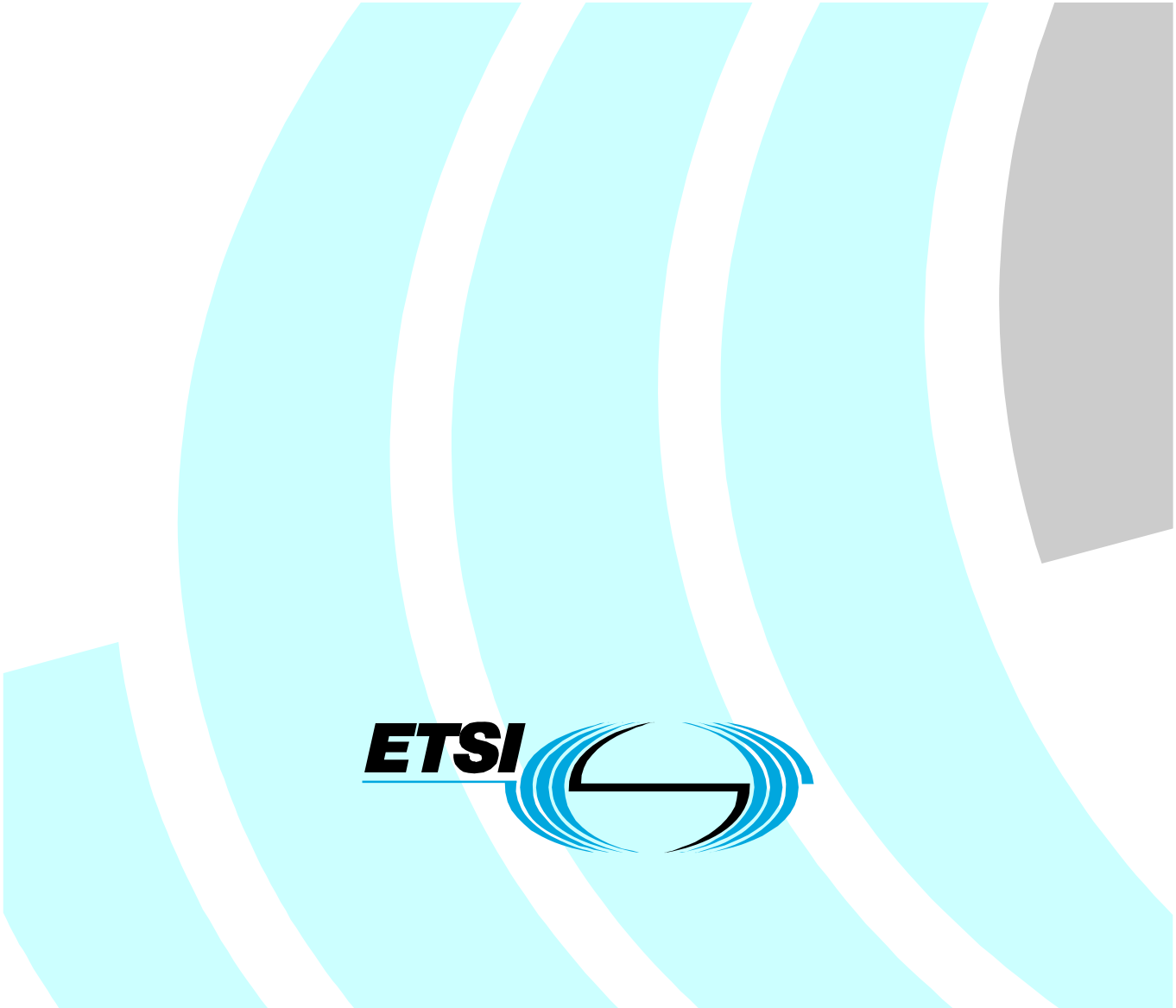
ETSI TS 105 174-5-4 V1.1.1 (2009-10)

Technical Specification

**Access, Terminals, Transmission and Multiplexing (ATTM);
Broadband Deployment - Energy Efficiency
and Key Performance Indicators;
Part 5: Customer network infrastructures;
Sub-part 4: Data centres (customer)**



Reference
DTS/ATTM-020005-4-3

Keywords
access, cable, optical, site engineering

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Contents

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Foreword

This Technical Specification (TS) has been produced by ETSI Technical Committee Access, Terminals, Transmission and Multiplexing (ATTM).

The present document is part 5-4 of a multi-part deliverable. Full details of the entire series can be found in part 1 [i.10].

Introduction

The increasing interaction between the different elements of the Information Communication Technology (ICT) sector (hardware, middleware, software and services) supports the concept of convergence in which:

- multi-service packages can be delivered over a common infrastructure;
- a variety of infrastructures is able to deliver these packages;
- a single multi-service-package may be delivered over different infrastructures.

As a result of this convergence, the development of new services, applications and content has resulted in an increased demand for bandwidth, reliability, quality and performance, with a consequent increase in the demand for power which has implications for cost and, in some cases, availability. It is therefore important to maximize the energy efficiency of all the network elements necessary to deliver the required services.

New technologies and infrastructure strategies are expected to enable operators to decrease the energy consumption, for a given level of service, of their existing and future infrastructures thus decreasing their costs. This requires a common understanding among market participants that only standards can produce.

The present document is part 5-4 of a multi-part deliverable which has been produced by ETSI Technical Committee Access, Terminals, Transmission and Multiplexing (ATTM) in close collaboration with CENELEC via the Co-ordination Group on Installations and Cabling (CGIC). It offers a contribution to the required standardization process by establishing an initial basis for work on ICT networks and transmission engineering, with active collaboration from a number of other ETSI and CENELEC Technical Bodies. When complete, the documents will contain information that has been jointly evolved to present developments in installations and transmission implementation, and describing their progress towards energy efficiency in Next Generation Networks (NGN).

1 Scope

The present document details measures which may be taken to improve the energy efficiency within industrial premises (single-tenant) by virtue of broadband deployment. Clauses 2 and 3 contain references, definitions and abbreviations which relate to this part; similar information will be included in the corresponding clauses of the other parts, thus ensuring that each document can be used on a "stand-alone" basis.

Within the present document:

- clause 4 describes the nature of customer premises networks in data centres (customer), defines the interfaces to those networks and identifies the standardization bodies working on the design and installation of those networks;
- clause 5 describes the strategies that may be employed within data centres (customer) to both increase the energy efficiency of installed information technology equipment and to use the facilities offered by information technology services to reduce overall energy consumption.

This will enable the proper implementation of services, applications and content on an energy efficient infrastructure, though it is not the goal of this multi-part deliverable to provide detailed standardized solutions for home broadband network architecture.

2 References

References are either specific (identified by date of publication and/or edition number or version number) or non-specific.

- For a specific reference, subsequent revisions do not apply.
- Non-specific reference may be made only to a complete document or a part thereof and only in the following cases:
  - if it is accepted that it will be possible to use all future changes of the referenced document for the purposes of the referring document;
  - for informative references.

Referenced documents which are not found to be publicly available in the expected location might be found at http://docbox.etsi.org/Reference.

NOTE: While any hyperlinks included in this clause were valid at the time of publication ETSI cannot guarantee their long term validity.

2.1 Normative references

The following referenced documents are indispensable for the application of the present document. For dated references, only the edition cited applies. For non-specific references, the latest edition of the referenced document (including any amendments) applies.

Not applicable.

2.2 Informative references

The following referenced documents are not essential to the use of the present document but they assist the user with regard to a particular subject area. For non-specific references, the latest version of the referenced document (including any amendments) applies.

[i.1] European Commission: "DG-JRC Code of Conduct on Energy Consumption of Broadband Equipment".

[i.2] CENELEC EN 50173-1: "Information technology - Generic cabling systems - Part 1: General requirements".

[i.3] CENELEC EN 50173-2: "Information technology - Generic cabling systems - Part 2: Office premises".

[i.4] CENELEC EN 50173-5: "Information technology - Generic cabling systems - Part 5: Data centres".

[i.5] CENELEC EN 50174-1: "Information technology - Cabling installation - Part 1: Installation specification and quality assurance".

[i.6] CENELEC EN 50174-2: "Information technology - Cabling installation - Part 2: Installation planning and practices inside buildings".

[i.7] CENELEC EN 50174-3: "Information technology - Cabling installation - Part 3: Installation planning and practices outside buildings".

[i.8] ETSI TS 102 973: "Access Terminals, Transmission and Multiplexing (ATTM); Network Termination (NT) in Next Generation Network architectures".

[i.9] ISO/IEC 24764: "Information technology - Generic cabling systems for data centres".

[i.10] ETSI TS 105 174-1: "Access, Terminals, Transmission and Multiplexing (ATTM); Broadband Deployment - Energy Efficiency and Key Performance Indicators; Part 1: Overview, common and generic aspects".

[i.11] ETSI TS 105 174-2-2: "Access, Terminals, Transmission and Multiplexing (ATTM); Broadband Deployment - Energy Efficiency and Key Performance Indicators; Part 2: Network sites; Sub-part 2: Data centres".

[i.12] ETSI TR 105 174-5-2: "Access, Terminals, Transmission and Multiplexing (ATTM); Broadband Deployment - Energy Efficiency and Key Performance Indicators; Part 5: Customer network infrastructures; Sub-part 2: Office premises (single-tenant)".

[i.13] ETSI TR 105 174-4: "Access, Terminals, Transmission and Multiplexing (ATTM); Broadband Deployment - Energy Efficiency and Key Performance Indicators; Part 4: Access networks".

3 Definitions and abbreviations

3.1 Definitions

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

application: system, with its associated transmission method that is supported by telecommunications cabling (this corresponds to a Layer One application in the OSI 7-layer model)

Broadcast Communication Technology (BCT) application: system, with its associated transmission method using the HF band (3 MHz to 30 MHz), the VHF band (30 MHz to 300 MHz) and the UHF band (300 MHz to 3 000 MHz) dedicated to the transmission of sound radio, TV and two-way data services, as well as for in-home inter-networking

NOTE: See EN 50173-1[i.2] modified.

BCT service: transmission of sound radio, TV and two-way data

NOTE: See EN 50173-1 [i.2] modified.

Control, Command and Communications in Building (CCCB) application: system, with its associated transmission method dedicated to providing appliance control and building control

NOTE: See EN 50173-1[i.2] modified.

CCCB services: appliance control and building control

NOTE: See EN 50173-1 [i.2] modified.

Information Communication Technology (ICT) applications: system, with its associated transmission method for the communication of information

ICT services: creation, communication dissemination, storage and management of information

network convergence: ability of a network, by virtue of the applications it supports, to deliver multiple ICT, BCT and CCCB services

3.2 Abbreviations

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

BCT	Broadcast Communication Technology
CCCB	Control, Command and Communications in Building
CGIC	ETSI CLC Co-ordination Group on Installations and Cabling
DSL	Digital Subscriber Line
ENI	External Network Interface
ENTI	External Network Termination Interface
EO	Equipment Outlet
FTTB	Fire To The Building
HF	High Frequency
ICT	Information and Communication Technology
KPI	Key Performance Indicator
LDP	Local Distribution Point
MD	Main Distributor
NGN	Next Generation Network
OIE	Operator Independent Equipment
OSE	Operator Specific Equipment
UHF	Ultra High Frequency
VHF	Very High Frequency
ZD	Zone Distributor

4 Customer networks in data centres

4.1 Overview of data centre network infrastructures

4.1.1 General

Customers data centres range in size from relative small areas contained in offices or industrial premises (perhaps only containing a telephony switch and a small number of servers) to sophisticated, enterprise data centres of a size and complexity equivalent to those described in TR 105 174-5-2 [i.12].

However, in virtually all cases the energy consumption of information technology equipment is the major element of the overall energy consumption of the area designated as the data centre.

4.1.2 Network convergence

Within customer data centres, the range of networks has, in the past, reflected the diversity of the services with ICT services being delivered over a variety of cabling infrastructures for specified computer-computer or computer-peripheral connections.

The type of networks within data centres include the Ethernet solutions of the type found in other premises for the delivery of ICT services. However, other networks such as Fibre Channel are also used in data centres for specific purposes in specific areas.

These networks are supported by the transmission performance offered by generic cabling (see clause 4.2.1) and CENELEC TC215 developed EN 50173-5 [i.4] covering the design and specification of generic cabling within data centres which can be applied, although not as a complete replacement for all cabling, within all data centres.

4.2 Infrastructure standardization activities

4.2.1 Generic cabling designs in accordance with EN 50173-5

NOTE: EN 50173-5 [i.4], published in 2007, has a similar scope, and is intended to be technically equivalent, to ISO/IEC 24764 [i.9] produced by ISO/IEC JTC1 SC25.

4.2.1.1 Infrastructure layers

EN 50173-5 [i.4] specifies a single layer infrastructure for data centre cabling as shown in figure 1.

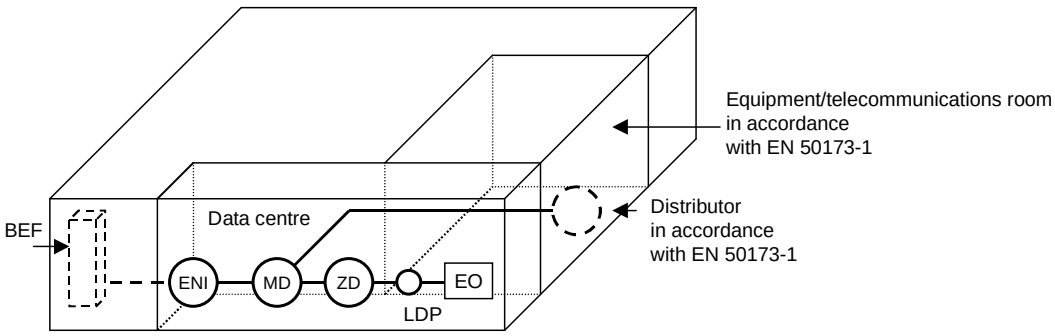

Figure 1: "Data centre"-specific cabling infrastructure of EN 50173-5 [i.4]

Within the area designated as the data centre, the infrastructure is fed from a Main Distributor (MD) which is connected to one or more Zone Distributors (ZD). Information technology equipment may be housed at any distributor as required by the networked application. The final distribution to the servers and other peripheral equipment is from the ZD to the Equipment Outlets (EO). A Local Distribution Point (LDP) may be installed an EO and a ZD to provide a point of administration but does not house active information technology equipment.

Connections from the data centre are:

- external: via the External Network Interfaces (ENI) allowing connection of either an MD or a ZD to the access network;
- internal: via connection to a generic cabling distributor as relevant to the type of premises within which the data centre is housed (if appropriate).

The computer room may contain generic cabling for general ICT services with the room which would be designed in accordance with EN 50173-2 [i.3] as described in TR 105 174-5-2 [i.12].

The hierarchical nature of the data centre cabling infrastructure is shown in figure 2 (as in EN 50173-5 [i.4]).

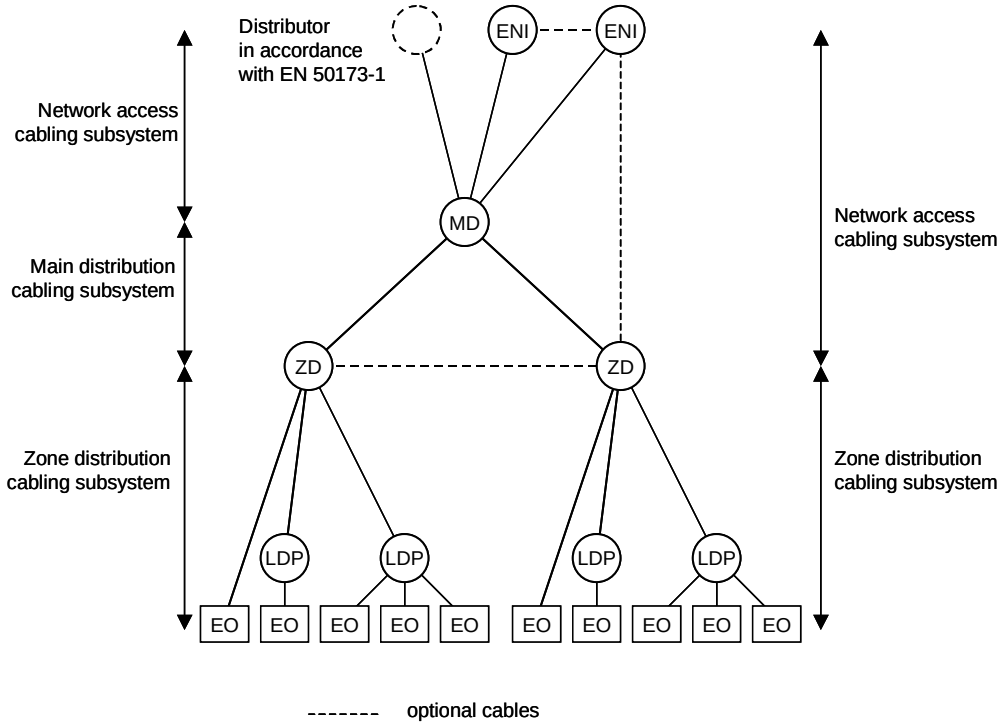

Figure 2: Cabling topology of EN 50173-5 [i.4]

4.2.1.2 Cabling

The main and zone distribution cabling subsystems of figure 2 shall be provided by either balanced or optical fibre cabling.

EN 50173-5 [i.4] Amendment 1:2009 requires that the balanced cabling is capable of providing a minimum transmission performance (defined as Class E_A of EN 50173-1 [i.2]) which is cable of supporting 10BASE-T, 100BASE-T, 1000BASE-T and 10GBASE-T applications.

EN 50173-5 [i.4] Amendment 1:2009 requires that, where the main or zone distribution cabling subsystems do not exceed 300 metres in length, the minimum performance of the cabled multimode optical fibre is Category OM3 which is capable of supporting 10GBASE-SR/SW applications.

4.2.2 Cabling installation in accordance with EN 50174 standards

EN 50174-1 [i.5], EN 50174-2 [i.6] and EN 50174-3 [i.7] contain requirements and recommendations for the specification, quality assurance, planning and installation practices that apply to all information technology cabling media in all premises. Clause 8 of EN 50174-2 [i.6] specifies the additional/amended requirements and recommendations that apply within the buildings containing data centres.

4.3 Network access infrastructure

The connection between the operator's access network and the customer's data centre is made to the ENI as shown in figure 1 (or the equivalent in non-generic cabling). The ENI is an interface within the premises which provided to the access network. The physical nature of this interface is specified in EN 50173-5 [i.4] for both balanced and optical fibre cabling.

The ENI is the boundary between the network access cabling and the access network as shown by the dotted line in figure 3.

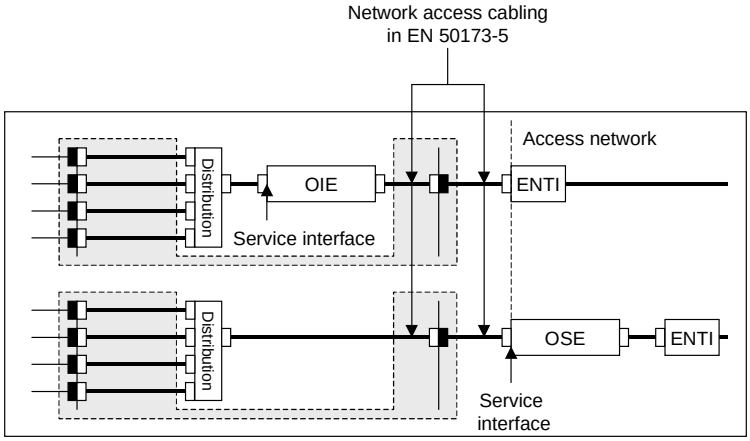

Figure 3: Network access cabling and equipment

The network telecommunications equipment typically comprises a passive interface (ENTI) and an optional item of apparatus. The apparatus may be specific to the network operator (OSE) or may be operator independent (OIE) as described in the following examples:

- OIE: DSL modem, FTTB modem (where interoperability standard exists).

NOTE: See TS 102 973 [i.8].

- OSE: FTTB modem (where no interoperability standard exists).

The OSE is part of the access network whereas the OIE is part of the customer premises infrastructure.

In most cases the OIE, or some part of it, may be powered from the access network. In some cases the OSE may be powered from the customer premises.

For this reason, the energy efficiency of the access network takes into account any power required to maintain the functionality at the service interface, whether or not it is part of the access network (and is covered in TR 105 174-4 [i.13]).

The EU Code of Conduct on Energy Consumption of Broadband Equipment [i.1] provides a framework for ensuring operational energy efficiency consumption of network telecommunication equipment.

5 Energy efficiency

5.1 General

TS 105 174-2-2 [i.11] provides information regarding Key Performance Indicators (KPIs) for the energy efficiency of data centres.

Although the customer data centre is outside the scope of TS 105 174-2-2 [i.11], its requirements and recommendations may be applied to these customer networks and their associated infrastructure. The comparative viability of implementing such solutions will depend on the size and nature of the customer data centre.

History

Document history		
V1.1.1	October 2009	Publication