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**Access, Terminals, Transmission and Multiplexing (ATTM);
Broadband Deployment and Energy Management;
Part 7: Digital multiservice cities;
Sub-part 1: Multiservice Street Furnitures**

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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 7, sub-part 1, of a multi-part deliverable covering "Broadband deployment and energy management", as identified below:

ETSI TS 105 174-1: "Overview, common and generic aspects";

ETSI TS 105 174-2: "Network sites";

ETSI TS 105 174-3: "Core, regional metropolitan networks";

ETSI TS 105 174-4: "Access networks";

ETSI TS 105 174-5: "Customer network infrastructures";

ETSI TR 105 174-6: "Cable Access Networks";

ETSI TS 105 174-7: "Digital multiservice cities":

Sub-part 1: "Multiservice street furnitures".

Modal verbs terminology

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Executive summary

The main objectives of cities are to improve citizens' lives, local economy dynamics and to attract new residents and enterprises to establish locally. Strong evolutions in the fixed and mobile Internet connectivity have impacted the expectations and behaviours of the people and the enterprises they are working in.

Digital services have become an important part of the daily life, crossing many activities within the day from personalized morning news, thru latest updates on the transportation schedule (bus, train, road traffic), the operations at work or schools even up to shopping at the supermarket. This digital revolution has also entered the area of services and operations delivered by public services such as the city. To adopt this evolution, the Information Communication Technology (ICT) platforms of the city services should be rethought and changed from the silo strategy to an integrated approach. To achieve this goal, the ICT of the city should rely on a unified digital multi services infrastructure that combines cable-based and wireless networks.

This digital multi services infrastructure is supposed to be economic, safe, multi purposes and future proof to enable the sustainability of the city in regards to its digital services strategy and roadmap.

Up till now silo and vertical ICT have been mainly taken into consideration to deploy services. Since a few years, various smart city efforts and initiatives suggest to strongly adopt a transversal approach in which services share a common Internet Protocol (IP) network, co-operate between each other and furthermore enable third parties to leverage the value offered by the power of data mining and big data processing.

A common and shared multi services architecture for the city's digital services is therefore needed to achieve the city's goals and ambitions at reasonable cost of ownership and of operation while strongly taking into consideration the eco efficiency of the different elements of the ICT deployments.

Introduction

Today digital life is leading major evolutions in the expectations that peoples and enterprises have towards the public administrations. As the local representative and interface, the municipality is in front line. The boom of the mobile Internet economy has created many new types of services which requires the city to evolve and adapt to such new behaviours from their target audiences.

City parking or tourism attractiveness are two simple examples of such digital revolution. In both cases, one expect to have access to digital services which respectively facilitate the discovery of an available parking place or to the accessibility of local public transportation facility such as bus, tram and even city bikes.

These digital services have increased the requirements of the ICT infrastructures of the city and amplified the need for a more sustainable information Technology (IT) design. Smart digital city parking service requires sensors to be deployed within the field, that their real time status (busy of available parking place) are transmitted thru a data network and that a digital service leverage this information to be made available to the driver but also to the financial department in case of the parking usage has to be charged.

Today many city applications are to be seen as island or silo application and have their own network, own software platform and as a results different operations and maintenances. A common architecture will reduce this multiplication of networks and software solutions while improving the economical and energy efficiently costs.

The present document will contain information which covers topics such as physical network installation, network transmission implementation, digital services deployments thru an energy efficiency Next Generation Network (NGN).

1 Scope

The present document details measures which may be taken to ease the deployment of smart new services and their multiservice street furnitures of digital multiservice city within the IP network of a single city or an association of cities administratively clustered. Furthermore, the suggested measures will enable to engineer a reliable common networking infrastructure which can improve the Total Cost of Ownership (TCO) for the public administration while improving the energy efficiency of the overall deployment.

The present document also lists the requirements which have led to this common architecture.

Clause 4 identifies and presents a general overview of a city from small entity to significantly large municipality clustering several cities and villages.

Clause 5 presents the pursued objectives behind the concept of smart city.

Clause 6 describes the general theoretical pillars which bears the engineering requirements to deploy a digital multi service city.

Clause 7 identifies the general needs from the cities.

Clause 8 of the present document present a suggestion of an engineered digital multiservice city.

This will enable the proper introduction and implementation of a new service, application or content within the city digital portfolio on a unified energy efficient network, though it is not the goal of the present document to provide detailed standardized solutions for network architecture.

2 References

2.1 Normative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

Referenced documents which are not found to be publicly available in the expected location might be found at https://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.

The following referenced documents are necessary for the application of the present document.

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

[2] CENELEC EN 50173-4: "Information technology - Generic cabling systems - Part 4: Homes".

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

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

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

2.2 Informative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

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

The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

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

[i.2] ETSI TR 105 174-4: "Access, Terminals, Transmission and Multiplexing (ATTM); Broadband Deployment - Energy Efficiency and Key Performance Indicators; Part 4: Access networks".

[i.3] ETSI TS 105 174-4-1: "Access, Terminals, Transmission and Multiplexing (ATTM); Broadband Deployment and Energy Management; Part 4: Access Networks; Sub-part 1: Fixed access networks (excluding cable)".

[i.4] ETSI TS 105 174-5-1: "Access, Terminals, Transmission and Multiplexing (ATTM); Broadband Deployment and Energy Management; Part 5: Customer network infrastructures; Sub-part 1: Homes (single-tenant)".

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

[i.6] ETSI TS 105 174-5-4: "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)".

[i.7] 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.8] ETSI TS 102 973: "Access Terminals, Transmission and Multiplexing (ATTM); Network Termination (NT) in Next Generation Network architectures".

[i.9] ETSI TR 103 290: " Machine-to-Machine communications (M2M); Impact of Smart City Activity on IoT Environment (Impact of Smart City activity on IoT Environment)".

[i.10] ETSI TR 102 898: "Machine to Machine communications (M2M); Use cases of Automotive Applications in M2M capable networks".

[i.11] ETSI TR 102 935: "Machine-to-Machine communications (M2M); Applicability of M2M architecture to Smart Grid Networks; Impact of Smart Grids on M2M platform".

[i.12] ETSI TR 102 857: "Machine-to-Machine communications (M2M); Use Cases of M2M applications for Connected Consumer".

[i.13] ETSI TR 103 375: "SmartM2M IoT Standards landscape and future evolutions".

[i.14] AIOTI Recommendations for future collaborative work in the context of the Internet of Things Focus Area in Horizon 2020.

NOTE: Available at https://ec.europa.eu/digital-single-market/en/news/aioti-recommendations-future-collaborative-work-context-internet-things-focus-area-horizon-2020.

[i.15] Wikipedia definition of street furniture's.

NOTE: Available at https://en.wikipedia.org/wiki/Street_furniture.

[i.16] European Innovation Partnership on Smart Cities and Communities "Operational Implementation Plan".

NOTE: Available at http://ec.europa.eu/eip/smartcities/files/operational-implementation-plan-oip-v2_en.pdf.

[i.17] European Innovation Partnership on Smart Cities and Communities "Strategic Implementation Plan".

NOTE: Available at http://ec.europa.eu/eip/smartcities/files/sip_final_en.pdf.

[i.18] European Innovation Partnership on Smart Cities and Communities "Humble Lamppost".

NOTE: Available at https://eu-smartcities.eu/commitment/6670.

[i.19] ETSI GS OEU 009: "Operational energy Efficiency for Users (OEU); Global KPI Modelling for Green Smart Cities".

[i.20] ETSI GS OEU 019: "OEU KPIs for Smart Cities".

[i.21] Light Fidelity TED Talk "Wireless data from every light bulb".

NOTE: Available at http://www.ted.com/talks/harald_haas_wireless_data_from_every_light_bulb.

[i.22] IEEE 802.11™: "Wireless LAN; 802.11-2012 -- IEEE Standard for Information technology -- Telecommunications and information exchange between systems Local and metropolitan area networks--Specific requirements -- Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications".

[i.23] IEEE 802.11s™: "Wireless Mesh Networking; 802.11s-2011 -- IEEE Standard for Information Technology -- Telecommunications and information exchange between systems--Local and metropolitan area networks--Specific requirements --Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) specifications Amendment 10: Mesh Networking".

[i.24] VLC Visible Light Communications IEEE 802.15.

[i.25] IEEE 802.15.4™: "IEEE Standard for Information technology - Telecommunications and information exchange between systems - Local and metropolitan area networks - Specific requirements - Part 15.4: Wireless Medium Access Control (MAC) and Physical Layer (PHY) Specifications for Low Rate Wireless Personal Area Networks (WPANs)".

[i.26] IEEE 802.11ah™: "WiFi HaLow; P802.11ah -- IEEE Draft Standard for Information Technology -- Telecommunications and Information Exchange Between Systems-Local and Metropolitan Area Networks-Specific Requirements -- Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications: Amendment 2: Sub 1 GHz License Exempt Operation".

[i.27] IETF RFC 3031: "Multiprotocol Label Switching Architecture".

[i.28] IETF RFC 4761: "Virtual Private LAN Service Using Label Distribution Protocol (LDP) Signaling".

[i.29] IETF RFC 4762: "Virtual Private LAN Service Using BGP for Auto-Discovery and Signaling".

[i.30] IEEE 802.3™: "Ethernet".

[i.31] IEEE 802.3az™: "Energy Efficient Ethernet; IEEE 802.3az-2010 -- IEEE Standard for Information technology -- Local and metropolitan area networks -- Specific requirements -- Part 3: CSMA/CD Access Method and Physical Layer Specifications -- Amendment 5: Media Access Control Parameters, Physical Layers, and Management Parameters for Energy-Efficient Ethernet".

[i.32] IEEE 802.3ab™: "Ethernet over Twisted Pair at 1 Gbit/s; 802.3ab-1999 -- IEEE Standard for Information Technology -- Telecommunications and information exchange between systems -- Local and Metropolitan Area Networks -- Part 3: Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications -- Physical Layer Parameters and Specifications for 1000 Mb/s Operation over 4 pair of Category 5 Balanced Copper Cabling, Type 1000BASE-T".

[i.33] IEEE 802.3u™: "Fast Ethernet over Twisted Pair; 802.3u-1995 -- IEEE Standards for Local and Metropolitan Area Networks-Supplement -- Media Access Control (MAC) Parameters, Physical Layer, Medium Attachment Units and Repeater for 100Mb/s Operation, Type 100BASE-T (Clauses 21-30)".

[i.34] IEEE 802.3z™: "Ethernet over Fiber Optic at 1 Gbit/s; 802.3z-1998 -- Media Access Control Parameters, Physical Layers, Repeater and Management Parameters for 1,000 Mb/s Operation, Supplement to Information Technology -- Local and Metropolitan Area Networks -- Part 3: Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications".

[i.35] IEEE 802.3af™: "Power Over Ethernet; 802.3af-2003 -- IEEEE Standard for Information Technology - Telecommunications and Information Exchange Between Systems -- Local and Metropolitan Area Networks - Specific Requirements -- Part 3: Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications -- Data Terminal Equipment (DTE) Power Via Media Dependent Interface (MDI)".

[i.36] IEEE 802.3at™: "Power Over Ethernet; 802.3at-2009 -- IEEE Standard for Information technology -- Local and metropolitan area networks -- Specific requirements -- Part 3: CSMA/CD Access Method and Physical Layer Specifications -- Amendment 3: Data Terminal Equipment (DTE) Power via the Media Dependent Interface (MDI) Enhancements".

[i.37] IEEE 802.1q™: "Ethernet Virtual LAN ; 802.1q-2014 - IEEE Standard for Local and metropolitan area networks--Bridges and Bridged Networks".

[i.38] Market Place of the European Innovation Partnership on Smart Cities and Communities.

NOTE: Available at http://eu-smartcities.eu.

[i.39] Guide Pratique - Deploiement de la Boucle Locale Optique Mutualisee sur support aerien.

NOTE: Available at http://www.fieec.fr/iso_album/20151126085028_121115_guide_pratique_blom_basse_def.pdf.

[i.40] IETF RFC 1034: "Domain Names - Concepts and Facilities".

[i.41] IETF RFC 1035: "Domain Names - Implementation and Specification".

[i.42] UEFI Forum ACPI specification.

NOTE: Available at http://www.uefi.org/specifications.

[i.43] IETF RFC 2474: "Definition of the Differentiated Services Field (DS Field) in the IPv4 and IPv6 Headers".

[i.44] IETF RFC 2475: "An Architecture for Differentiated Services".

[i.45] European Innovation Partnership on Smart Cities and Communities "s[m2]art".

NOTE: Available at https://eu-smartcities.eu/commitment/7434.

[i.46] Recommendation ITU-T G.9959: "Short range narrow-band digital radiocommunication transceivers - PHY, MAC, SAR and LLC layer specifications".

[i.47] IEEE 802.1p™: "Traffic Class Expediting and Dynamic Multicast Filtering; 802.1D-2004 - IEEE Standard for Local and metropolitan area networks: Media Access Control (MAC) Bridges".

[i.48] IEEE 802.11e™: "Wireless Multi Media; 802.11e-2005 -- IEEE Standard for Information technology -- Local and metropolitan area networks -- Specific requirements -- Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications -- Amendment 8: Medium Access Control (MAC) Quality of Service Enhancements".

[i.49] IEEE 802.11ad™: "WiFi WiGig; 802.11ad-2012 -- IEEE Standard for Information technology -- Telecommunications and information exchange between systems--Local and metropolitan area networks--Specific requirements -- Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications -- Amendment 3: Enhancements for Very High Throughput in the 60 GHz Band".

[i.50] IEEE 802.11ac™: "WiFi ac ; 802.11ac-2013 - IEEE Standard for Information technology -- Telecommunications and information exchange between systems -- Local and metropolitan area networks -- Specific requirements -- Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications -- Amendment 4: Enhancements for Very High Throughput for Operation in Bands below 6 GHz".

[i.51] IEEE 802.3bv™: "Gigabit Ethernet Over Plastic Optical Fiber ; P802.3bv - IEEE Draft Standard for Ethernet Amendment: Physical Layer Specifications and Management Parameters for 1000 Mb/s Operation Over Plastic Optical Fiber".

[i.52] 3GPP: http://www.3gpp.org/specifications/specifications.

[i.53] Recommendation ITU-T Y.4900: "Overview of key performance indicators in smart sustainable cities".

[i.54] Recommendation ITU-T Y.4901: "Key performance indicators related to the use of information and communication technology in smart sustainable cities".

[i.55] Recommendation ITU-T Y.4902: "Key performance indicators related to the sustainability impacts of information and communication technology in smart sustainable cities".

[i.56] Recommendation ITU-T Y.4903: "Key performance indicators for smart sustainable cities to assess the achievement of sustainable development goals".

[i.57] ISO 37120:2014: "Sustainable development of communities -- Indicators for city services and quality of life".

[i.58] Recommendation ITU-T SG5: "Environment, climate change and circular economy".

[i.59] ISO/TC 268: "Sustainable cities and communities".

3 Definitions and abbreviations

3.1 Definitions

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

digital multiservice cities: cities using digital infrastructure which consist of a single unified high speed networking infrastructure that allows the ICT systems of the complete city services departments to interconnect seamlessly and securely to each other

street furniture: collective term for objects and pieces of equipment installed on city streets, city roads, and public areas under responsibility of the city for various purposes

NOTE: These objects and equipments belong to the wider terminology of the urban assets as named by cities.

urban asset: collective term to qualify the physical assets which belong to a city and which are located across its territory, in streets, roads, public parks and associated urban constructions