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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.

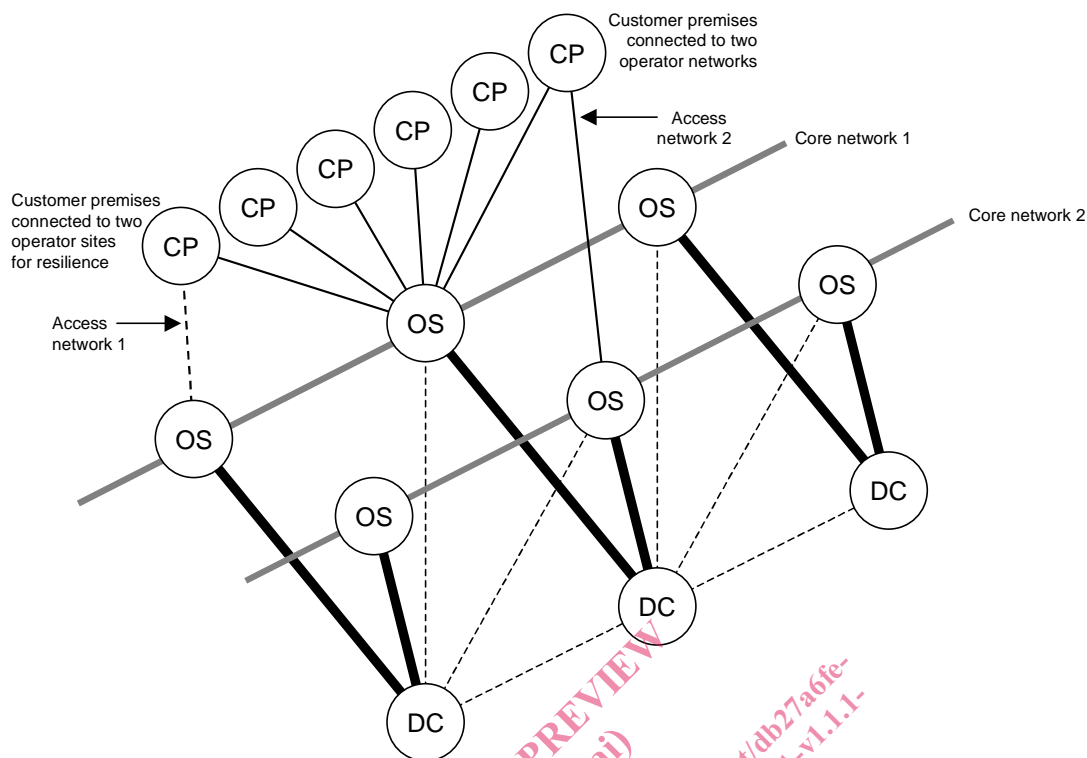


Figure 1: Network sub-systems of broadband deployment

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.