. The specifications shall include, inter alia, all the information necessary to allow manufacturers to carry out, at their choice, the relevant tests for the essential requirements applicable to the telecommunications terminal equipment. Member States shall ensure that those specifications are made readily available by the operators".

However, it is generally recognized that PNOs can only publish information under their direct control or that which has been disclosed to them and for which they have been given the rights to publish.

The present document provides guidance on the content of such publications for the area of broadband cable multimedia access to the public telecommunications network in order to meet this requirement. Documents for a similar purpose have been produced by ETSI covering the publication of other type of interfaces.

The present document studies aspects related with a technology and systems under development, therefore may need further earlier revisions to align with the knowledge acquired during the running standardization process.

1 Scope

The purpose of the present document is to assist the Public Network Operators and Public Service Providers sharing the Telecommunications physical support with Broadcast systems based on cable technologies in producing publications that describe their public interfaces in accordance with article 4.2 of the Radio Equipment and Telecommunications Terminal Equipment (R&TTE) Directive 1999/5/EC [1].

The present document lists in special the characteristics of a broadband cable multimedia interface to the Public Telecommunications Network which could be necessary for a description of that interface but does not give guidance on the style of presentation of interface publications. The present document makes also reference to the most relevant ETSI deliverables in the case where the network interface offered uses other technologies.

The present document is applicable to interface specifications for new, modified and existing interfaces.

The present document does not specify how any proprietary interfaces details, which are not already in the public domain, are published.

The present document does not specify which interfaces should be published, neither does it address the timing of publication, as these functions are clearly the responsibility of the National Regulatory Authorities. The process of publication is not covered in the present document.

2 References

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

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, subsequent revisions do apply.

- [1] Directive 1999/5/EC of the European Parliament and of the Council of 9 March 1999 on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity.
- [2] ETSI TR 101 092 (V1.1.1): "Network Aspects (NA); Report on Carrier Selection".
- [3] ITU-T Recommendation X.200 / ISO/IEC 7498-1: "Information technology – Open Systems Interconnection – Basic Reference Model: The basic model".
- [4] Telecommunications Conformity Assessment and Market Surveillance Committee (TCAM); Guidance for Public Network Operators when publishing interfaces, and nras/Member States when supervising such publication (Commission Guide 3).
- [5] Telecommunications Conformity Assessment and Market Surveillance Committee (TCAM); Guidance on Interface Publication by Public Telecommunications Network Operators (Commission Guide 2).
- [6] ETSI EG 201 212: "Electrical safety; Classification of interfaces for equipment to be connected to telecommunication networks".
- [7] ETSI TR 101 730: "Publication of interface specification under Directive 1999/5/EC; Guidelines for describing analogue interfaces".
- [8] ETSI TR 101 731: "Access and Terminals (AT); Digital access to the public telecommunications network; Publication of interface specification under Directive 1999/5/EC".

- [9] ETSI EG 201 838: "Electromagnetic compatibility and Radio spectrum Matters (ERM); Publication of interface specifications under Directive 1999/5/EC; Guidelines for describing radio access interfaces".
- [10] ETSI TR 101 845: "Fixed Radio Systems; Technical Information on RF Interfaces applied by Fixed Service Systems including Fixed Wireless Access (FWA) in the light of the R&TTE Directive (article 4.2)".
- [11] ETSI EG 201 450: "Guidance on the identification of Harmonized Standards and/or other technical specifications for Radio equipment and Telecommunications Terminal Equipment (R&TTE) covering requirements under article 3.1 of Directive 1999/5/EC".
- [12] RFC 826: "Ethernet Address Resolution Protocol: Or converting network protocol addresses to 48.bit Ethernet address for transmission on Ethernet hardware".
- [13] Directive 97/51/EC of the European Parliament and of the council of 6 October 1997 amending Council Directives 90/387/EEC and 92/44/EEC for the purpose of adaptation to a competitive environment in telecommunications.
- [14] Council Directive 90/387/EEC of 28 June 1990 on the establishment of the internal market for telecommunications services through the implementation of open network provision.

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply:

Cable Modem Termination System (CMTS): located at the cable television system headend or distribution hub, which provides complementary functionality to the cable modems to enable data connectivity to wide-area network services

Cable Modem Termination System - Network Side Interface (CMTS-NSI): the interface, between a CMTS and the equipment on the access network side

direct access: access for TTE to services provided by a PNO or PSP exclusively via the infrastructure of that PNO or PSP

Distribution Hub: location in a cable television network which performs the functions of a Headend for customers in its immediate area, and which receives some or all of its television program material from a Master Headend in the same metropolitan or regional area

headend: central location on the cable network that is responsible for injecting broadcast video and other signals in the downstream direction

See also Master Headend, Distribution Hub.

indirect access: access for TTE to services provided by a PNO or PSP via the infrastructure of another PNO or PSP

interface, according to R&TTE-D [1], article 2 (e):

(i) a network termination point, which is a physical connection point at which a user is provided with access to public telecommunications network; and/or

(ii) an air interface specifying the radio path between radio equipment and their technical specifications.

master headend: headend which collects television program material from various sources by satellite, microwave, fibre and other means, and distributes this material to Distribution Hubs in the same metropolitan or regional area. A Master Headend may also perform the functions of a Distribution Hub for customers in its own immediate area.

Network Termination Point (NTP): point at which the network operator describes the characteristics of service provided and beyond which their responsibility for the service ceases

See also "interface" according to R&TTE-D.

NOTE 1: Article 1(2) of the ONP Directive 97/51 [13], amending article 2(5) of Directive 90/387 [14] states: "network termination point" shall mean the physical point at which a user is provided with access to a public telecommunications network. The locations of network termination points shall be defined by the national regulatory authority and shall represent a boundary, for regulatory purposes, of the public telecommunications network.

NOTE 2: **According to** Proposal for a DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on universal service and users' rights relating to electronic communications networks and services (presented by the Commission), article 2(f), network termination point (NTP) means the physical point at which a subscriber is provided with access to a public communications network; in the case of networks involving switching or routing, the NTP is identified by means of a specific network address, which may be linked to a subscriber number or name; it represents a boundary for regulatory purposes between different systems; defining the location of NTP is the responsibility of the national regulatory authority.

Network Equipment (NE): equipment forming the Public Operator's Network up to and including NTP, relevant for the provision of Telecommunications services

Open Systems Interconnection (OSI): framework of ISO standards for communication between different systems made by different vendors, in which the communications process is organized into seven different categories that are placed in a layered sequence based on their relationship to the user

Each layer uses the layer immediately below it and provides a service to the layer above. Layers 7 through 4 deal with end-to-end communication between the message source and destination, and layers 3 through 1 deal with network functions.

Public Network Operator (PNO): anyone providing publicly available telecommunications services over a network to which terminal equipment can be connected, either via a fixed network terminating point or an air interface for radio terminals

Public Service Provider (PSP): provider of publicly available telecommunications service(s) who provides service from one or more sets of apparatus connected to a Public Network, but does not itself operate a network

Public Telecommunications Network (PTN): Telecommunications Network used to provide publicly available Telecommunications Services

Radio Frequency (RF): In cable television systems, this refers to electromagnetic signals in the range 5 to 1 000 MHz.

Telecommunication Terminal Equipment (TTE): according to R&TTE-D [1], article 2.b:

"a product enabling communication or a relevant component thereof which is intended to be connected directly or indirectly by any means whatsoever to interfaces of public telecommunications networks (that is to say, telecommunications networks used wholly or partly for the provision of publicly available telecommunications services)"

3.2 Abbreviations

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

BER	Bit Error Rate
CM	Cable Modem
CMTS	CM Termination System
CPE	Customer Premises Equipment (equivalent to TTE)
EMC	ElectroMagnetic Compatibility (regulated by EU Directive 89/336/EC)
EU	European Union
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronic Engineers (organization accredited by the American National Standards Institute sponsoring standards committees)
IGMP	Internet Group Management Protocol (network-layer protocol for managing multicast groups on the Internet)
IP	Internet Protocol (Internet network-layer protocol)
ISO	International Organization for Standardization, commonly known as the International Standards Organization
LLC	Logical Link Control
MAC	Media Access Control
NDIS	Network Driver Interface Specification
NIC	Network Interface Card
NSI	Network Side Interface
NTP	Network Termination Point
ONP	Open Network Provision
OSI	Open Systems Interconnection
PHY	PHYsical (layer)
PICS	Protocol Implementation Conformance Statement
PIXIT	Protocol Implementation eXtra Information for Testing
PMD	Physical Media Dependent (sublayer)
PNO	Public Network Operator
PSP	Public Service Provider
PTN	Public Telecommunications Network
QoS	Quality of Service
R&TTE	Radio Equipment and Telecommunications Terminal Equipment
R&TTE-D	Directive 1999/5/EC [1], commonly designated R&TTE Directive [1]
RF	Radio Frequency
STB	Set Top Box
TCAM	Telecommunication Conformity Assessment and Market Surveillance Committee (see article 13 of the R&TTE-D [1])
TTE	Telecommunications Terminal Equipment (equivalent to CPE)
VoIP	Voice over Internet Protocol

4 Guidance for publication

The following clauses gives guidance on the content and the format of the publication of access interfaces with public telecommunication networks, including where applicable, Supplementary Services.

4.1 Intellectual Property Rights (IPR) and Copyright

As part of the access interface publication, the PNO should make users and manufacturers aware of the potential for IPR rights in the implementation of the interface. However, it is the sole responsibility of the individual manufacturer to ensure that IPR issues are cleared. In so far as the publisher is aware of the same, the publisher should ensure that the publication itself contains a clear indication of:

- 1) any IPR and/or copyright asserted over the contents of the publication (including any specifications referred out to);
- 2) the rights granted and restrictions made to users of the specification; and
- 3) how details of any licensing requirements associated with such IPR may be obtained.

NOTE: These IPR/copyrights however do not limit the operators obligation of publishing his public interface. There is no requirement for the contents of an existing specification to be reproduced in the interface publication. In line with clause 4.2 of the R&TTE-D [1] on reference to standards, it is recommended that the interface refers out to the published specification and/or provides details of where the specification may be obtained.

If the interface publication published by the PNO contains any sort of IPR or copyright, the PNO is recommended to give appropriate information of existing IPRs in the publication.

There is no obligation for PNOs to publish the IPRs which are needed or may be needed for the design of an equipment compliant with the specified interface. There is also no obligation for PNOs to make IPRs owned by others available to TTE manufacturers.

4.2 Content of access interface publications

Annex A contains an example that may be used in the specification of the access interface. The presentation style of annex A is provided for illustrative purposes only.

The publication should contain sufficient information to enable manufacturers to design terminal equipment to inter-work with and to use all services offered by the PNO on the Public Telecommunications Network for the purpose of establishing, modifying, charging for, holding and clearing real or virtual connections and to prevent the misuse of network resources.

Details of value added services (services provided over network connections) are not required to be published under the present regulations, but all supplementary services provided must be published, together with the service codes used for their actuation.

The access interface publication should contain at least the relevant information described under the headings given in the annex A proforma where relevant to that interface.

Guidance notes are contained in the proforma to explain the nature and level of detail of the information required. PNOs may, if they choose, provide additional information, e.g. relating to the interface definition, the services provided over that interface, facilities provided to terminal designers/users for interoperability testing.

In producing the access interface publication, the following points should be considered:

- 1) Wherever possible, the interface specification should refer out to published standards. The following list gives an indication of standards and specifications that may be referenced for the purposes of the publication:
 - a) standards whose reference is published in the Official Journal of the European Communities;
 - b) European standards or specifications adopted by ETSI;
 - c) international standards or recommendations adopted by the International Telecommunications Union (ITU), the International Standards Organization (ISO) or the International Electrotechnical Commission (IEC);
 - d) national standards or specifications; and
 - e) proprietary specifications in the public domain.

NOTE: This list does not preclude reference to accepted industry standards in the absence of a standard that is in any one of the categories above (e.g. IEEE, Wireless ATM Forum, and Bluetooth).

- 2) When a standard referred to contain options, the access interface specification should indicate which option(s) have been implemented. For some protocols there may be standards or specifications defining the associated Protocol Implementation Conformance Statements (PICS) which may be used for this purpose.

5 Applicability of parameters to interface types

Annex B contains an extract from a report presented to TCAM in July 1999 by the European Commission. The present document was used by the EU Commission in deriving guidance documents on interface publication, [4], [5].

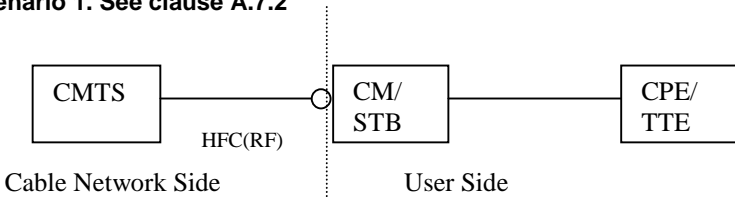
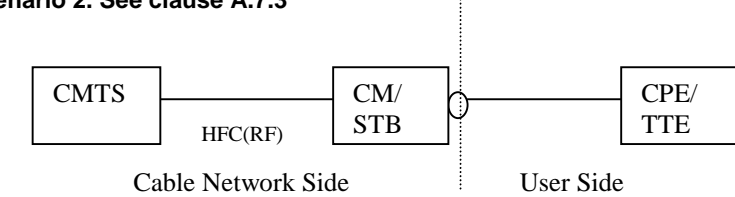
From annex B the following can be deduced:

- 1) For interfaces based on the Open Systems Interconnection Model – parameters for layers 1, 2 and 3 will need to be considered as appropriate. Some parameters within any specific layer may not be relevant for all types of interface. In the case of Tele-services some parameters in higher levels may also need to be described.
- 2) For other types of interfaces similar levels of detail will need to be provided, Networks should be defined where possible by reference to ETSI deliverables or other International Standards. Where networks are generally based on an International or ETSI standard but differ in some way the preferred manner of declaring the interface is to declare the source standard and then indicate where the interface is different (Provide a "delta" document).
- 3) Whilst the provision of a PICS and PIXIT taken from the source standard may be desirable, the provision of the network interface description in this format is not mandatory. However, if the PICS and PIXIT are not used, the format used should provide at least an equivalent level of clarity, removal of ambiguity and ease of use. This allows commonality between network interfaces to be assessed.

The parameters described in the present document are applicable to various categories of CM and STB equipment.

Table 1 describes two scenarios for CM/STB interface connection arrangement identifying the location of the NTP and user interfaces.

Table 1: Position of the NTP

Scenario	Who Publishes	Comments
<p>Scenario 1. See clause A.7.2</p> 	<p>The Cable Network Operator publishes specification for the RF interface between the CM/STB and the CMTS.</p>	<p>Details of the RF interface description are given in clause A.7.2. CM/STB is a TTE according the R&TTE-D and therefore in the scope of this Directive</p>
<p>Scenario 2. See clause A.7.3</p> 	<p>The Cable Network Operator publishes specifications relating to the interfaces between the CM/STB for connection to CPE/ TTE.</p>	<p>CM/STB is not a TTE according the R&TTE-D and therefore not in the scope of this Directive.</p>

NOTE: A PNO offering or supporting both scenarios is requested to fulfil the conditions associated with each of them.

For both scenarios the specification of the interface at the NTP has to be published in accordance with article 4.2 of Directive R&TTE-D [1].

There may be further scenarios that have not been considered in the present document.

Article 1(2) of the ONP Directive 97/51 [13], amending article 2(5) of Directive 90/387 [14] states:

"The locations of NTP shall be defined by the national regulatory authority and shall represent a boundary, for regulatory purposes, of the public telecommunications network".

Above is understood by some as not being necessarily always a priori and to apply in a case by case basis (see below further legal text) and may mean, particularly for new technologies, that the operator may, in the interface description, propose the location together with other details of the physical connection. In fact article 1(2) of the ONP Directive 97/51 [13], amending article 2(8) of Directive 90/387 [14] states:

"...Without prejudice to their application on a case-by-case basis, open network provision conditions may include harmonized conditions with regard to technical interfaces, including the definition and implementation of NTP, where required..."

The correct interpretation and the case by case application of the above legal text can be established by National Authorities.

Annex A: A Broadband Multimedia Cable interface specification

The present annex gives guidance on how a Broadband Multimedia Cable interface specification might be produced.

The presentation style suggested is provided for illustrative purposes only.

The technology and systems under study are in a development process. This can determine important deviations from the suggestions below and is likely to justify earlier revisions of the present document.

A.1 Introduction

This clause can be used by the PNO as required.

A.2 Table of Contents

The contents list for the interface publication.

A.3 Scope

This clause should identify the applicability of the document to fulfil the requirements of article 4.2 of the R&TTE Directive 1999/5/EC [1].

It should contain the information covered by the document and the applicability, including text that defines the actual service offerings, to which the present document applies. Reference should be made to the applicable National Interface declaration to which the interface applies (if available).

A.4 References

This clause should contain a list of reference material that is required to implement a TTE. This may also be a reference to an on-line location to access the necessary references.

A.5 Definitions, symbols and abbreviations

This clause may be used, if required, to identify any specific definitions given in the publication. It should also contain a list of all abbreviations used in the document and their explanations.

A.6 Background information

This clause is available for the PNO to include any legal material or operational limitations etc. which gives additional information to the manufacturer. It may also be used to provide details of any IPR issues that may be relevant.

This clause should also include the address, telephone number, fax number, e-mail, etc. to which queries arising from the publication of the present document should be addressed.

This clause could also contain the procedures for the notification of changes to the network, and how they will be published, which may affect the correct working of the TTE.

A.7 Description

This clause should contain a brief description of the system and the clear identification of the interface or interfaces being published. This may include diagrams to give clearer description of the system and the interface.

A.7.1 General and common characteristics to be specified

The guidance in this clause is valid for all type of interfaces.

A.7.1.1 General

Article 4.2 of Directive 1999/5/EC [1] obliges Member States to ensure that Network Operators provide a detailed technical description of their interfaces. Sufficient information must be published to allow TTE manufacturers to:

- test that their equipment matches the interface specification, including the relevant essential requirements;
- manufacture the design;
- place the TTE on the market.

In order that the manufacturer can advise customers about the suitability of the TTE for specific Public Networks and Telecommunications Services, the description of the interface should either include or reference details of the services the PNO supports using that interface.

PNOs should include any information concerning interworking with the network that the PNO is aware would be relevant to the design and operation of appropriate terminal equipment.

Where the value of any particular parameter will be significantly affected by the method of measurement, then the method of measurement should also be stated.

Interfaces should be defined where possible by reference to publicly available standards indicating which options have been implemented, where applicable. Where a published PICS proforma exists, consideration should be given to using the PICS proforma as a means of publication of the relevant interface specification, or appropriate part of the interface specification. Where a published PICS proforma does exist and it is decided not to use it, then the network operator should present information in a sufficient level of detail to allow a reader to clearly and unambiguously understand the implementation of all optional and conditional requirements identified in the published PICS proforma.

Whilst the provision of PICS and PIXITs may be desirable, the provision of the network description in this format is not mandatory.

Where networks are generally based on a publicly available standard but differ in some way, the preferred manner of declaring the interface is to declare the source standard, indicate the options that have been implemented and indicate the differences by the use of a "delta" document.

NOTE: There is no requirement for the contents of an existing specification to be reproduced in the interface publication. In line with guidance given in the present document on reference to standards, it is recommended that the interface refers out to the published specification and/or provides details of where the specification may be obtained.

Where a TTE standard exists that would help a terminal designer to achieve a satisfactory design, the present document may be referenced as additional information. Publication should be made using ETSI terminology where possible.

A.7.1.2 Safety

PNO should state conformance with the relevant safety specifications of NE susceptible to be influenced by the behaviour of TTE. The safety status of the network interface should be described according to the classifications detailed in EG 201 212 [6].

It would be helpful for the PNO to provide any other available information that would assist TTE suppliers to determine their safety strategy. EG 201 450 [11] gives guidance on article 3.1a (Safety) of R&TTE-D [1].

A.7.1.3 EMC

PNO should state conformance with the relevant EMC specifications of NE susceptible to be influenced by the behaviour of TTE.

It would be helpful for the PNO to provide any other available information that would assist TTE suppliers to determine their EMC strategy. EG 201 450 [11] gives guidance on article 3.1b (EMC) of R&TTE-D [1].

A.7.2 Cable Modem-Network (RF) interface characteristics to be specified

This clause studies scenario 1 of table 1.

There are different Telecommunications technologies sharing the physical support in the local Network ("last mile") with Broadcast technologies. The present clause should be a support for all of them and does not intend to create a privilege situation to any of those technologies.

A.7.2.1 Physical characteristics

A.7.2.1.1 Network Termination Point (NTP)

NTP covered by the this clause should be identified.

A.7.2.1.2 Connection method

The mechanical characteristics of the network connection point should be described in sufficient detail as to allow a terminal manufacturer to design or select connectors or adapters capable of reliably connecting the terminal at the NTP.

A.7.2.1.3 Connection arrangements

Full details of connection arrangements used at the NTP and characteristics of all relevant cable types should be provided.

A.7.2.1.4 Sizing constraints/dimensioning the installation

Any characteristic that may limit the number of terminals that can be connected to the PTN interface should be specified.

A.7.2.2 Electrical or optical characteristics

A.7.2.2.1 Power feed conditions

Where power is or may be provided over the interface, full details of the power feeding arrangements should be given, including information on the protection provided.

A.7.2.2.2 Signal characteristics

Details of the electrical characteristics of the interface such as the range of input and output frequencies, the range of RF signal levels accepted and delivered by the interface, etc. should be provided.

A.7.2.3 Transmission characteristics

For systems that are standardized or where the proprietary specification is in the public domain refer to the appropriate standards or specifications.

A.7.2.3.1 RF channel transmission characteristics

The RF channel transmission characteristics of the cable network in the upstream and downstream directions shall be fully specified.

A.7.2.3.2 Frequency plan

Details of the downstream and upstream frequency plan should be specified for the cable modem. This should include where relevant limitations on emissions to protect Broadcast or other network signals and/or services.

A.7.2.3.3 Transmission levels

The transmission levels of the downstream CMTS signal(s) within channel spacing as described by the Cable Operator and the range of power levels of the upstream CM signal(s) shall be specified.

A.7.2.3.4 Frequency conversion

Requirements for frequency inversion in the transmission path in either the downstream or upstream direction shall be specified.

A.7.2.3.5 Synchronization

Where the service provides a network source of synchronization or requires synchronization to the network for it to function, sufficient information should be provided to enable the designer to produce a terminal that can synchronize with the network.

A.7.2.3.6 Other transmission characteristics

All the other relevant characteristics, e.g. impedance, acceptable signal to noise ratio, relevant immunity aspects, modulation, should be also specified.

A.7.2.4 Physical layer

The Physical (PHY) layer shall comprise two sublayers, a transmission convergence sublayer (present in the downstream only) and Physical Media Dependent (PMD) sublayer.

Details of the structure and description of the downstream sublayer shall be given.

A description of the PMD sublayer and RF interface points shall be given.

A.7.2.4.1 Upstream physical media dependent sub-layer

Description and technical characteristics of the Upstream PMD sub-layer modulation format used shall be given.

If the upstream modulation scheme implements a scrambler (randomizer) and/or variable length preamble field that is prepended to the data after being randomized and encoded, full details should be provided.

The characteristics and functionality of any transmitter pre-equalizer should be given.

The characteristics and functionality of burst profiles supported by the CM should be given.

The characteristics, functionality, limits and measurement methods for transmit power, fidelity, spurious emissions, symbol rate error, filter distortion, carrier phase noise, channel frequency accuracy, symbol rate accuracy, symbol timing jitter shall be given.

Also details of the frame structure, signalling processing requirements, upstream CMTS input power characteristics, upstream output power from the CM should be given.

A.7.2.4.2 Downstream physical media dependent sub-layer

The CM shall be able to locate and accept RF modulated signals located within channels for frequency plans as defined by the Cable Operator.

The CM BER performance shall be given.

A.7.2.4.3 Downstream transmission convergence sub-layer

Any information specific to the CM for downstream convergence sub-layer shall be given.

A.7.2.4.4 Fault isolation impact on services

Faults and fault isolation procedures have potential harmful impact on numerous users of the data-over-cable and other services. Any specific requirements on fault isolation procedures should be specified.

A.7.2.4.5 Other aspects

Further details may have to be provided in order to satisfy the legal requests of article 4.2 of the R&TTE-D, i.e. make possible the design of TTE.

A.7.2.5 Data link layer

Support of Data Link Layer that is divided into sublayers shall be provided with details of the specifications that it shall be in accordance with.

Class 1 only shall be supported for Logical Link Control (LLC) sublayer and shall be provided with details of the specifications it is in accordance with. Address resolution shall be used as defined in RFC 826 [12]. The specification to be used for MAC-to-LLC service definition shall be given.

The implementation of a Media Access Control (MAC) sublayer shall be provided. In particular the cable modem implementation of downstream and upstream channel transmission mechanism, behaviour and policy shall be given.

The MAC shall provide a protocol service interface to upper-layer services, such bridging, embedded applications (e.g. Packetcable/VoIP), a host interface (e.g. NIC adapter with NDIS driver), and layer three routers (e.g. IP router).

The MAC Service interface defines the functional layering between the upper layer service and the MAC. As such it defines the functionality of the MAC which is provided by the underlying MAC protocols. This interface is a protocol interface, not a specific implementation interface. A description of the data services provided by the MAC service interface shall be given.

A.7.2.5.1 Media Access Control

Any information relating to MAC, frame format, MAC management messages specific to the CM shall be given.

A.7.2.5.2 QoS and Fragmentation

Any information relating to the QoS and packet fragmentation characteristics specific to the CM should be given.

A.7.2.5.3 CM interaction with CMTS

Details of the CM functionality, initialization process, interaction with the CMTS that are to be supported shall be given.

A.7.2.5.4 Communication Protocols

The communication protocols that shall be used in the cable system and detailed specifications for the physical media dependent, downstream transmission, and media access control sublayers are to be fully specified.

A.7.2.5.5 Basic coding structure

Details should include items such as state machine, bit stuffing, traffic prioritization mechanisms, alarm reporting, etc.

A.7.2.5.6 Other aspects

Further details may have to be provided in order to satisfy the legal requests of article 4.2 of the R&TTE-D, i.e. make possible the design of TTE.

A.7.2.6 Network layer

Details of the network layer to be supported shall be fully specified.

A.7.2.6.1 IGMP management

The CM should support IGMP forwarding. Full details of any network specific rules, e.g. on cable, that apply in order for the CM to be fully conformant shall be given.

A.7.2.6.2 Other aspects

Further details may have to be provided in order to satisfy the legal requests of article 4.2 of the R&TTE-D, i.e. make possible the design of TTE.

A.7.2.7 IP Multimedia time critical services

Where applicable, this clause should contain a list of the services supported by the network.

A.7.2.7.1 Voice services

The coding algorithm used to digitize the speech should be detailed.

A.7.2.7.2 Other aspects

Further details may have to be provided in order to satisfy the legal requests of article 4.2 of the R&TTE-D, i.e. make possible the design of TTE.

A.7.2.8 Additional features

Not all interfaces will support all the features identified in this clause. The information suggested should be published where applicable.

A.7.2.8.1 Charging information

Where charging information is applied or supplied by the network at the NTP, this should be specified.

A.7.2.8.2 "Supplementary" services and optional user facilities

Elements and procedures for the control of supplementary services and optional user facilities, where provided, should be detailed.

A.7.2.8.3 Presentation aspects

Any information related to specific text character presentation by the terminals during communication should be provided. This clause has particular relevance for Telex systems.

A.7.2.9 Other aspects and characteristics

This clause should identify any other characteristics that the PNO is aware of to assist the manufacturer in his implementation of the TTE. This could cover such issues under any other considerations e.g. the essential requirements of R&TTE Directive article 3, applicable to the terminal.

A.7.2.9.1 Higher Network Layers

Where CM services provide transparent IP capability as a bearer for higher layer services, use of these services will be transparent to the CM.

In addition to the transport of such user data, full details of the support for any network management and operational capabilities which are dependent on the Network Layer shall be specified.

A.7.2.9.2 Coexistence with other services

The conditions under which the Cable Modem is to coexist with other services on the cable network and any requirements of its interoperability in the specified cable spectrum assigned for CMTS-CM interoperability is to be specified.

The conditions under which the CM should not cause measurable degradation should be specified with full details on the levels and measure of degradation.

The conditions under which the CM should not cause harmful interference to any other services assigned to the cable network in spectrum outside that allocated to CMTS should be specified.

A.7.2.9.3 Downloading new Operating Software

Details of downloading new operating software to the CM in support of future new capabilities shall be given.

A.7.2.9.4 Protocol elements and procedures for signalling

Where the Public Telecommunications Network uses a layered protocol architecture, the functions and characteristics of each layer that involves interaction between the terminal equipment and the Public Telecommunications Network should be specified.

As an example, for interfaces based on the Open Systems Interconnection Model [3] - characteristics of layers 1, 2 and 3 will need to be considered, although some characteristics within any specific layer may not be relevant for all types of interface. Where interaction between the terminal and the network is required above layer 3, characteristics of these higher layers will also need to be provided. A similar level of detail will need to be provided for interfaces not based on the ISO 7 layer model.

Any protocol elements and procedures for establishing, maintaining, modifying and terminating communications should be detailed as well as the methodology for dealing with any unrecognized protocol data units or data elements.

Protocol elements might be code, frame format and size, messages, information elements, timers, window size, etc.

A.7.3 Cable Modem-User interface characteristics to be specified

This clause studies scenario 2 of table 1.

In this case the technologies used may be the most different to take the best advantage of Network infrastructure capabilities and users requests on Telecom services.

ETSI maintains a web page (<http://www.etsi.org/tb/rtte/rtte.htm>) with the relevant information on work produced to the R&TTE Directive [1]. This includes information concerning the application of article 4.2 of the R&TTE Directive [1]. At the present following deliverables are available:

- For **Telecom analogue wired** interfaces, **TR 101 730** [7].
- For **Telecom digital wired** interfaces, **TR 101 731** [8].
- For **Telecom radio** interfaces, **EG 201 838** [9].
- For **RF for Fixed Wireless** interfaces, **TR 101 845** [10].

Many other ETSI deliverables (related to TTE or to NTP) may be used to facilitate application of the article 4.2 of the R&TTE Directive [1].

Annex B:

Extract from a Report presented to TCAM

Part 3: Guidelines for Public Network Operators when publishing interfaces, and NRAs/Member States when supervising such publication.

- 1) Public Network Operators and NRAs should take account of any guidance published by the Commission concerning the publication of interfaces under the R&TTE Directive.
- 2) Publication is required for each type of public network interface. Such interfaces include not only direct interfaces with terminal equipment (the Network Terminating Point), but also indirect interfaces where the Public Network Operator has a contractual relationship with end-users. (See annex 2 [*of the report presented to TCAM*] for the different configurations to be considered.) In the case of indirect connection, only those details additional to the publication relating to the direct interface need be published, that is, the publication is a "delta" to the direct interface publication.
- 3) Specifications of existing interfaces, as well as new and modified interfaces, must be published in accordance with any published guidelines or rules produced by NRAs, national competition authorities or from Europe. The withdrawal of any existing published interface must be notified including, ideally, any phased withdrawal process.
- 4) NRAs may specify guidelines or rules for appropriate lead-times for publication of existing, new and modified interfaces. These should be the minimum consistent with the need to allow manufacturers to design equipment, or to provide modified equipment in the case of modified interfaces. NRAs ought to take account of the need to promote innovation and competition in markets and should therefore allow shorter lead times where this can be justified.
- 5) Sufficient detail must be published to allow manufacturers to design, manufacture, test and place equipment on the market, including information concerning any Essential Requirements. The annexed templates [*to the report presented to TCAM and others being produced by ETSI*] provide details of the expected content of analogue, digital and radio interfaces.
- 6) Interface publications may be produced using the Public Network Operator's own "house style" so long as the contents of the publication provide the same information as indicated in the templates. Clarity would be improved by cross-referencing to the template paragraph numbers and by using ETSI terminology wherever possible. There is no requirement to have a separate publication for each customer interface; it is recognized that where customer interfaces are very similar, it may be beneficial to have all of those interfaces in a single document. Similarly, it may be desirable to specify some characteristics which are common to a number of customer interfaces (e.g. tones and announcements) in a separate publication. The criteria for deciding how to document the technical characteristics of the customer interfaces should be based on clarity, removal of ambiguity, maintainability and ease of use for the users of these publications.
- 7) Publications should contain sufficient information to permit the design of terminal equipment so that it can interwork with the public telecommunications network for the purpose of establishing, modifying, charging for, holding and clearing real or virtual connections and to meet all Essential Requirements. They should also contain details of any supplementary services or enhanced features provided by the network that is important for the design and operation of terminal equipment. The PNO should not exclude any information concerning interworking with the network that it is aware would be relevant to the design and operation of terminal equipment. Sufficient information must be published to allow manufacturers to test that their equipment conforms to the interface specification, including the relevant Essential Requirements. The level of detail should be comparable to that previously provided in TBRs, excluding test specifications unless the test method needs to be declared in order to clarify the meaning of a given parameter.
- 8) Interface publications should refer to published standards where available and specify any options, additions or modifications selected by the PNO within them. For example, ISDN PICS and PIXIT documents could be used where available. PNOs may refer out to other published company documentation for all or part of their interface publication, as long as such documentation defines the interface from the network rather than the terminal viewpoint. Where such references are made, the PNO should ensure that the same ease of access exists for the referenced document(s) as that applied to the interface publication.

- 9) The PNO should ensure it does not knowingly publish in breach of any associated IPR and/or copyright. The PNO should at least consult the network equipment supplier. In so far as the PNO is aware of any relevant property rights, it should ensure that the publication contains a clear indication of:
- any IPR and/or copyright asserted over the contents of the publication (including any specifications referred out to);
 - the rights granted and restrictions made to users of the specification; and
 - how details of any licensing requirements associated with such IPR may be obtained.
- 10) The language of publication is a matter for each Member State. NRAs are encouraged not to place onerous translation requirements on PNOs.
- 11) Publications should be version controlled with a document history.
- 12) It is recommended that PNOs should make publications available electronically, i.e. on the World Wide Web. NRAs or other bodies may create hyperlinks to individual publication sites and to similar sites in other Member States. Paper copies should be made available on request, for which the PNO may levy a reasonable charge.
- 13) NRAs should promote the establishment of a national forum for the discussion of draft and published specifications with Public Network Operators, Public Service Providers, manufacturers and other interested parties, with the purpose of ensuring that publications conform to any relevant guidelines, meet the needs of terminal manufacturers and that the integrity of the network is maintained. Any such forum should take account of any harmonizing guidelines at the European level.
- 14) NRAs should require PNOs to republish any specifications that are found to be inadequate for their intended purpose. Any such decision should be based on published rules or guidelines or the templates in the level.

NOTE: References on this page to "the present document" or "annexes" refer to the report presented to TCAM, not the present document.

History

Document history		
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