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Technical Specification

Access, Terminals, Transmission and Multiplexing (ATTM); Broadband Deployment - Energy Efficiency and Key Performance Indicators; Part 1: Overview, common and generic aspects



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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 1, of a multi-part deliverable covering energy efficiency and broadband deployment, as identified below:

- Part 1: "Overview, common and generic aspects";**
- Part 2: "Network sites";
 - Sub-part 1: "Operator sites";
 - Sub-part 2: "Data centres";
- Part 3: "Core, regional metropolitan networks";
- Part 4: "Access networks";
- Part 5: "Customer network infrastructures";
 - Sub-part 1: "Homes (single-tenant)";
 - Sub-part 2: "Office premises (single-tenant)";
 - Sub-part 3: "Industrial premises (single-tenant)";
 - Sub-part 4: "Data centres (customer)";
 - Sub-part 5: "Multi-tenant premises (residential and commercial)".

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 1 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 multi-part deliverable 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).

It is intended that all the documents mentioned in the foreword and more fully described in clause 7 will be produced as soon as the workload allows. The initial activity is outlined in informative annex C, which will be revised from time to time. The multi-part deliverable will contain a high level analysis of broadband deployment and multi-service implementation, explaining the various optical fibre access network infrastructure architectures (FTTx) required to deliver efficient broadband services to customer premises and the associated difficulties, for example, the impact on implementation created by legislation and regulation of the operator environment.

In order to monitor the implementation and operation of energy efficient broadband deployment, certain documents will also discuss Key Performance Indicators (KPI) for energy efficiency and focus on the possible consequences of standardization of installations, cabling techniques and equipment. In particular, the study will investigate possibilities and suggest solutions for development of processes for optimization in installation techniques and energy consumption.

1 Scope

The present document gives an overview of this multi-part deliverable covering energy efficiency and 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.

Clause 5 describes the network sub-systems applicable to broadband deployment and their interconnections.

Clause 6 considers the measures which may be taken to maximize energy efficiency of the end-to-end network and introduces the concept of key performance indicators (KPI) to enable consistent monitoring of energy efficiency for each of the network sub-systems described in clause 4.

Clause 7 contains details of the subsequent parts and sub-parts of this multi-part deliverable which, for each of the network sub-systems described in clause 4:

- identify the standardization bodies working on the design and installation of the cabling within and between the network sub-systems and the relevant interfaces;
- provide a more strategic analysis of energy consumption trends, in a range of different broadband deployment scenarios;
- outline further work needed to ensure the improvement of power efficiency in communication networks.

This will enable the proper implementation of services, applications and content using an energy efficient infrastructure, though it is not the goal of this multi-part deliverable to provide detailed standardized solutions for the power distribution systems or physical design of data centres.

The present document also contains informative annexes which may later be deleted and/or the information transferred to other parts of the multi-part deliverable set.

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.

- [1] European Commission, DG-JRC Code of Conduct on Data Centres Energy Efficiency.
- [2] CENELEC EN 50173-2: "Information technology - Generic cabling systems - Part 2: Office premises".
- [3] CENELEC EN 50173-3: "Information technology - Generic cabling systems - Part 3: Industrial premises".
- [4] CENELEC EN 50173-4: "Information technology - Generic cabling systems - Part 4: Homes".
- [5] CENELEC EN 50173-5: "Information technology - Generic cabling systems - Part 5: Data centres".
- [6] CENELEC TR 50173-99-2: "Information technology - Implementation of BCT applications using cabling in accordance with EN 50173-4".
- [7] CENELEC EN 50174-1: "Information technology - Cabling installation - Part 1: Installation specification and quality assurance".
- [8] CENELEC EN 50174-2: "Information technology - Cabling installation - Part 2: Installation planning and practices inside buildings".
- [9] CENELEC EN 50174-3: "Information technology - Cabling installation - Part 3: Installation planning and practices outside buildings".
- [10] CENELEC EN 60728 series: "Cable networks for television signals, sound signals and interactive services".
- [11] CENELEC EN 61784 series: "Industrial communication networks - Profiles".
- [12] CENELEC EN 61918: "Industrial communication networks - Installation of communication networks in industrial premises".
- [13] ITU-T Recommendation I.113: "Vocabulary of terms for broadband aspects of ISDN".

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] 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 (R&TTE Directive).
- [i.2] Directive 2002/22/EC of the European Parliament and of the Council of 7 March 2002 on universal service and users' rights relating to electronic communications networks and services (Universal Service Directive).
- [i.3] ETSI TS 102 973: "Access Terminals, Transmission and Multiplexing (ATTM); Network Termination (NT) in Next Generation Network architectures".
- [i.4] ETSI EG 201 730 (all parts): "Terminals' access to Public Telecommunications Networks; Application of the Directive 1999/5/EC (R&TTE), article 4.2; Guidelines for the publication of interface specifications".
- [i.5] ETSI EG 202 306: "Transmission and Multiplexing (TM); Access networks for residential customers".

- [i.6] ETSI TR 105 174-2-1: "Access, Terminals, Transmission and Multiplexing (ATTM); Broadband Deployment - Energy Efficiency and Key Performance Indicators; Part 2: Network sites; Sub-part 1: Operator sites".
- [i.7] 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.8] ETSI TS 105 174-3: "Access, Terminals, Transmission and Multiplexing (ATTM); Broadband Deployment - Energy Efficiency and Key Performance Indicators; Part 3: Core, regional metropolitan networks".
- [i.9] ETSI TR 105 174-4: "Access, Terminals, Transmission and Multiplexing (ATTM); Broadband Deployment - Energy Efficiency and Key Performance Indicators; Part 4: Access networks".
- [i.10] ETSI TR/TS 105 174-5 (all sub-parts): "Access, Terminals, Transmission and Multiplexing (ATTM); Broadband Deployment - Energy Efficiency and Key Performance Indicators; Part 5: Customer network infrastructures".

3 Definitions and abbreviations

3.1 Definitions

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

access network: functional elements (that is equipment and infrastructure) that enable communication between the core network and a customer network

core network: functional elements (that is equipment and infrastructure) that enable communication between operator sites and/or network data centres

customer network: functional elements (that is equipment and infrastructure) that enable communication between an NTP or ENTI, as appropriate, and one or more attached terminal equipments

distribution infrastructure: sub-part of the access network comprising the functional elements that enable communication between the last cabinet and a customer network

External Network Test Interface (ENTI): point in or near the customer premises (inside or outside the customer network) accessible to the network operator for testing purposes

Network Termination Point (NTP): physical point(s) at which a subscriber is provided with access to the operator network (this may be co-located with an external network test interface)

NOTE: The schematic of figure 1 helps understanding many of the definitions related with relevant points and areas of the installation.

transport infrastructure: sub-part of the access network comprising the functional elements that enable communication between the core network and the last cabinet and a customer network

3.2 Abbreviations

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

ATTM	Access, Terminals, Transmission and Multiplexing
BEF	Building Entrance Facility
CENELEC	European Committee for Electrotechnical Standardization
CGIC	Co-ordination Group on Installations and Cabling
CP	Customer Premises
DC	(Network) Data Centre
ENTI	External Network Test Interface
FTTB	Fibre To The Building

FTTC	Fibre To The Cabinet
FTTH	Fibre To The Home
FTTx	Fibre To The (various)

NOTE: See FTTB, FTTC and FTTH.

HEF	Home Entrance Facility
HFC	Hybrid Fibre Coaxial
HV	High Voltage
ICT	Information Communications Technology
ISDN	Integrated Service Digital Network
KPI	Key Performance Indicator
LC	Last Cabinet

NOTE: Before the customer premises in the access network.

NGN	Next Generation Networks
NTP	Network Termination Point
ODC	Operator Data Centre
OS	Operator Site
POTS	Plain Old Telephone Service
TxRx	Transceiver equipment

4 Broadband deployment

Broadband access equipment is defined by its incorporation of a transmission technology capable of providing more than 2 048 kbit/s (ITU-T recommendation I.113 [13]) full-rate capacity in at least one direction. On this basis, ISDN is not considered to be a broadband technology and is not addressed in the present document.

5 Network sub-systems of broadband deployment

5.1 General

This clause will identify and explain the elements of the network sub-systems employed in broadband deployment.

5.2 Network sub-systems

Figure 1 is a technology agnostic diagram depicting a segment of a broadband network showing the interconnection of network data centres, operator sites and customer premises installations. In principle, every operator network can contain any number of each of these elements and may be connected to any number of other operator networks.

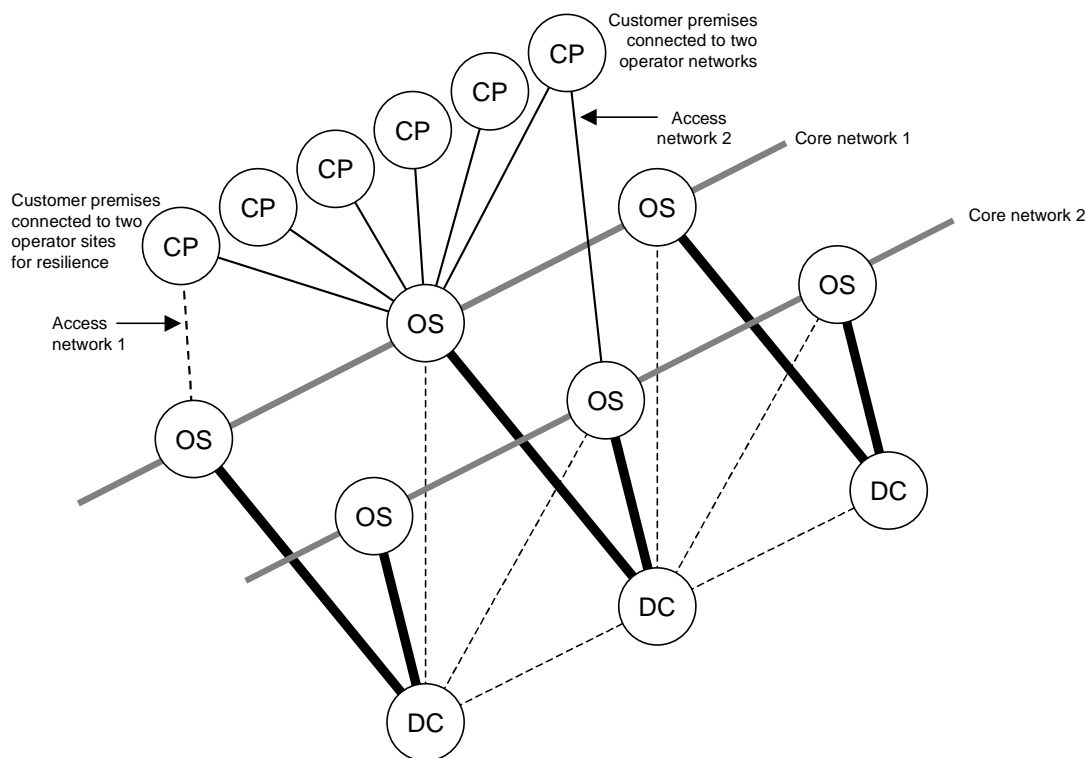


Figure 1: Network sub-systems of broadband deployment

5.2.1 Data centre

A network data centre is the network sub-system that supports one or more operator core networks. Its functions include the storage, processing and dissemination of data as required to fulfil customer expectations, the hosting of the necessary applications, content hosting, etc. In this context, data centres do not include sites containing only servers and their related hardware that are used solely for administrative functions such as customer management functions, billing, etc.

To enable their functionality, all data centres must be connected to at least one core network operator site. For reasons of network resilience, data centres will invariably be connected to more than one operator site and to several other data centres. Data centres may serve core networks operated by several network operators, thus enabling traffic between customers of different network operators.

5.2.2 Operator site

An operator site is the network sub-system in the core network that enables the connectivity between network data centres and customer premises over which the required services can be delivered, using the access network. In turn, operator sites also enable indirect connectivity between customer premises. Operator sites will almost invariably each serve many thousands of customer connections. Each customer connection may be comprised of multiple communication paths and serve a variety of applications.

5.2.3 Customer premises

Customer premises are connected to at least one operator site in the core network and contain the terminal equipment required to provide those services to which the customer has chosen to subscribe, together with the local network equipment necessary to distribute those services amongst the customers' families or employees at that location.

Customer premises may be connected to two or more operator sites on one or more core networks in order to provide the desired service diversity.

However, the domestic customer premises (that is, homes) will be connected to fewer operator sites as convergence allows multi-service packages to be delivered over a common infrastructure. The connection of customer premises to multiple operator sites will be restricted to businesses where the connections provided are intended to a contracted level of service resilience.

This highlights the distinction between the need of high speed data provision and the requirement for service availability: the demand for high speed data in homes is expected to increase but the criticality of that provision is low since much of the increases are related to entertainment services. In comparison, businesses may demand high levels of service availability, independent of the amount of data transmitted.

5.2.4 Primary power requirements

Both data centres and operator sites will always be critically dependent upon an adequate supply of primary power both for operation of the network equipment and usually for providing environmental control (for example, temperature and humidity) and housekeeping services (for example, lighting and domestic services) for the equipment accommodation. Power is typically provided by one or more feeds from a public supply supplemented almost invariably by on-site generation equipment in case of supply failure.

These sites also require some form of uninterruptible power supply, at least sufficient to cover the generator start-up period, in the event of failure of the public supply. Energy from the HV supply invariably needs conversion to a lower voltage for connection to the equipment; this conversion will always incur some losses.

Customer premises are also dependent on external power in all but the simplest of installations. In the majority of cases this dependency will be business critical, thus needing similar provisions as those at the main network sites, albeit on a smaller scale.

In considering overall energy efficiency, the losses incurred in the power conversion equipment for both public and on-site supplies must be taken into account.

5.3 Network sites

Figure 2 shows the content and external connectivity of the data centres and operator sites in a little more detail though this diagram is intended only to illustrate the types of equipment employed, not its internal connectivity. For the purposes of the present study, the boxes marked "TxRx" will be regarded as part of the access or core network, as appropriate and their power requirements included in the assessments for those networks.

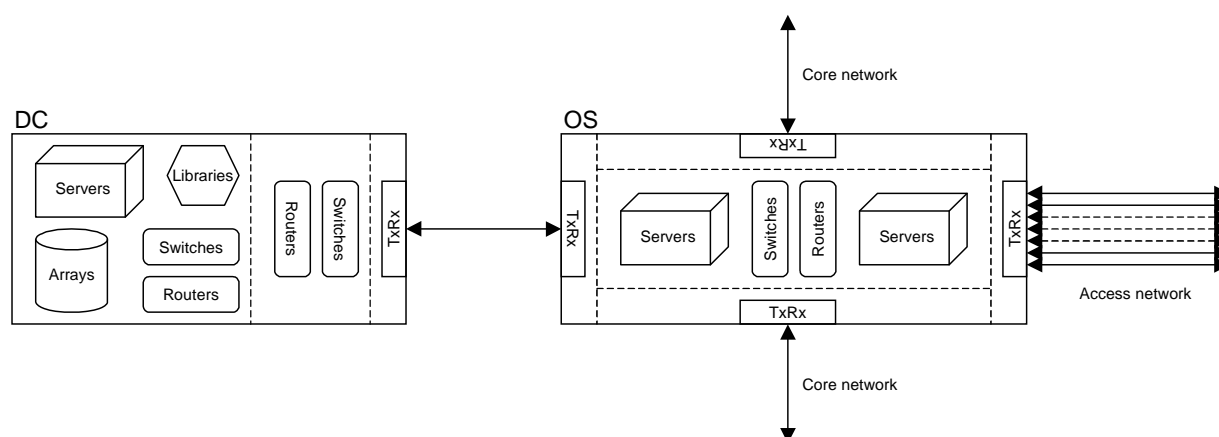


Figure 2: Simplified schematic of operator data centres and operator sites

5.4 Customer premises

Figure 3 shows the types of premises served by the majority of access networks.

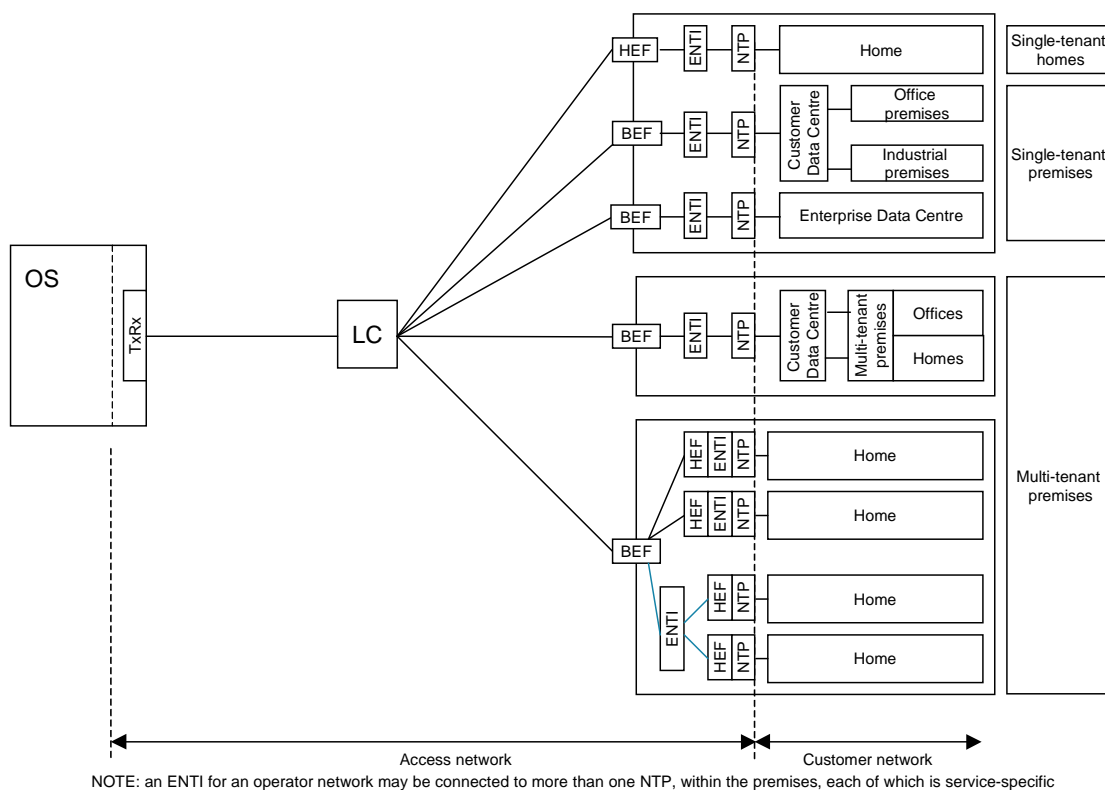


Figure 3: Customer premises served by the access network

Customer premises can be defined as being single-tenant or multi-tenant.

Single-tenant premises include offices premises and industrial premises that will usually be equipped with their own customer premises distribution network served by one or more data centres within the premises connected to at least one operator network via one or more Network Termination Points (NTPs).

It should be noted that an ENTI for each of the operator networks may be connected to more than one, service-specific NTP within the premises.

Single-tenant premises also include dedicated customer data centres that have limited, or no, other distribution networks.

Multi-tenant premises can house homes and/or offices and in both cases can take two forms:

- a) one or more NTPs serve(s) each home or office within which there is a customer network;
- b) one or more NTPs serve(s) connects to a customer data centre from which services are distributed to each of the homes and/or offices via a third party - normally acting on behalf of the building owner. In such cases the customer network includes both the network within the individual homes and/or offices together with the building distribution network.

As detailed in clause 5.2.3 a given customer network may be serviced by a number of NTPs providing broadband delivery from a number of operator networks, thus providing resilience in the case of failure of one of the access networks. The reasons for this may be commercial or strategic (to provide resilience in the case of access network failure).

5.5 Access networks

5.5.1 Schematic

Figure 4 shows options for access network implementations based on FTTx.

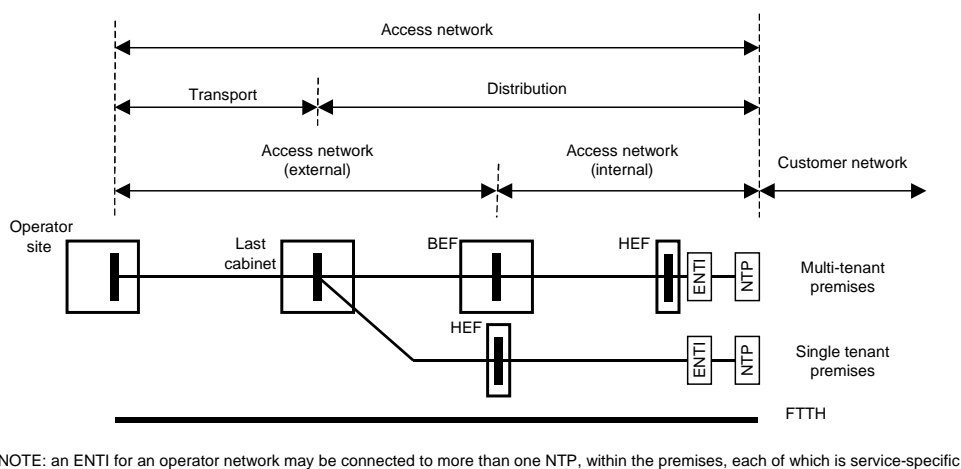
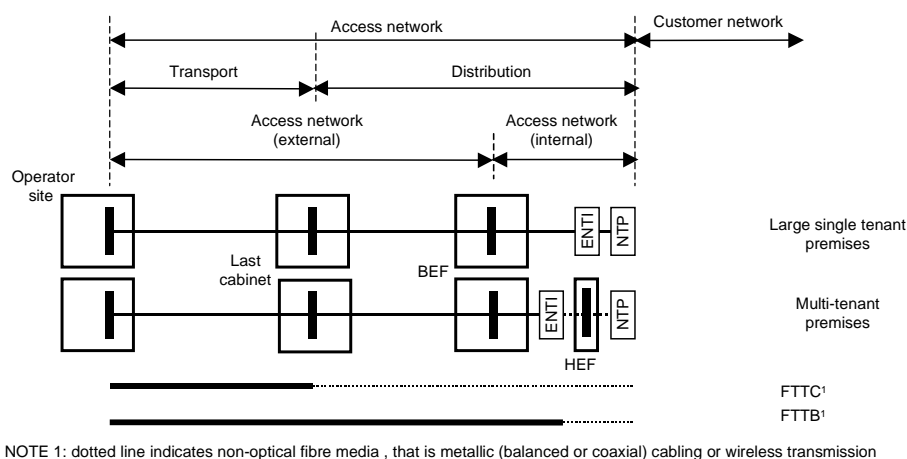


Figure 4: FTTx access network implementations

5.5.2 Infrastructures and technologies

TR 105 174-4 [i.9] describes access networks using a variety of transmission media. Figure 5 shows the general access network topologies reviewed in TR 105 174-4 [i.9].

The transmission media addressed comprise balanced and coaxial metallic cabling, optical fibre cabling and wireless solutions.

TR 105 174-4 [i.9] covers "point-to-point" networks in all transmission media.

Where the access network is divided at the last cabinet between transport and distribution infrastructures, the transport infrastructure is implemented using optical fibre and the distribution infrastructure is:

- all supported media for point-to-point systems;
- optical fibre only for point-to-point (virtual) systems;
- optical fibre only for point-to-multi-point (passive) systems;
- optical fibre only for point-to-multi-point (virtual and passive) systems.

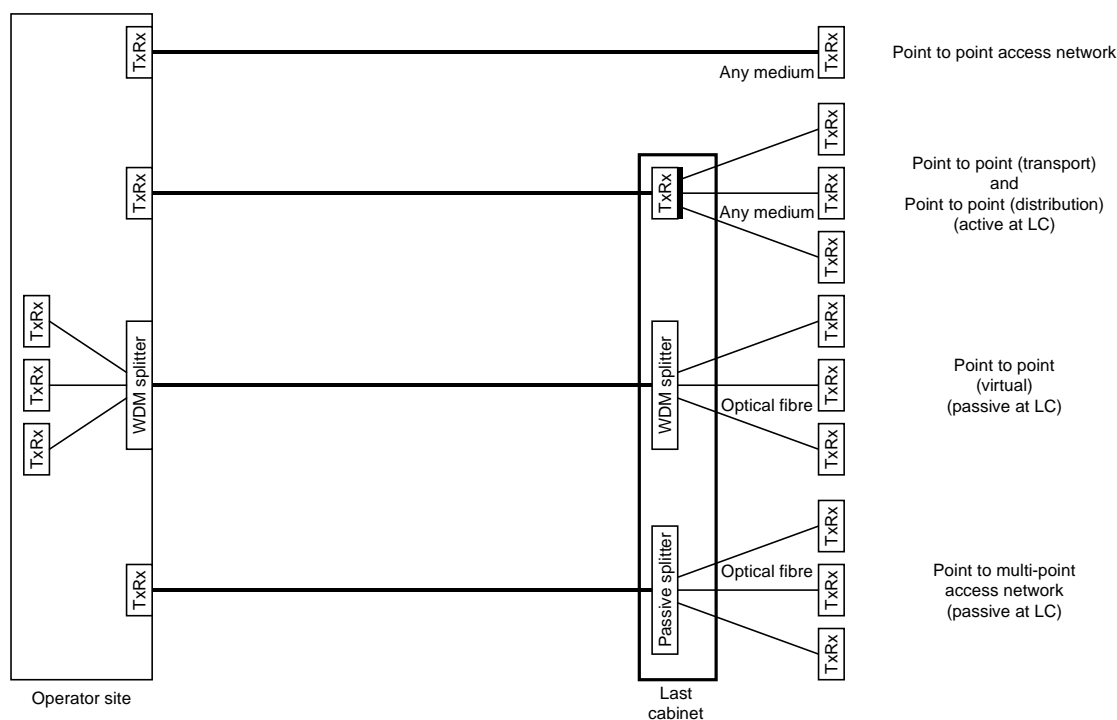


Figure 5: Access network technology options

6 Energy efficiency

Broadband provision is an enabling technology capable of supporting a reduction of global energy consumption (for example, by providing facilities such as home working and video conferencing to reduce travel demands).

For this reason, it may not be the case that the total energy consumption of broadband networks will be reduced, though the application of effective energy efficiency measures will minimize any increases due to predicted service evolution.

For the purposes of the present document, "energy efficiency" relates to the operational energy efficiency of broadband network sub-systems described in clause 4.

It is not the intention of the present document to take into consideration the following aspects of the broadband network sub-systems:

- implications for carbon "footprint";
- resources used to construct the sub-systems;
- the renewable nature of the energy used.

Possible energy efficiency gains from the design of new network sub-systems are expected to differ from, and generally offer greater outcomes than, those that may be applied to existing infrastructures.

The scale of energy efficiency gains and the measurable impact also varies between the different network sub-systems. The outcomes of energy efficiency measures at network sites as identified in TR 105 174-2-1 [i.6] and TS 105 174-2-2 [i.7] are expected to be substantial but apply in only a relatively small number of locations and may prove vital where availability of power is restricted. These clearly defined premises are provided with appropriate KPIs to determine relative performance levels in terms of energy efficiency.

In comparison, the saving within individual access and customer networks will be very much smaller, their totality may very well outweigh the energy efficiency gains elsewhere due to the very large number of customers, thus justifying their consideration and implementation. The communities served by customer networks are the recipients of the "energy efficiency enabling" technologies provided by broadband deployment and the relevant parts of this multi-part deliverable serves to indicate strategies/approaches that maximize the opportunities presented.

Furthermore, it is the customer rather than the operator that funds the energy costs within customer networks. Potential reductions in energy consumption may well be identifiable in design terms but they are generally not individually quantifiable due to the diversity of customer networks.

This multi-part deliverable specifies different KPIs for certain network sub-systems. The KPI for a given network sub-system may differ between an existing sub-system and a new implementation where efficiencies can be included at the design stage.

7 Overview of the multi-part deliverable: Energy efficiency and broadband deployment

7.1 Part 1: Overview, common and generic aspects

The present document, TS 105 174-1, is intended to provide and maintain an overview of all the other parts of the series to facilitate the correct and consistent application of the complete multi-part deliverable.

NOTE 1: The following clauses give an overview of the different parts and sub-parts of this multi-part deliverable. For detailed information each one of the sub-parts should be consulted.

NOTE 2: New parts and sub-parts may be created in the future and any changes will be reflected in the present document. In particular, the extension of the set of documents to cover new areas or specific sub-areas might be useful but needs additional collaboration from an extended base of experts.

This multi-part deliverable focuses on the best practice for cabling and installations and transmission implementation independently from the ownership of these infrastructures or systems. Should the ownership of the installations or equipment be a matter for analysis it is strongly recommended to take in consideration TS 102 973 [i.3] and the EG 201 730 [i.4] series of documents which study the regulatory implications associated with the definition of the network termination (NT/NTP) for different technologies.

NOTE 3: Requirements for, and the definition of, NTP are specified in Universal Service (2002/22/EC [i.2]) and R&TTE (1999/5/EC [i.1]) Directives. See also the series of EG 201 730 [i.4] offering guidance on the requirements applicable to the NTP.

7.2 Part 2: Network sites

7.2.1 Sub-part 1: Operator sites

The energy efficiency of operator sites is discussed in TR 105 174-2-1 [i.6] which:

- reviews the opportunity for energy efficiency gains within operator sites in the following areas:
 - selection and use of network telecommunications equipment and information technology equipment;
 - environmental control (including temperature, humidity and lighting);
 - support infrastructures (for example, network telecommunications cabling and information technology cabling);
 - power distribution;
- defines the applicable energy efficiency KPIs for existing and new buildings;
- states requirements and recommendations for conformance to TR 105 174-2-1 [i.6].

TR 105 174-2-1 [i.6] also makes reference to standardization available and in development in ETSI, CENELEC, IEC, and ITU-T. The significance of the different standards (and current work) is discussed and proposals for any useful new standardization are made where relevant.

Standards for the design and specification of information technology cabling that may be applied within operator sites have been developed by CENELEC TC215 (EN 50173-2 [2]), EN 50173-5 [5]).

Standards for the installation of cabling within operator sites have been developed by CENELEC TC215 (EN 50174-1 [7], EN 50174-2 [8] clauses 8 to 11, EN 50174-3 [9]).

7.2.2 Sub-part 2: Data centres

The energy efficiency of data centres is discussed in TS 105 174-2-2 [i.7] which:

- reviews the opportunity for energy efficiency gains within network data centres in the following areas:
 - selection and use of network telecommunications equipment and information technology equipment;
 - environmental control (including temperature, humidity and lighting);
 - support infrastructures (for example, network telecommunications cabling and information technology cabling);
 - power distribution;
- defines the applicable energy efficiency KPIs for existing and new buildings;
- states requirements and recommendations for conformance to TS 105 174-2-2 [i.7].

TS 105 174-2-2 [i.7] makes reference to:

- contributions made by governmental agencies (including the European Commission, DG-JRC Code of Conduct on Data Centres Energy Efficiency [1]);
- the activities and publications of major industry associations and fora;
- standardization available and in development in ETSI, CENELEC, IEC, and ITU-T.

The significance of the different standards (and current work) is discussed and proposals for any useful new standardization are made where relevant.

Standards for the design and specification of information technology cabling within data centres have been developed by CENELEC TC215 (EN 50173-2 [2]), EN 50173-5 [5]).

Standards for the installation of cabling within data centres have been developed by CENELEC TC215 (EN 50174-1 [7], EN 50174-2 [8] clauses 8 to 11, EN 50174-3 [9]).

7.3 Part 3: Core networks

The energy efficiency of core networks is discussed in TS 105 174-3 [i.8] which:

- reviews the opportunity for energy efficiency gains within the core networks in the selection and use of network telecommunications equipment;
- defines the applicable energy efficiency KPI;
- states requirements and recommendations for conformance to TS 105 174-3 [i.8].

TS 105 174-3 [i.8] also makes reference to standardization available and in development in ETSI, CENELEC, IEC, and ITU-T. The significance of the different standards (and current work) is discussed and proposals for any useful new standardization are made where relevant.

7.4 Part 4: Access networks

The energy efficiency of access networks is discussed in TR 105 174-4 [i.9] which:

- reviews the opportunity for energy efficiency gains within the access networks in the selection and use of network telecommunications equipment and its accommodation within the access network;
- defines the applicable energy efficiency KPI;
- states requirements and recommendations for conformance to TR 105 174-4 [i.9].

TR 105 174-4 [i.9] also makes reference to standardization available and in development in ETSI, CENELEC, IEC, and ITU-T. The significance of the different standards (and current work) is discussed and proposals for any useful new standardization are made where relevant.

A previous study by ETSI, published as EG 202 306 [i.5] covering a wide range of access technologies also contains some useful and relevant information but is thought not to be sufficiently up to date in some areas.

A variety of access network technologies and topologies are addressed as described in clause 5.5.2.

Certain existing operator networks, both metallic and Hybrid Fibre Coaxial (HFC), have the potential to support broadband services in the access network. As a result some historical installations may remain in service but limitations in their capability may have a detrimental impact the availability of some types of services.

It must also be recognized that although new technologies may better fit users' needs, operators may be obliged to support some level of POTS or ISDN service using legacy installations. These infrastructures will be studied only as far, and in as much depth, as is relevant to the present work.

7.5 Part 5: Customer network infrastructures

These sub-parts TS/TR 105 174-5 [i.10] review the opportunity for energy efficiency gains within customer networks, supported by the access networks of TR 105 174-4 [i.9], in the selection of network terminal equipment and its accommodation within the customer premises.

TS/TR 105 174-5 [i.10] makes reference to:

- contributions made by governmental agencies;
- standardization available and in development in ETSI, CENELEC, IEC, and ITU-T.

The significance of the different standards (and current work) is discussed and proposals for any useful new standardization are made where relevant.

7.5.1 Sub-part 1: Homes (single-tenant)

Standards for the design and specification of customer network cabling within homes are developed by:

- generic cabling: TC215 (EN 50173-4 [4], CLC TR 50173-99-2 [6]);
- home and Building Electronic Systems: TC205;
- cable networks for television signals, sound signals and interactive services: TC209 (EN 60728 series [10]).

Standards for the planning and installation of customer network cabling in support of all the above design standards activity are developed by CENELEC TC215 (EN 50174-1 [7], EN 50174-2 [8], clause 11) and TC209 (EN 60728 series [10]).

7.5.2 Sub-part 2: Office premises (single-tenant)

Standards for the design and specification of customer network cabling within office premises are developed by CENELEC TC215 (EN 50173-2 [2]).

Standards for the installation of customer network cabling in support of the above design standards activity are developed by CENELEC TC215 (EN 50174-1 [7], EN 50174-2 [8], clause 8, EN 50174-3 [9]).

7.5.3 Sub-part 3: Industrial premises (single-tenant)

Standards for the design and specification of customer network cabling within industrial premises are developed by a number of different Technical Committees within CENELEC:

- generic cabling: TC215 (EN 50173-3 [3]);
- industrial automation: SC65CX (EN 61784 series [11]).

Standards for the installation of customer network cabling in support of the above design standards activity are developed by CENELEC TC215 (EN 50174-1 [7], EN 50174-2 [8], clause 9, EN 50174-3 [9]) and SC65CX (EN 61918 [12]) respectively.

7.5.4 Sub-part 4: Data centres (customer)

Standards for the design and specification of customer network cabling within data centres are developed by CENELEC TC215 (EN 50173-5 [5]).

Standards for the installation of customer network cabling in support of the above design standards activity are developed by CENELEC TC215 (EN 50174-1 [7], EN 50174-2 [8], clause 10, EN 50174-3 [9]).

7.5.5 Sub-part 5: Multi-tenant premises (residential and commercial)

Standards for the design and specification of customer network cabling within multi-tenant premises are developed by CENELEC TC215 (see clauses 7.5.1 and 7.5.2).

Standards for the installation of customer network cabling in support of the above design standards activity are developed by CENELEC TC215 (see clauses 7.5.1 and 7.5.2).

8 Future developments in the series of documents

New parts and sub-parts of the present multi-part deliverable may be created in the future and any changes will be reflected in the Foreword and clause 7 of a revised version of the present document.

Annex A (informative): Bibliography

- Directive 2002/19/EC of the European Parliament and of the Council of 7 March 2002 on access to, and interconnection of, electronic communications networks and associated facilities (Access Directive).
- Directive 2002/21/EC of the European Parliament and of the Council of 7 March 2002 on a common regulatory framework for electronic communications networks and services (Framework Directive).

History

Document history		
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