

Location of the Network Termination Point

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Table of Contents

Executive Summary	5
1 Introduction and objective	7
2 Overview of the definition of the NTP location in the EU	9
2.1 Fixed NTP location	9
2.2 Mobile NTP location	10
3 A national authority defined the location of the NTP in general	11
3.1 Approach used to define the NTP location in general.....	11
3.2 Definition of the NTP location.....	16
3.3 Relevant criteria	17
4 Layer 2/3 wholesale access products imposed by NRAs	21
4.1 L2 WAPs	22
4.2 L3 WAPs	24
5 Conclusions	26
6 Abbreviations for countries	28
7 Further abbreviations	28
Annex Basic data of the report	30
Annex 1: Description of possible fixed NTP locations.....	30
Annex 2: Basic data used in section 2	33
Annex 3: Basic data used in section 3	50
Annex 4: Basic data used in section 4	81

List of Figures

Figure 1: Location of the network termination point.....	7
Figure 2: Different locations of the NTP in case of an internet access service	7
Figure 3: Overview of the definition of the fixed NTP location in the EU	10
Figure 4: Overview of the definition of the mobile NTP location in the EU	11
Figure 5: Year when the legal instrument entered into force	13
Figure 6: Different locations of the NTP in case of a L2 WAP or a L3 WAP	22

List of Tables

Table 1: Legal instrument used to define the NTP location in general	12
Table 2: Main reasons why the national authority defined the NTP location	13
Table 3: Involvement of stakeholders in the process of the definition of the NTP location	14
Table 4: Main positions of the stakeholders involved in the process of the definition of the NTP location	15
Table 5: Definition of the location of the fixed NTP	16
Table 6: Interoperability between public network and CPE/modem	19
Table 7: CPEs including modem ANOs are allowed to use in case of L2 WAPs available on copper-based access lines	22
Table 8: CPEs including modem ANOs are allowed to use in case of L2 WAPs available on fibre-based access lines	23
Table 9: CPEs including modem ANOs are allowed to use in case of L3 WAPs available on copper-based access lines	24
Table 10: CPEs including modem ANOs are allowed to use in case of L3 WAPs available on fibre-based access lines	25
Table 11: Did a national authority define the location of the NTP in general and legal power of the NRA to decide in individual disputes (AT, BE, BG, HR, CY, CZ, DK)	34
Table 12: Did a national authority define the location of the NTP in general and legal power of the NRA to decide in individual disputes (EE, FI, FR, DE, GR, HU, IE)	35
Table 13: Did a national authority define the location of the NTP in general and legal power of the NRA to decide in individual disputes (IT, LV, LT, LU, MT, NL, PL)	36
Table 14: Did a national authority define the location of the NTP in general and legal power of the NRA to decide in individual disputes (PT, RO, SK, SI ES, SE, UK)	37
Table 15: Legal power of the NRA to define the location of the NTP in general (AT, BE, BG, HR, CY)	38
Table 16: Legal power of the NRA to define the location of the NTP in general (CZ, DK, EE, FI, FR)	39
Table 17: Legal power of the NRA to define the location of the NTP in general (DE, GR, HU, IE, LT)	40
Table 18: Legal power of the NRA to define the location of the NTP in general (LU, MT, PL, PT, RO)	41
Table 19: Legal power of the NRA to define the location of the NTP in general (SK, SI, ES, SE, UK)	42
Table 20: Definition of the term 'NTP' (AT, BE, BG, HR, CY, CZ, DK)	43
Table 21: Definition of the term 'NTP' (EE, FI, FR, DE, GR, HU, IE)	44
Table 22: Definition of the term 'NTP' (IT, LV, LT, LU, MT, NL, PL)	45
Table 23: Definition of the term 'NTP' (PT, RO, SK, SI, ES, SE, UK)	46
Table 24: Complaints of market players about the current situation on the NTP location (AT, BE, BG, HR, CZ, DK)	47
Table 25: Complaints of market players about the current situation on the NTP location (EE, FI, FR, GR, HU, IE)	48

Table 26: Complaints of market players about the current situation on the NTP location (LT, LU, MT, PL, PT, RO).....	49
Table 27: Complaints of market players about the current situation on the NTP location (SK, SI, SE, UK)	49
Table 28: Legal instrument chosen by the national authority to define the NTP location – part 1 (CY, DE, IT)	50
Table 29: Legal instrument chosen by the national authority to define the NTP location – part 1 (LV, NL)	51
Table 30: Legal instrument chosen by the national authority to define the NTP location – part 2 (CY, DE, IT)	52
Table 31: Legal instrument chosen by the national authority to define the NTP location – part 2 (LV, NL)	52
Table 32: Legal instrument chosen by the national authority to define the NTP location – part 3 (CY, DE, IT)	53
Table 33: Legal instrument chosen by the national authority to define the NTP location – part 3 (LV, NL)	54
Table 34: Approach used by the national authority to define the NTP location (CY, DE, IT)	55
Table 35: Approach used by the national authority to define the NTP location (LV, NL)	56
Table 36: Main positions and arguments of the stakeholders brought before the national authority when it defined the NTP location (CY, DE)	57
Table 37: Main positions and arguments of the stakeholders brought before the national authority when it defined the NTP location (IT, LV)	58
Table 38: Main positions and arguments of the stakeholders brought before the national authority when it defined the NTP location (NL)	59
Table 39: Definition of the NTP location – part 1 (CY, DE).....	60
Table 40: Definition of the NTP location – part 1 (IT, LV)	61
Table 41: Definition of the NTP location – part 1 (NL)	62
Table 42: Definition of the NTP location – part 2 (CY, DE, IT)	63
Table 43: Definition of the NTP location – part 2 (LV, NL).....	64
Table 44: Conformity of the definition of the NTP location with the legal provisions (CY, DE, IT)	65
Table 45: Conformity of the definition of the NTP location with the legal provisions (LV, NL)	66
Table 46: CPEs/modems end-users can use – part 1 (CY, DE, IT, LV, NL)	67
Table 47: CPEs/modems end-users can use – part 2 (CY, DE, IT)	68
Table 48: CPEs/modems end-users can use – part 2 (LV, NL).....	69
Table 49: Publication of the NTP characteristics (CY, DE, IT, LV, NL)	70
Table 50: Interoperability between public network and CPE/modem (CY, DE).....	71
Table 51: Interoperability between public network and CPE/modem (IT, LV)	72
Table 52: Interoperability between public network and CPE/modem (NL)	73
Table 53: Simplicity of network operation (CY, DE, IT)	74
Table 54: Simplicity of network operation (LV, NL).....	75
Table 55: End-users may have no interest to be responsible for the modem in case of certain services (CY, DE, IT, LV, NL).....	76
Table 56: Discrimination of end-users which use own CPE/modem (CY, DE, IT)	77
Table 57: Discrimination of end-users which use own CPE/modem (LV, NL).....	78
Table 58: Security and data protection (CY, DE, IT)	79
Table 59: Security and data protection (LV, NL).....	80
Table 60: L2 WAP – part 1 (AT, BE, CZ, HR).....	81
Table 61: L2 WAP – part 1 (CZ, DK, FR).....	82
Table 62: L2 WAP – part 1 (GR, HU, IE, LT)	83
Table 63: L2 WAP – part 1 (LU, MT, PT, SI)	84

Table 64: L2 WAP – part 2 (AT, BE, CZ, HR).....	85
Table 65: L2 WAP – part 2 (DK, FR, GR, HU, IE)	86
Table 66: L2 WAP – part 2 (LT, LU, MT, PT, SI)	87
Table 67: L3 WAP – part 1 (AT, BE, CZ, HR).....	88
Table 68: L3 WAP – part 1 (DK, FR, GR, HU, IE)	89
Table 69: L3 WAP – part 1 (LT, LU, MT, PT, SI)	90
Table 70: L3 WAP – part 2 (AT, BE, CZ, HR).....	91
Table 71: L3 WAP – part 2 (DK, FR, GR, HU, IE)	92
Table 72: L3 WAP – part 2 (LT, LU, MT, PT, SI)	93

Executive Summary

According to the Universal Service Directive (2002/22/EC, recital 6), defining the location of the network termination point (NTP) is the responsibility of the national regulatory authority (NRA). The location of the NTP has an impact on whether an equipment is part of the public network or part of the telecommunications terminal equipment (TTE). For example, in case of an internet access service, depending on the location of the NTP, modem and router are either part of the public network (NTP location “C”) or router (NTP location “B”) or modem and router (NTP location “A”) are part of the TTE.

The aim of this report is to foster the knowledge transfer between NRAs and to get a deeper insight in the legal provisions of NRAs (and also of other national authorities) in the EU on the location of the (fixed and mobile) NTP with the following objectives: (i) to give an overview of the definition of the NTP location in the EU; (ii) to analyse the legal provisions of NRAs or other national authorities which define the NTP location in general (i.e. for all NTPs); and (iii) to examine Layer 2/Layer 3 wholesale access products imposed by NRAs with regard to characteristics which may have an impact on the NTP location. The analysis is descriptive and does not aim to be normative or to recommend best practices.

The overview of the definition of the NTP location in the EU shows that a national authority defined or plans to define the location of the fixed NTP in general (i.e. for all fixed NTPs) in five EU countries and of the mobile NTP in general (i.e. for all mobile NTPs) in three EU countries. In 13 other countries, the NRA does have this legal power but did not use it so far.

The NRA has the legal power to decide in individual disputes between end-users and network operators or service providers on the fixed and mobile NTP location in 15 EU countries. In all 15 countries, there was no need to resolve any such individual dispute with a decision so far.

The analysis of the legal provisions of the national authorities in the five countries which defined or plans to define the NTP location in general so far can be summarised as follows:

- Authority and legal instrument: Different authorities (parliament, ministry, NRA) defined the NTP location in general and used different legal instruments (law, guidelines, regulation).
- Main reasons for the definition of the NTP location: In all countries to provide clarity on the NTP location, in four countries to enable end-users to use the TTE of their choice and in three countries to respond to significant complaints from market players.
- Definition of the fixed NTP location: Four countries defined the fixed NTP at point A (or a similar point) and therefore end-users can use their own customer premises equipment (CPE) including modem and one country defined that it depends on the ownership of the equipment (point A, B or C).
- Definition of the mobile NTP location: In all three countries which defined the mobile NTP location in general, the mobile NTP is at a point which allows end-users to use their own mobile equipment with removable SIM card (e.g. mobile phone) and also with non-removable SIM card (e.g. IoT device).
- CPE/modem end-users are allowed to use: In all four countries in which the fixed NTP is at point A (or a similar point), end-users are allowed to use all modems/ routers

which fulfil the characteristics of the NTP (no restriction to a white list or certification). In the other country where the NTP depends on the ownership of the equipment, end-users can use their modems/routers only in case network operators or service providers offer this possibility to them voluntarily.

The findings of the examination of L2 WAPs and L3 WAPs imposed by NRAs in 14 countries with regard to characteristics which may have an impact on the NTP location are as follows:

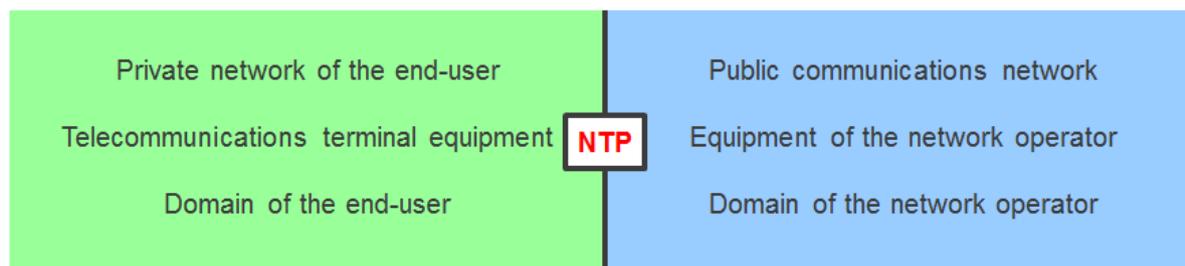
- L2 WAPs and L3 WAPs allow alternative network operators (ANOs) to use their own CPE including modem in nearly all cases on copper-based access lines and in about half of the cases on fibre-based access lines which enable ANOs to provide retail services with an NTP at point A (or B, C).
- When ANOs are allowed to use their own CPE including modem, then in about two third (copper-based access) or half (fibre-based access) of these cases, ANOs are allowed to use any CPE (including modem) which fulfils the requirements of the SMP operator and in the other cases to use CPEs which are on a white list.

Overall, so far there was only the need to define the NTP location in some countries. In case of the fixed NTP, it seems this was driven mainly, on the one hand, by end-users who demanded to be able to use their own CPE (including modem) and, on the other hand, in one country by the need to define the demarcation line between public network infrastructure and the private in-building network infrastructure. In most cases the national authority laid down that the fixed NTP is at point A and that end-users are allowed to use all CPEs (including modem) which fulfils the characteristics of the NTP (no restriction to a white list or certification).

This report also constitutes a comprehensive basis for the guidelines on the topic “location of the NTP” that BEREC has to adopt according to the new European Electronic Communications Code.

1 Introduction and objective

According to the Universal Service Directive (2002/22/EC, recital 6) and also to the new European Electronic Communications Code (EECC, recital 19)¹, “the network termination point represents a boundary for regulatory purposes between the regulatory framework for electronic communications networks and services and the regulation of telecommunication terminal equipment. Defining the location of the network termination point is the responsibility of the national regulatory authority [...]” (see Figure 1).

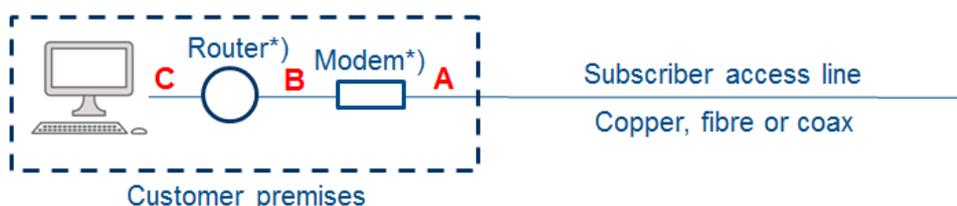


Source: BEREC

Figure 1: Location of the network termination point

The location of the network termination point (NTP) therefore has an impact on whether an equipment is part of the public network or part of the telecommunications terminal equipment (TTE). For example (see Figure 2), in case of an internet access service, depending on the location of the NTP, the modem and router are either part of the public network (NTP location “C”) or router (NTP location “B”) or modem and router (NTP location “A”) are part of the TTE.²

Internet access service



*) In case the NTP is at point A or C, router and modem may be integrated in one device.

Source: BEREC

Figure 2: Different locations of the NTP in case of an internet access service

If the NTP is located at point A, modem and router are part of the domain of the end-user and not of the network operator and therefore end-users can use their own modem and router. In case NTP is located at point B router is part of the domain of the end-user and modem part of the domain of the network operator and end-users can use their own router but without modem

¹ Draft version of the EECC as of August 2018, Document PE-CONS 52/18 – 2016/0288 (COD)

² This report uses the term “telecommunications terminal equipment” (TTE) when it refers to legal provisions which uses this term or in case stakeholders use this term in their arguments. The term “customer premises equipment” (CPE) is used when it refers to equipment at the customer premises (irrespective whether this equipment is part of the public network or of the TTE).

and have to use the modem of the network operator. Finally, if the NTP is at point C modem and router are part of the domain of the network operator and therefore end-users have to use modem and router of the network operator. For the purpose to discuss the location of the NTP in this report, the discussion refers to these three different NTP locations, which are described in more detail and also illustrated for further services in Annex 1.

Several legal provisions at the EU level are related to the topic “NTP”. For example, the term “NTP” is defined in the Framework Directive (2002/21/EC)³ and the Regulation (EU) 2015/2120 (Art. 3.1) provides for the end-users of internet access services the right to use the terminal equipment of their choice. Service providers, end-users and other market participants, however, may interpret these legal provisions differently with regard to the location of the NTP (i.e. whether the NTP is at point A, B, C or somewhere else).

Disputes between end-users and network operators or service providers may arise and the national regulatory authority (NRA) may have to decide on the location of the NTP in these disputes. NRAs or other national authorities may also issue legal provisions (e.g. laws, regulations, guidelines) which provide further information on the location of the NTP in general, i.e. for all NTPs. NRAs may also impose on the operator with significant market power (SMP) the obligation to offer wholesale access products and the characteristics of these products may also have an impact on the location of the NTP.

In the future, the definition of the location of the NTP by NRAs will be harmonised through the following provisions in the new EECC (Art. 59.6):⁴ *“In order to contribute to a consistent definition of the location of NTPs by NRAs, BEREC shall, after consulting stakeholders and in close cooperation with the Commission, adopt guidelines on common approaches to the identification of the NTP in different network topologies. NRAs shall take utmost account of those guidelines when defining the location of NTPs.”*

The aim of the report is to foster the knowledge transfer between NRAs and to get a deeper insight in the legal provisions of NRAs (and also of other national authorities) in the EU on the location of the (fixed and mobile) NTP with the following objectives:

- to give an overview of the definition of the NTP location in the EU with regard to legal power of NRAs, decisions taken by NRAs in individual disputes and legal provisions of NRAs and other national authorities;
- to analyse the legal provisions (e.g. law, regulation, guidelines) of NRAs or other national authorities which define the NTP location in general (i.e. for all NTPs);⁵ and

³ “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” (Framework Directive Art. 2 (da)).

⁴ Preliminary version of the EECC of 18 June 2018

⁵ Not considering legal provisions which solely transposed the definition of the term “NTP” in the Framework Directive into national law without any further information or explanation on the NTP location.

- to examine Layer 2/Layer 3 wholesale access products imposed by NRAs with regard to characteristics which may have an impact on the NTP location.

The analysis is descriptive and does not aim to be normative or to recommend best practices.

The document begins with an overview of the definition of the NTP location in the EU (see section 2) and then analyses legal provisions of NRAs or other national authorities which define the NTP location in general (section 3). Following this, Layer 2/Layer 3 wholesale access products imposed by NRAs are examined with regard to characteristics which may have an impact on the NTP location (section 4). Finally, conclusions are drawn (section 5). The data on which the analysis is based upon are provided in the annex.

2 Overview of the definition of the NTP location in the EU

This section provides an overview of the definition of the NTP location in the EU separately for the fixed NTP (see Figure 3) and the mobile NTP (see Figure 4) with regard to:

- whether an NRA or another national authority defined the NTP location in general (i.e. for all NTPs);⁵
- in countries where this is not the case, whether the NRA does have this legal power and, if this is the case, for what reasons it did not define the NTP location in general so far; and
- whether the NRA has the legal power to decide in individual disputes between end-users and network operators or service providers on the location of the NTP and, if this is the case, whether it actually resolved such disputes.

The overview is based on data in Annex 2 which provides additional information on the legal power of NRAs (e.g. reasons why NRAs do not have a legal power considered in this section).

In all 28 EU countries, the term “NTP” applies to retail services and in 24 EU countries also to wholesale services (see Table 20 to Table 23 in Annex 2).

2.1 Fixed NTP location

In five EU countries, a national authority defined (CY, DE, IT, LV) or plans to define (NL⁶) the location of the fixed NTP in general, in two of them the NRA (CY, IT) and in the other three countries (DE, LV, NL) another national authority.⁵

In the other 23 EU countries in which this is not the case, the competences of the NRA are as follows. In 13 of them, the NRA has the legal power to do so but did not use this power so far and in the other 10 countries the NRA does not have this legal power. The reasons why they did not use this legal power so far are in all 13 countries no (or only minor) complaints by end-

⁶ In the Netherlands, a legal provision relevant for the fixed and mobile NTP location is still in preparation (see section 3.1).

users that they cannot use their own modem/router. In eight⁷ of these 13 countries, the location of the fixed NTP is typically at a point which allows end-users to use their own modem/router (point A or B).

Fixed NTP location defined in general? (28)		
Yes (5)		No (23)
NRA (2) CY, IT	ONA (3) DE, LV, NL*)	AT, BE, BG, CZ, DK, EE, ES**),FI**), FR, GR, HR, HU, IE, LT, LU, MT, PL, PT, RO, SE, SI, SK, UK

NRA does have the legal power to define the fixed NTP location in general? (23)	
Yes (13) CZ, ES, FI, FR, GR, HR, HU, LT, LU, PT, RO, SK, UK	No (10) AT, BE, BG, DK, EE, IE, MT, PL, SE, SI

NRA does have the legal power to define the fixed NTP location in individual disputes? (28)		
Yes - All (13)		Yes-IAS (2)
Decision taken?		No (13)
No (13) CY, CZ, ES, FI, FR, GR, HU, IT, LT, LV, RO, SI, SK	No (2) AT, SE	BE, BG, DE, DK, EE, HR, IE, LU, MT, NL, PL, PT, UK

*) In preparation **) Fixed NTP defined in general for passive, not for active infrastructure⁸

Source: BEREC

Figure 3: Overview of the definition of the fixed NTP location in the EU

In most of the 10 countries in which the NRA does not have the legal power to define the fixed NTP location in general, the NRA also received no or only minor complaints by end-users and other market players on the current situation on the NTP location.

In 15 EU countries, the NRA has the legal power to decide on the location of the fixed NTP in individual disputes between end-users and network operators or service providers. In 13 of them, it has this legal power with regard to all communications services provided for end-users, in the other two countries only with regard to internet access services (IAS). In all 15 countries, there was no need to resolve any such individual dispute with a decision so far.

In the other 13 EU countries, the NRA does not have this legal power and reasons are, for example, that the NRA does not have any legal power on end-user rights since a different national authority does have this power.

2.2 Mobile NTP location

The situation with regard to the definition of the mobile NTP location is similar to the definition of the fixed NTP location (see Figure 4). In three EU countries (IT, LV, NL), a national authority defined (IT, LV) or plans to define (NL) the mobile NTP location in general (i.e. for all mobile

⁷ CZ, FI, GR, LT, LU, RO, SK, UK

⁸ In Finland and in Spain, a national authority defined in a regulation on the topic private in-building network infrastructure the location of the fixed NTP with regards to passive infrastructure, this however, does not further define whether e.g. in case of an internet access service the end-user has the legal right to use its own modem/router.

NTPs).⁵ In the other 25 countries in which this is not the case, the NRA does have this legal power in 13 countries but not in the other 12 countries. The reasons why there was no need for the NRA to use this power so far is that the location of the mobile NTP is at a point which allows end-users to use their own mobile equipment. In the other 12 countries in which the NRA does not have this legal power, end-users also have the possibility to use their own mobile equipment.

Mobile NTP location defined in general ? (28)		
Yes (3)	No (25)	
ONA (3)	AT, BE, BG, CY, CZ, DE, DK, EE, ES, FI, FR, GR, HR, HU, IE, LT, LU, MT, PL, PT, RO, SE, SI, SK, UK	
IT, LV, NL*)		

NRA does have the legal power to define the mobile NTP location in general ? (25)	
Yes (13)	No (12)
CY, ES, FR, GR, HR, HU, IE, LT, LU, PT, RO, SK, UK	AT, BE, BG, CZ, DE, DK, EE, FI, MT, PL, SE, SI

NRA does have the legal power to define the mobile NTP location in individual disputes ? (28)		
Yes - All (13)	Yes-IAS (2)	No (13)
Decision taken?		
No (13)	No (2)	
CY, CZ, ES, FI, FR, GR, HU, IT, LT, LV, RO, SI, SK	AT, SE	
		BE, BG, DE, DK, EE, HR, IE, LU, MT, NL, PL, PT, UK

*) In preparation

Source: BEREC

Figure 4: Overview of the definition of the mobile NTP location in the EU

The situation with regard to the legal power to decide on the location of the mobile NTP in individual disputes between end-users and network operators or service providers is exactly the same as in case of the fixed NTP. Also in case of the mobile NTP location in all 15 countries, in which the NRA does have this legal power for all communications services (13) or only for internet access services (2), there was no need to resolve any such individual dispute with a decision so far.

3 A national authority defined the location of the NTP in general

This section analyses (based on data in Annex 3) the legal provisions which define the NTP location in general (i.e. for all fixed and/or mobile NTPs) of the five countries which do have (CY, DE, IT, LV) or plan (NL) such legal provisions (see section 2). These legal provisions provide further information or explanation on the NTP location than provided in the definition of the term “NTP” in the Framework Directive. The analysis considers the approach used to define the NTP location in general, the definition of the location of the NTP and relevant criteria for the definition of the NTP location.

3.1 Approach used to define the NTP location in general

This sub-section examines the approach used to define the NTP location in general with regard to

- legal instrument used;
- main reasons why the national authority defined the NTP location;
- stakeholders involved in the process of the definition of the NTP location; and
- main positions of the stakeholders.

Legal instrument

Table 1 provides an overview of the legal instruments used to define the NTP location in general. In two countries (DE, IT), the definition of the term “NTP” in national law includes further information on the fixed (DE) or mobile (IT) NTP location than the definition of the term “NTP” in the Framework Directive. In one of them (DE), the term “NTP” is defined in the national Telecommunications Act, in the other (IT) in a Government Legislative Decree. Both are legal instruments of the Parliament.

In further two countries (NL, IT) a ministry (NL) plans to issue guidelines to the national telecommunications act (NL) or the NRA (IT) published a decision which is mandatory for all operators related to the implementation of the Regulation (EU) 2015/2120 (IT) with further explanations on the fixed (NL, IT) and mobile (NL) NTP location.

In the two other countries (CY, LV), an order of the NRA (CY) or a regulation of the Cabinet of ministries (LV) provides further information on the fixed (CY, LV) and mobile (LV) NTP location.

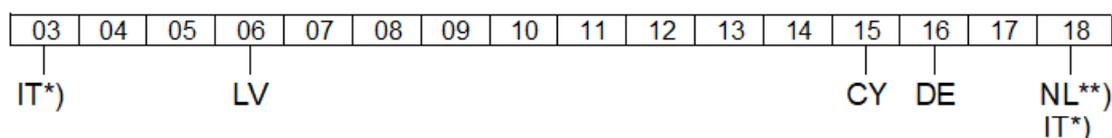
In all five countries, the legal instrument defines the fixed NTP location, in three of them also the mobile NTP location. In all five countries, the definition of the term “NTP” applies to retail services in four of them (not NL) also to wholesale services.

Table 1: Legal instrument used to define the NTP location in general

Legal instrument	Authority	Retail / Wholesale	Fixed / Mobile	Country
Telecommunications act	Parliament	RT + WS	Fixed	DE
(i) Government Legislative Decree (ii) Decision which is mandatory for all operators	(i) Parliament (ii) NRA	RT + WS	(i) Mobile (ii) Fixed	IT
(i) Telecommunications Act (ii) Guidelines to the national telecommunications act (planned)	(i) Parliament (ii) Ministry of Economic Affairs and Climate Policy	RT	Fixed + Mobile	NL
Regulation	Cabinet of Ministries	RT + WS	Fixed + Mobile	LV
Order	NRA	RT + WS	Fixed	CY

Source: BEREC

Figure 5 shows when the legal instruments which define the NTP location in general entered into force. In 2003 in Italy (Government Legislative Decree), in 2006 in Latvia, in 2015 in Cyprus, in 2016 in Germany, in 2018 in Italy (NRA Decision) and currently planned in the Netherlands.



*) In 2003 Government Legislative Decree, in 2018 NRA Decision

**) Planned Guidelines

Source: BEREC

Figure 5: Year when the legal instrument entered into force

Main reasons why the national authority defined the NTP location

Table 2 provides an overview of the main reasons why the national authority defined the NTP location in general. In all five countries, a main reason was to provide clarity for all market players on the NTP location and eliminate uncertainties. In three countries (DE, IT – fixed NTP, NL), further main reasons were to respond to significant complaints (DE, NL) or requests (IT – fixed NTP) from market players (incl. end-users) and to enable end-users to use the TTE of their choice. In one country (LV), a further main reason was also to enable end-users to use the TTE of their choice although this was not a response to complaints from end-users or other market players. In one country (CY), the main reason was to provide clarity on the demarcation line between the public network infrastructure and the private in-building network infrastructure.⁹

Table 2: Main reasons why the national authority defined the NTP location

Country	Cyprus	Germany	Italy	Latvia	Netherlands
To provide clarity for all market players on the NTP location and eliminate uncertainties?	Yes	Yes	Yes	Yes	Yes
To respond to significant complaints / requests from market players (e.g. end-users)	No	Yes	Mobile: No Fixed: Yes ¹⁰	No	Yes
To enable end-users to use the TTE of their choice?	No	Yes	Mobile: No Fixed: Yes	Yes	Yes

Source: BEREC

In all countries, the market players accepted both, that the national authority has the legal power to define the NTP location in general and also the legal instrument the national authority used to do this.

⁹ In Cyprus, the adopted definition does not affect the right of end-users to use the TTE of their choice. The definition implicitly clarifies that modem and router are not part of the public network and therefore end-users have the right to use their own modem/router. In addition, end-users are enabled to have access to the TTE of their choice, since network operators publish the characteristics of the NTP to which the TTE is to be connected.

¹⁰ There were some requests to enforce the Regulation (EU) 2015/2120 in particular for the free choice of terminals.

Stakeholders involved in the process of the definition of the NTP location

Table 3 provides an overview of the involvement of stakeholders in the process of the definition of the NTP location in general. In all four countries, where a main reason was (also) to enable end-users to use the TTE of their choice, not only network operators and service providers were involved but also CPE manufacturers (not in LV) and consumers (in some countries some further stakeholders). In Cyprus, where the main reason was to provide clarity on the demarcation line between the public network infrastructure and the private in-building network infrastructure only network operators and service providers were involved.

Table 3: Involvement of stakeholders in the process of the definition of the NTP location

Country	Cyprus	Germany	Italy	Latvia	Netherlands
Which stakeholders were involved:					
Network operators?	Yes	Yes	Yes	Yes	Yes
Service providers?	Yes	Yes	Yes	Yes	Yes
CPE manufacturers?	No	Yes	Yes	No	Yes
Consumers?	No	Yes	Yes	Yes	Yes
Others?	No	No	Yes ¹¹	No	Yes ¹²
How were the stakeholders involved:					
Public consultation?	Yes	Yes	Yes	Yes	Yes
Workshops?	No	No	No ¹³	Yes	Yes ¹⁴

Source: BEREC

In all countries the stakeholders had the possibility to provide their views in a public consultation. In two countries (LV, NL) the stakeholder involvement includes not only a public consultation but also (a) workshop(s).

Main positions of the stakeholders

Table 4 provides an overview of the main positions of the stakeholders involved in the process of the definition of the NTP location in general in the four countries (DE, IT, LV, NL) in which a main reason for this definition was (is) to enable end-users to use the TTE of their choice.

In three of them (DE, IT, NL), network operators argued that NTP at point A, which enables end-users in case of an internet access service to use their own modem and router, is not possible for several reasons. Network operators, in particular cable and FTTB/H operators, need to control the modem functionality in order to ensure control of their networks and to ensure quality of service, especially concerning fault repair and updating software (DE). An NTP at point A compromises network safety, results in disruption of services and network operators are not allowed to disconnect non-compatible equipment (NL). In case of some services, proprietary solutions are used and therefore, in case the NTP is located at point A, it is not possible to ensure interoperability and an NTP at point A also increases the costs of

¹¹ Associations

¹² NRA, Ministry of Internal Affairs (safety), Agentschap Telecom (Agency of Ministry of Economic Affairs and Climate)

¹³ However, individual hearings were held.

¹⁴ A workshop was held with network operators and CPE manufacturers.

end-user support (NL). Network operators and service providers need to be able to offer integrated services (connectivity + modem) in order to ensure scaling, low operational expenses and a sufficient high performance and security level (IT).

Table 4: Main positions of the stakeholders involved in the process of the definition of the NTP location

Country	Germany	Italy	Latvia	Netherlands
Network operators, service providers	<ul style="list-style-type: none"> Control over the modem is necessary NTP should be at point B or C 	<ul style="list-style-type: none"> Need to be able to offer integrated services NTP should be at point B or C 	Ownership decides on the NTP location	NTP at point A is not possible because of several reasons ¹⁵
CPE manufacturers	NTP should be at point A: <ul style="list-style-type: none"> Enables a broad customer base Increase independence from network operators 	<ul style="list-style-type: none"> NTP should be at point A There is no reason to limit users' choice of terminals 	N/A	NTP should be at point A: <ul style="list-style-type: none"> EU law stipulates competition on end-user equipment U.S., Germany are clear examples Publication of specifications of NTP and services is important
Consumers	NTP should be at point A: <ul style="list-style-type: none"> Enables broadest choice of equipment Some: NTP at point B or C may be critical with regard data protection and privacy 	<ul style="list-style-type: none"> NTP should be at point A There is no reason to limit users' choice of terminals 	Ownership decides on the NTP location	NTP should be at point A: <ul style="list-style-type: none"> Enables broadest choice of equipment Some: NTP at point B or C may be critical with regard data protection and privacy Some: minor concern about complexity

Source: BEREC

In the fourth country (LV), the network operators and service providers agreed that the ownership of the equipment should decide on the location of the NTP. Depending on who owns the equipment the NTP may be at point A, B or C (or somewhere else).

The CPE manufacturers demanded in three countries (DE, IT, NL), that the location of the NTP should be at point A for the following reasons. It enables them to have the broadest customer base possible for their equipment and to secure some independence from network operators (DE). EU law (Directive 2008/63/EC) stipulates competition on end-user equipment, the U.S. and Germany show that this is possible and publication of the specifications of the NTP is important in order to enable them to manufacture the appropriate equipment (NL). There is no reason to limit users' choice of terminals (IT).

End-users are in favour of an NTP location at point A in three countries (DE, IT, NL) for the following reasons. NTP at point A enables them to have the broadest choice of equipment and some end-users raised concerns on data protection and privacy if the NTP were located at

¹⁵ Based on workshop: (i) Network safety, (ii) Disruption of services, (iii) Not allowed to disconnect/refuse non-compatible equipment, (iv) Special services make use of propriety solutions, and (v) Higher cost of end-user support.

point B or C (DE, NL). There is no reason to limit users' choice of terminals (IT). Some end-users also expressed concerns about complexity (NL). In the fourth country (LV), the end-users had the same view as the network operators and service providers that the ownership of the equipment should decide on the location of the NTP.

3.2 Definition of the NTP location

This sub-section analyses the definitions of the NTP location with regard to:

- Where is the fixed NTP (point A, B, C or somewhere else)?
- Where is the mobile NTP?
- Which networks, services, access media and access technologies fall within the scope of this definition?

The examination is based on data in Table 39 to Table 43 in Annex 3, which provide further information and the full text of the definition of the NTP locations. The discussion refers to fixed NTP locations point A, B and C which are described in section 1 (Figure 2) and Annex 1.

Location of the fixed NTP

Table 5 shows where the fixed NTP is located according to the definition of the NTP location. In three countries (DE, IT, NL), the fixed NTP is at point A, in one of them (NL) with the exception that devices which have an exclusive identification, authentication or security function in connection with granting network access also belong to the public network (e.g. decoding smartcards for TV bundles).¹⁶ In the country (CY) in which a main reason was to provide clarity on the demarcation line between the public network infrastructure and the private in-building network infrastructure (see section 3.1), the fixed NTP is at a similar point as point A. In this country, the NTP is the point where the public network is connected to the private in-building network, which typically is the first distribution box inside the building.

Table 5: Definition of the location of the fixed NTP

Location of the fixed NTP	Country
Point A	DE, IT, NL (exceptions)
Similar point as point A. The point where the public network is connected to the private in-building network	CY
A, B, C (or somewhere else) depending on ownership of equipment and cables	LV

Source: BEREC

In one country (LV), the location of the NTP is at point A, B, C or somewhere else depending on the ownership of the equipment and cables. The end-users do not have any legal right that

¹⁶ "To the public electronic communications network also belongs any device or radio communications device that has an exclusive identification, authentication or security function belonging to a specific public electronic communications network in connection with granting access to a public electronic communications network or a public electronic communications service" (Guidelines, point 5)

they can use their own modem and/or router.¹⁷

Location of the mobile NTP

In all three countries (LV, NL, IT) which defined (LV, IT) or plan to define (NL) the mobile NTP location in general, the mobile NTP is at a point which allows end-users to use their own mobile equipment with removable SIM card (e.g. mobile phone) and also with non-removable SIM card (e.g. IoT¹⁸ device).

Scope of the definition of the NTP location

In all five countries, the definition of the NTP location applies to all network operators and service providers, all retail and wholesale services, all media of the subscriber access line (e.g. copper, fibre) and also to all access technologies (e.g. ADSL, VDSL, GPON, DOCSIS) with the following two exceptions. The definition applies only to retail and not to wholesale services in the Netherlands and to network operators that deploy fixed network infrastructure to the building but not to other network operators in Cyprus.

3.3 Relevant criteria

This sub-section analyses the definitions of the fixed NTP location of the five countries considered with regard to criteria which might be relevant when a national authority defines the fixed NTP location.

Conformity of the definition of the fixed NTP location with the legal provisions

The definition of the location of the fixed NTP has to be conform with legal provisions at the national and international level. When a national authority defines the fixed NTP location, market players may argue that the proposed definition of the fixed NTP location is not in conformance with legal provisions at the national and/or international level.

In one (DE) of the five countries considered this was actually the case.¹⁹ In this country, cable operators argued that it is not possible to define point A as border of the network since cable networks are shared media in which end-users do not have a dedicated subscriber line and therefore can only be addressed via the modem. For this reason, they demanded that in case of cable networks the NTP has to be at point B or C. The counter argument of the national authority was that any requirement of the network operator could be met by a suitable definition of the characteristics of the NTP which the CPE manufacturers have to comply with.

¹⁷ Usually service providers give end-users the choice to buy or rent their equipment.

¹⁸ Internet of Things

¹⁹ In one country (NL), this information is not (yet) available since the results of the public consultation have not yet been fully analysed and published.

CPEs/modems end-users are allowed to use

In case end-users are allowed to use their own modem and router (NTP at point A), for end-users it is of interest which modem/router they are allowed to use. End-users may be allowed to use any modem/router which fulfils the characteristics of the NTP defined by network operators or service providers. However, in order to ensure interoperability between modem/router and network, it may also be possible that end-users are only allowed to use modems/routers listed in a white list or which are certified or tested by the network operator.

In all four countries (CY, DE, IT, NL) in which the fixed NTP is at point A (or at a similar point), end-users are allowed to use all modems/routers which fulfil the characteristics of the NTP defined by the network operator or service provider and they are not restricted to equipment on a white list or which is certified or tested by network operators. In these countries, the specifications of the fixed NTP are publicly available, published either by network operators and/or service providers (CY, DE, NL), or by a technical body of a ministry (IT).

In the country (LV) in which the location of the fixed NTP depends on the ownership, end-users can use their modems/routers in case network operators or service providers offer them this possibility voluntarily and then they have (usually) the possibility to use modems/routers which are sold by network operators or listed in a white list.

Interoperability between public network and CPE/modem

Interoperability between the public network and the CPE/modem at the customer premises is necessary in order to enable network operators and service providers to provide communications services to the end-user. In case CPEs/modems are part of the public network (NTP at point B or C), interoperability between public network and CPEs/modems is ensured²⁰ since network operators have the possibility to choose CPEs/modems which are interoperable. In case end-users are allowed to use their own CPEs/modems (NTP at point A), it may not be so clear how interoperability between public network and CPEs/modems is ensured.

Table 6 shows for what reasons the national authority which defined the NTP location at point A considered it to be possible to ensure interoperability between CPEs/modems and public network. In three countries (CY, DE, NL), interoperability was considered to be possible since network operators have the possibility to take any requirement they have into account when they define the characteristics of the NTP to which the CPEs/modems have to comply with. In addition in three of them (CY, DE, NL), network operators are allowed to disconnect equipment harming the network (NL) or have the possibility to request from the NRA permission to disconnect CPEs/modems harming the network (CY²¹, DE). In one country (DE), network operators are allowed to disconnect CPEs/modems harming the network also without such a permission if, in an emergency situation, this is necessary to protect their networks. In the

²⁰ In case the NTP is at point B, at least up to the network layer

²¹ Provided in the law.

fourth country (IT), interoperability was considered to be possible since all CPEs/modems provided by the end user will need to satisfy the same standards as those provided directly by the operators.

Table 6: Interoperability between public network and CPE/modem

Reasons why interoperability can be ensured	Cyprus	Germany	Italy	Netherlands
Suitable definition of the characteristics of the NTP	X	X		X
Disconnection of equipment harming the network	X	X		X
CPEs/modems have to comply with standards			X	

Source: BEREC

In the three countries (CY, DE, IT), which defined the fixed NTP location at point A, the situation with regard to interoperability in practice is as follows. In all three countries there are no issues with regard to interoperability known by the NRA (so far), although in one country (DE) network operators use rather recently (or non) standardised and/or complex access technologies (e.g. VDSL2 vectoring, G.fast).²² In one country (DE) in a small number of cases, it is difficult to establish whether an interoperability issue results from faults in the network, the CPE or the behaviour of the end-user. In another country (CY), it is common that end-users do not use their own CPE/modem but that of the service provider. In the third country (IT), the NRA Decision which provide clarity on the fixed NTP location was published only rather recently.²³

In the country (LV) in which the ownership of the equipment and cables decides on the location of the NTP, interoperability is ensured since end-users are only allowed to use CPEs/modems sold by the network operator or which are on a white list.

Further information on interoperability between public network and CPE/modem is provided in Table 50 to Table 52 in Annex 3.

Simplicity of network operation

In case end-users are allowed to use their own CPE/modem, a variety of different CPEs/modems may be connected to a network which may have an impact on network operation. Since CPEs/modems are owned by the end-users and not by the network operator, this may also have an impact on fault repair.

In three countries (DE, IT, NL) which defined (or plan to define) the NTP location at point A, network operators and/or service providers complained that network operation is more difficult due to the variety of different CPEs/modems which may be connected to their networks and also that troubleshooting is more difficult since the CPEs/modems are owned by the end-users. Despite these complaints, the national authorities defined the fixed NTP location at point A because of the following reasons. In all three countries, the complexity of network operation may increase, however, the degree of this increase does not justify to limit the

²² In one country (NL) which plan to define the fixed NTP location in general, this information is not yet available.

²³ In August 2018

freedom of end-users to use the CPEs/modems of their choice. In one country (DE) in addition, network operation can be ensured since network operators have the possibility to take any requirement into account when they define the characteristics of the fixed NTP to which the CPEs/modems have to comply with. In another country (NL), a further reason is that, in case of a fault, network operators have the possibility to ask their end-users (who want to have the problem fixed) to allow them to access the CPE/modem in order to be able to repair the fault. In the third country (IT), another reason are rules of CENELEC which are mandatory²⁴ and foresee that all what comes after the service distribution box in the basement of new buildings shall be installed at the expense of the construction company or developer in charge of building the new housing.

Discrimination of end-users which use own CPE/modem

Network operators and/or service providers may discriminate end-users which use their own CPE/modem in order to force them to use their CPE/modem. For example, they may provide a lower quality of service or may not make available certain services when end-users use their own CPE/modem instead of the CPE/modem of the network operator/service provider.

In one (DE) of the two countries (CY, DE) which defined that the fixed NTP is at point A, this question is still investigated. In this country (DE), about 60 such cases are known to the NRA and the disadvantages that end-users have which use their own CPE/modem compared to end-users which use the CPE/modem of the service provider are as follows. Inferior speed of the internet access service, less numbers and lines that can be managed by a customer at a single network access, and no fault repair of the CPE/modem. The NRA did not yet take any measures in these cases since investigations are still ongoing and it is difficult to establish the cause of an inferior service and performance because the responsibility may lie in the domain of the end-user (e. g. software of CPE/modem is not up-to-date).

Security and data protection

Security and data protection are important and the location of the fixed NTP may have an impact on both. For example, in case the NTP is at point A, network operators may fear that the CPEs/modems of the end-users may compromise the security and data protection of their public networks. Or in case the NTP is at point C, end-users may fear that network operators get access to information they exchange within their local networks.

In three (DE, IT, NL) of the four countries which defined (or plan to define) the fixed NTP location at point A, market players complained about security and/or data protection issues caused by the location of the fixed NTP. In two countries (DE, IT), network operators complained that security breaches of the CPE/modem owned by the end-users may compromise the security and/or data protection of the public network. In one country (IT), network operators also expressed concern that NTP at point A may cause issues with local network firewall policy and possible spoofing of the number of the calling party (CLI). In one

²⁴ Law n.164/2014, Article 135 bis

country (DE) also end-users complained that in case NTP would be at point B or C network operators may get access to their private data.

The reasons why the national authority defined (or plans to define) the fixed NTP location at point A although security issues in the public network may be caused by the CPE/modem of the end-users (e.g. software not up-to-date) are as follows. In one country (DE), the reason is that in such cases, on the one hand, end-users are responsible for the damage they caused and have to pay compensation and, on the other hand, network operators have the possibility to request from the NRA permission to disconnect such CPEs/modems or to disconnect such modems without such a permission if, in an emergency situation, this is necessary to protect their networks. In the two other countries (IT, NL), it was considered that these security issues do not justify limiting the freedom of end-users to use the CPEs/modems of their choice and in case of problems with network stability caused by end-users network operators are allowed to disconnect them.

In the country (LV) in which the ownership of the equipment and cables decides on the location of the NTP, no market players complained about security and/or data protection issues.

4 Layer 2/3 wholesale access products imposed by NRAs

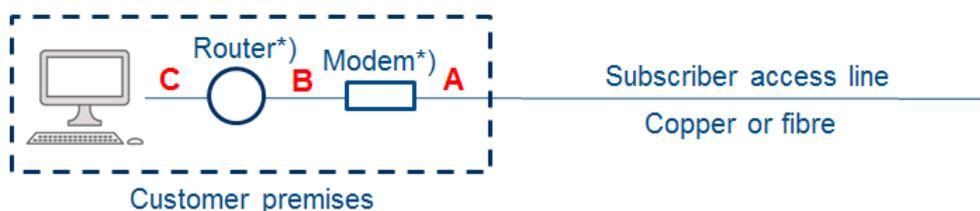
In market analyses, in which SMP is found, NRAs impose obligations on SMP operators. These obligations may have an impact on the location of the NTP. For example, whether or not a Layer 2 wholesale access product (L2 WAP) or a Layer 3 wholesale access product (L3 WAP) allows alternative network operators (ANOs) to use their own modem and/or router is relevant for the location of the NTP at the wholesale level and also at the retail level.

If an ANO is allowed to use its own CPE including modem, then the point of handover (PoH) at the customer premises between SMP operator and ANO, which is the NTP in case the term NTP applies also to the wholesale level, is at point A. In this case, ANOs can also offer retail products with an NTP at point A (or B, C). If an ANO is allowed to use its own CPE but not its own modem, then the PoH/NTP at the wholesale level is at point B and it has the possibility to offer retail products with an NTP at point B (or C). Finally, in case the ANO has to use modem and router from the SMP operator and therefore the PoH/NTP at the wholesale level is at point C, the ANO is only able to offer retail products with an NTP at point C (not A or B) (see Figure 6).

Therefore, this section analyses the following characteristics of L2 WAPs and L3 WAPs imposed by NRAs:

- Are ANOs allowed to use their own modem and/or router?
- Which CPEs/modems are ANOs allowed to use?
- Experiences made with regard to interoperability between CPEs/modems of ANOs and the network of the SMP operator.

L2/L3 WAP (e.g. bitstream, VULA)



*) In case the NTP is at point A or C, router and modem may be integrated in one device.

Source: BEREC

Figure 6: Different locations of the NTP in case of a L2 WAP or a L3 WAP

The examination focuses on 14 EU countries (AT, BE, CZ, DK, FR, GR, HR, HU, IE, LT, LU, MT, PT, SI) in which no national authority defined the fixed NTP location in general so far (see sections 2.1 and 3). It begins with L2 WAPs followed by L3 WAPs and is based on data in Annex 4.

4.1 L2 WAPs

13 of the 14 countries considered in section 4 (not LT), imposed a L2 WAP on the SMP operator.

L2 WAPs available on copper-based subscriber access lines

In 11 of the 13 countries which imposed a L2 WAP (not in MT, PT), the L2 WAP imposed on the SMP operator is available on copper-based subscriber access lines. In all 11 countries, ANOs are allowed to use their own CPE including modem and therefore are able to provide retail services with an NTP at point A (or B or C) based on the L2 WAP.

Table 7: CPEs including modem ANOs are allowed to use in case of L2 WAPs available on copper-based access lines

CPEs including modem	Number of countries	Country
The fulfilment of the requirements of the SMP operator is sufficient ²⁵	7	AT ²⁶ , BE (ADSL), DK (no vectoring) ²⁷ , FR, GR, IE, LU
Have to be on a white list	5	BE (VDSL, coax) ²⁸ , HR, CZ, DK (vectoring) ²⁷ , HU
Have to be tested	1	SI

Source: BEREC

²⁵ The CPEs/modems do not need to be on a white list, or tested or certified.

²⁶ However, ANOs have to prove that the requirements are fulfilled based on certificates, test reports or other appropriate documents e.g. product documents. Optionally, also a white list is available.

²⁷ In Denmark, ANOs are allowed to use any CPE which fulfils the requirements of the SMP operator with the following exception. In case copper is upgraded with vectoring, ANOs are only allowed to use CPEs which are on the whitelist published by the SMP operator.

²⁸ In Belgium, a CPE (including modem) needs to be certified before it is added to the white list.

Table 7 shows which CPEs (including modem) ANOs are allowed to use. In seven countries, it is sufficient that the CPEs (including modem) the ANOs are allowed to use fulfil the requirements of the SMP operator. Their choice is not restricted to CPEs (including modem) which are on a white list or tested by the SMP operator. ANOs are allowed to use only CPEs (including modem) which are on a white list in five countries, and which are tested in one country.

L2 WAPs available on fibre-based subscriber access lines

In all 13 countries which imposed a L2 WAP, the L2 WAP is (also) available on fibre-based access lines. In seven (BE³⁰, CZ, DK, GR, HU, IE, LU) of these 13 countries, ANOs are allowed to use their own CPE including fibre modem and therefore they are able to provide retail services with an NTP at point A (or B, C) based on the L2 WAP. In four (DK, GR, IE, LU) of these seven countries, it is sufficient that the CPEs (including fibre modem) ANOs are allowed to use fulfil the requirements of the SMP operator (see Table 8). However, in two of them to date in practice either the fibre modem (ONT) is provided by the SMP operator (IE) or the ANOs use in general the same equipment as the SMP operator (LU). In the other three countries, ANOs are only allowed to use CPEs (including fibre modem) which are on a white list (BE, CZ, HU).

Table 8: CPEs including modem ANOs are allowed to use in case of L2 WAPs available on fibre-based access lines

CPEs including modem	Number of countries	Country
The fulfilment of the requirements of the SMP operator is sufficient ²⁹	4	DK, GR, IE, LU
Have to be on a white list	3	BE (with WLU) ³⁰ , CZ, HU

Source: BEREC

In further six countries (AT, BE³⁰, HR, FR, MT, PT) of the 13 countries in which the L2 WAP is available on fibre-based access lines, ANOs are allowed to use their own CPE but not their own fibre modem (or network termination in case of P2P fibre access lines). Therefore, in these countries ANOs are able to offer retail services with an NTP at point B (or C) but not at point A based on the L2 WAP. In all six countries, it is sufficient that the CPE (excluding fibre modem) ANOs are allowed to use fulfils the requirements of the SMP operator. Typically they can use all CPEs with the standard Ethernet interface of the fibre modem (or network termination in case of P2P fibre) of the SMP operator.

In two countries (FR, SI), in case of P2P fibre the L2 WAP is available (also) without any network termination (and fibre modem) and ANOs are allowed to use their own CPE (excluding network termination/modem) which is directly connected to the fibre-based access line. Therefore, ANOs are also able to provide retail services with an NTP at point A based on the

²⁹ The CPEs/modems do not need to be on a white list, or tested or certified.

³⁰ In Belgium, ANOs have the possibility to use their own CPE including fibre modem in case of combining L2 WAP on Market 3a with wavelength unbundling (WLU) and to use their own CPE excluding fibre modem in case L2 WAP based on fibre is not combined with WLU.

L2 WAP. In one country (FR), ANOs are allowed to use any CPE which fulfils the requirements of the SMP operator; in the other country (SI), ANOs have to use CPEs which were tested by the SMP operator.

Interoperability issues between CPE/modem of ANOs and network of the SMP operator

In all 13 countries in which the NRA imposed a L2 WAP on the SMP operator, there were no problems with interoperability between CPE/modem of the ANOs and the network of the SMP operator with one exception. In Greece, in one case interoperability issues occurred since the SMP operator implemented vectoring and ANOs still deployed non-compatible CPEs. The issues were resolved with a grace period offered by the SMP operator to allow ANOs to upgrade their CPEs in order to be compatible with the vectoring standard.

In several countries (CZ, HU, MT, PT) the L2 WAP was introduced rather recently and is not yet used, therefore, experiences with regard interoperability are not yet gained.

4.2 L3 WAPs

11 (AT, CZ, DK, FR, GR, HR, HU, IE, LT, LU, PT) of the 14 countries considered in section 4 imposed (also) a L3 WAP on the SMP operator.

L3 WAPs available on copper-based subscriber access lines

In all 11 countries which imposed a L3 WAP, the L3 WAP is available on copper-based subscriber access lines and in ten of them ANOs are allowed to use their own CPE including modem. Therefore, ANOs are able to provide retail services with an NTP at point A (or B or C) based on the L3 WAP. In the other country (AT), ANOs have to use the CPE including modem of the SMP operator (they can choose between several options) and therefore they have the possibility to offer retail services with an NTP at point C, but not at point A or B based on this L3 WAP. However, the SMP operator has to offer in parallel (at the same regional PoHs) a L2 WAP which enables them to offer retail services with an NTP at point A (or B) (see section 4.1).

Table 9: CPEs including modem ANOs are allowed to use in case of L3 WAPs available on copper-based access lines

CPEs including modem	Number of countries	Country
The fulfilment of the requirements of the SMP operator is sufficient ³¹	7	DK (no vectoring) ³² , FR, GR, IE, LT, LU, PT
Have to be on a white list	4	CZ, DK (vectoring) ³² , HR, HU

Source: BEREC

³¹ The CPEs/modems do not need to be on a white list, or tested or certified.

³² In Denmark, ANOs are allowed to use any CPE which fulfils the requirements of the SMP operator with the following exception. In case copper is upgraded with vectoring, ANOs are only allowed to use CPEs which are on the whitelist published by the SMP operator.

Table 9 provides an overview of which CPEs (including modem) ANOs are allowed to use. In seven countries, it is sufficient that the CPEs (including modem) fulfil the requirements of the SMP operator. The CPEs (including modem) do not need to be on a white list or tested by the SMP operator. In four countries, ANOs are allowed to use only CPEs (including modem) which are on a white list.

L3 WAPs available on fibre-based subscriber access lines

In eight (AT, CZ, DK, HR, HU, IE, LT, LU) of the 11 countries which imposed a L3 WAP, the L3 WAP is (also) available on fibre-based access lines. In five (CZ, DK, HU, IE, LU) of these eight countries, ANOs are allowed to use their own CPE including fibre modem and therefore they are able to provide retail services with an NTP at point A (or B, C) based on the L3 WAP. In three (DK, IE, LU) of these five countries, it is sufficient that the CPEs (including fibre modem) ANOs are allowed to use fulfil the requirements of the SMP operator (see Table 8). However, in two of them to date in practice either the fibre modem (ONT) is provided by the SMP operator (IE) or the ANOs use the same equipment as the SMP operator in general (LU). In the other two countries (CZ, HU), ANOs are only allowed to use CPEs (including fibre modem) which are on a white list.

Table 10: CPEs including modem ANOs are allowed to use in case of L3 WAPs available on fibre-based access lines

CPEs including modem	Number of countries	Country
The fulfilment of the requirements of the SMP operator is sufficient ³¹	3	DK, IE, LU
Have to be on a white list	2	CZ, HU

Source: BEREC

In two other countries (HR, LT) in which the L3 WAP is available on fibre-based access lines, ANOs are allowed to use their own CPE but not their own fibre modem (PON) (HR) or network termination (P2P) (LT). Therefore, in these two countries ANOs are able to offer retail services with an NTP at point B (or C) but not at point A based on the L3 WAP. In both countries, it is sufficient that the CPE (excluding fibre modem/network termination) ANOs are allowed to use fulfil the requirements of the SMP operator.

In one country (AT) in which the L3 WAP is available on fibre-based access lines, ANOs have to use the CPE including modem of the SMP operator as in case of the L3 WAP based on copper access and therefore also the situation with regard to the NTP location is the same (see above).

Interoperability issues between CPE/modem of ANOs and network of the SMP operator

In all ten countries in which ANOs are allowed to use their own CPE (either including or excluding the modem), interoperability issues between CPE/modem of the ANOs and the network of the SMP operator are not known by the NRA.

5 Conclusions

In conclusion, the overview of the definition of the NTP location in the EU can be summarised as follows. A national authority defined or plans to define the location of the fixed NTP in general in five EU countries and of the mobile NTP in general in three EU countries. In 13 other countries, the NRA does have this legal power but did not use it so far.

The NRA has the legal power to decide in individual disputes between end-users and network operators or service providers on the fixed and mobile NTP location in 15 EU countries. In all 15 countries, there was no need to resolve any such individual dispute with a decision so far.

The analysis of the legal provisions of the national authorities which defined or plans to define the NTP location in general can be summarised as follows:

- Authority and legal instrument: Different authorities (parliament, ministry, NRA) defined the NTP location in general and used different legal instruments (law, guidelines, regulation).
- Main reasons for the definition of the NTP location: In all countries to provide clarity on the NTP location, in four countries to enable end-users to use the TTE of their choice and in three countries to respond to significant complaints from market players.
- Stakeholders involved: Network operators and service providers and depending on the main reasons also CPE manufacturers, consumers and further stakeholders.
- Main positions of the stakeholders: In case a main reason was to enable the end-users to use the TTE of their choice, CPE manufacturers and consumers demanded the fixed NTP to be located at point A and the network operators/service providers demanded the fixed NTP to be located at point B or C.
- Definition of the fixed NTP location: Four countries defined that the fixed NTP is at point A (or a similar point) and therefore end-users can use their own CPE including modem and one country defined that it depends on the ownership of the equipment (point A, B or C).
- Definition of the mobile NTP location: In all three countries, the mobile NTP is at a point which allows end-users to use their own mobile equipment with removable SIM card (e.g. mobile phone) and also with non-removable SIM card (e.g. IoT device).
- CPE/modem end-users are allowed to use: In all four countries in which the fixed NTP is at point A (or a similar point), end-users are allowed to use all modems/ routers which fulfil the characteristics of the NTP (no restriction to a white list or certification). In the other country where the NTP depends on the ownership of the equipment, end-users can use their modems/routers only in case network operators or service providers offer this possibility to them voluntarily.

The findings of the examination of L2 WAPs and L3 WAPs imposed by NRAs in 14 countries with regard to characteristics which may have an impact on the NTP location are as follows:

- L2/3 WAPs available on copper-based access lines: Nearly all L2 WAPs and L3 WAPs allow ANOs to use their own CPE including modem and therefore enable them to provide retail services with an NTP at point A (or B, C). About two third of them allows

ANOs to use any CPE which fulfils the requirements of the SMP operator and the other third allows ANOs to use CPEs which are on a white list.

- L2/3 WAPs available on fibre-based access lines: About half of the L2 WAPs and L3 WAPs allows ANOs to use their own CPE including modem, which enables ANOs to provide retail services with an NTP at point A (or B, C). About half of them allows ANOs to use any CPE which fulfils the requirements of the SMP operator and the other half allows ANOs to use CPEs which are on a white list. Nearly all other L2 WAPs and L3 WAPs allow ANOs to use their own CPE excluding modem which enables ANOs to provide retail services with an NTP at point B (or C).

Overall, so far there was only the need to define the NTP location in some countries. In case of the fixed NTP, it seems this was driven mainly, on the one hand, by end-users who demanded to be able to use their own CPE (including modem) and, on the other hand, in one country by the need to define the demarcation line between public network infrastructure and the private in-building network infrastructure. In most cases the national authority laid down that the fixed NTP is at point A and that end-users are allowed to use all CPEs (including modem) which fulfils the characteristics of the NTP (no restriction to a white list or certification).

This report also constitutes a comprehensive basis for the guidelines on the topic “location of the NTP” that BEREC has to adopt according to the new EECC.

6 Abbreviations for countries

Abbreviation	Country
AT	Austria
BE	Belgium
BG	Bulgaria
CY	Cyprus
CZ	Czech Republic
DE	Germany
DK	Denmark
EE	Estonia
ES	Spain
FI	Finland

Abbreviation	Country
FR	France
GR	Greece
HU	Hungary
HR	Croatia
IE	Ireland
IT	Italy
LT	Lithuania
LU	Luxembourg
LV	Latvia
MT	Malta
NL	Netherlands

Abbreviation	Country
PL	Poland
PT	Portugal
RO	Romania
SE	Sweden
SI	Slovenia
SK	Slovakia
UK	United Kingdom

7 Further abbreviations

ADSL	Asymmetric Digital Subscriber Line
ANO	Alternative Network Operator
CLI	Calling Line Identification
CPE	Customer Premises Equipment
DOCSIS	Data Over Cable Service Interface Specification
DRM	Digital Rights Management
EECC	European Electronic Communications Code
GPON	Gigabit-capable Passive Optical Network
IAS	Internet Access Service
IoT	Internet of Things
L2 WAP	Layer 2 Wholesale Access Product
L3 WAP	Layer 3 Wholesale Access Product
N/A	Not Applicable
NIA	No Information Available
NRA	National Regulatory Authority
NTP	Network Termination Point
ONA	Other National Authority

PoH	Point of Handover
SIM	Subscriber Identity Module
SMP	Significant Market Power
TTE	Telecommunications Terminal Equipment
VDSL	Very high speed Digital Subscriber Line
VoB	Voice over Broadband
WLU	WaveLength Unbundling

Annex Basic data of the report

Annex 1: Description of possible fixed NTP locations

In the report, the discussion of the location of the fixed NTP refers to points A, B and C. These points are defined as follows:

- **Point A:** The NTP is the point (e.g. physical connector) at which the subscriber access line ends at the customer premises and no active equipment is between the NTP and the subscriber access line.
- **Point B:** The NTP is the interface at the end-users' side of the modem (e.g. traditional DSL modem, fibre modem, cable modem) which provides network termination but no further functionalities (e.g. routing, WLAN).

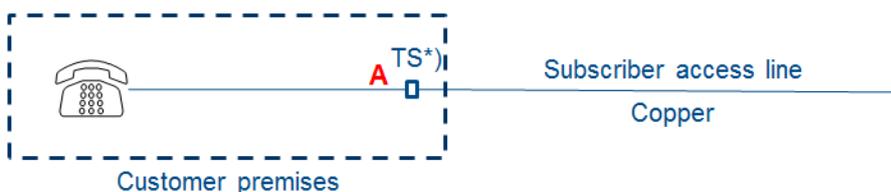
Note: Modems which are able to provide further functionalities than network termination (e.g. routing) are possible as long they are configured in a way that they only provide network termination functionality.

- **Point C:** The NTP is the interface at the end-users' side of the customer premises equipment (CPE) which provides not only network termination but also further functionalities (e.g. routing, WLAN).

Note: Depending on the functionality of the CPE point C may be at different locations (see C₁ and C₂ in case (6) below).

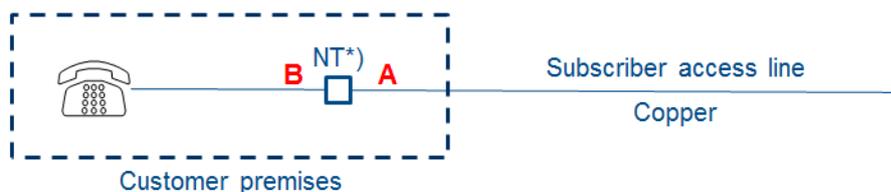
The following figures illustrate points A, B and C for several communications services.

(1) Traditional POTS service



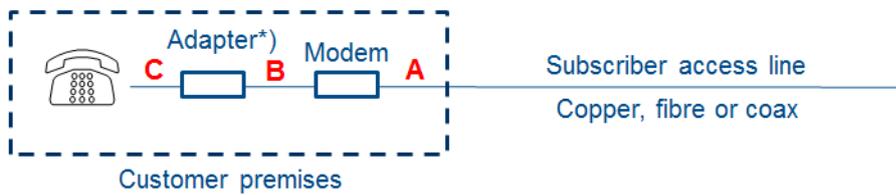
*) Telephone wall socket

(2) Traditional ISDN service



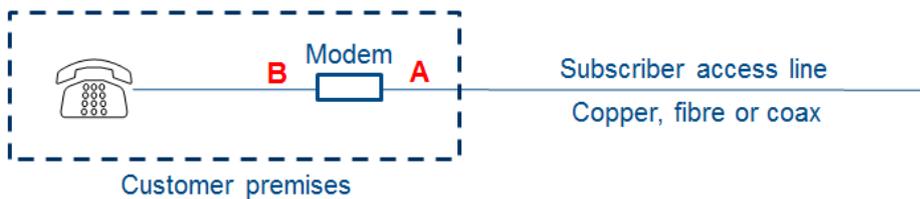
*) Network termination

(3) POTS/ISDN with VoIP on the subscriber access line

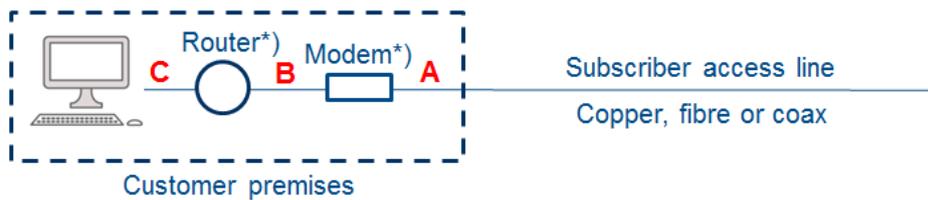


*) Conversion between POTS/ISDN and VoIP. Adapter and modem may be integrated in one device.

(4) VoIP service

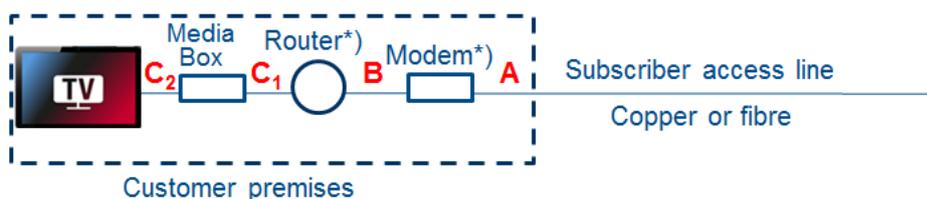


(5) Internet access service



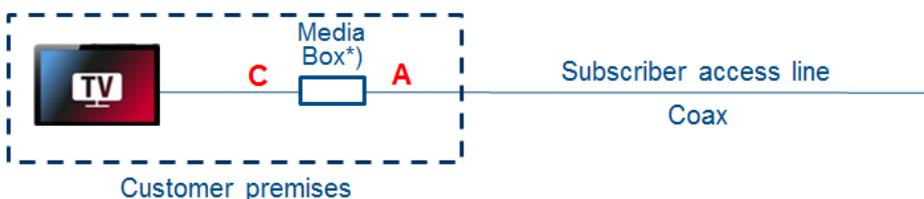
*) In case the NTP is at point A or C, router and modem may be integrated in one device.

(6) TV service (copper, fibre)



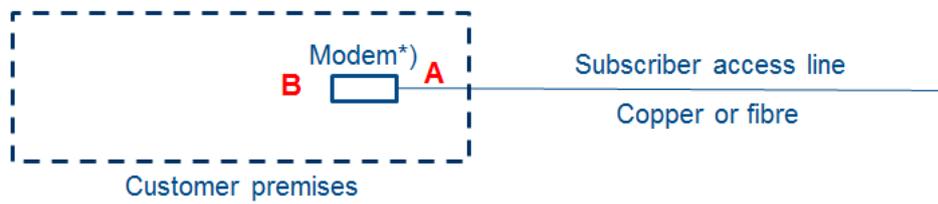
*) In case the NTP is not at point B, router and modem may be integrated in one device.

(7) TV service (coax)



*) Location B is not accessible from outside since the media box provides not only network termination functionality.

(8) Leased line



*) E.g. SHDSL modem, SDH terminal multiplexer, Ethernet network termination unit

Annex 2: Basic data used in section 2

This annex provides basic data used in section 2 of the report. This includes information on the following questions:

- Did a national authority define the location of the NTP in general?
- Does the NRA have the legal power to decide in individual disputes between end-users and network operators or service providers on the location of the fixed/mobile NTP?

These questions have to be understood as follows.

The report analyses whether or not the NRA or another national authority did define the location of the fixed and/or mobile NTP in general (i.e. for all fixed and/or mobile NTPs).³³ However, legal provisions which solely transposed the definition of the term “NTP” in the Framework Directive into national law without any further information or explanation on the NTP location are not considered (see section 1).

Therefore, the question “Did a national authority define the location of the NTP in general” refer to legal provisions which did not solely transpose the definition of the term “NTP” in the Framework Directive into national law but provide further information or explanation on the NTP location.

An end-user may complain before the NRA that its internet service provider does not allow him to use its own modem and/or router. Then, in case the NRA does have the legal power, the NRA has to decide whether or not the end-user does have the legal right to use its own modem/router. In case the NRA decides, for example, that the fixed NTP is at point A, then modem and router are part of the domain of the end-user and the end-user can use its own modem and router (see section 1). However, does the NRA decide that the fixed NTP is at point C, then the end-user has to use modem and router of the internet service provider.

Therefore, the question “Does the NRA have the legal power to decide in individual disputes between end-users and network operators or service providers on the location of the fixed/mobile NTP” refer to such disputes and such decisions on the location of the fixed/mobile NTP. This question, however, is not limited to internet access services.

³³ There might be some exemptions but in principle for all fixed and/or mobile NTPs.

Table 11: Did a national authority define the location of the NTP in general and legal power of the NRA to decide in individual disputes (AT, BE, BG, HR, CY, CZ, DK)

Country	Austria	Belgium	Bulgaria	Croatia	Cyprus	Czech Republic	Denmark
Does the NRA have the legal power to decide in individual disputes between end-users and network operators or service providers on the location:							
• Of the fixed NTP?	Yes – IAS ³⁴	No	No	No	Yes	Yes – All ³⁵	No ³⁶
• Of the mobile NTP?	Yes – IAS ³⁴	No	No	No	Yes	Yes – All ³⁵	No ³⁶
Did the NRA take a (or several) decision(s) on the location of the (fixed and/or mobile) NTP in individual disputes between end-users and network operators or service providers?	No	No	N/A	N/A	No	No	N/A
Did a national authority, either the NRA or another national authority (e.g. parliament), define the location							
• Of the fixed NTP in general? ³⁷	No	No ³⁸	No	No	Yes	No	No
• Of the mobile NTP in general? ³⁹	No	No	No	No	No	No	No

Source: BEREC

³⁴ The NRA has this legal power only in case of internet access services.

³⁵ The NRA has this legal power for all electronic communications services provided to end-users

³⁶ In Denmark, the NRA (DBA) does not have any powers on end-users rights (this power belongs to the Danish Energy Agency)

³⁷ i.e. the definition applies at least in principle to all fixed NTPs (there may be some exemptions)

³⁸ However, in Belgium the NRA defined the location of the point at the customer premises at which wholesale access products on Markets 3a and 3b are handed over between SMP operator and ANOs and this enables ANOs to offer retail services with an NTP at point A.

³⁹ i.e. the definition applies at least in principle to all mobile NTPs (there may be some exemptions)

Table 12: Did a national authority define the location of the NTP in general and legal power of the NRA to decide in individual disputes (EE, FI, FR, DE, GR, HU, IE)

Country	Estonia	Finland	France	Germany	Greece	Hungary	Ireland
Does the NRA have the legal power to decide in individual disputes between end-users and network operators or service providers on the location:							
• Of the fixed NTP?	No	Yes – All ⁴⁰	Yes – All ⁴⁰	No	Yes – All ⁴⁰	Yes – All ⁴⁰	No
• Of the mobile NTP?	No	Yes – All ⁴⁰	Yes – All ⁴⁰	No	Yes – All ⁴⁰	Yes – All ⁴⁰	No
Did the NRA take a (or several) decision(s) on the location of the (fixed and/or mobile) NTP in individual disputes between end-users and network operators or service providers?	N/A	No	No	N/A	No	No	N/A
Did a national authority, either the NRA or another national authority (e.g. parliament), define the location							
• Of the fixed NTP in general? ⁴¹	No	No ⁴²	No	Yes	No	No	No
• Of the mobile NTP in general? ⁴³	No	No	No	No	No	No	No

Source: BEREC

⁴⁰ The NRA has this legal power for all electronic communications services provided to end-users

⁴¹ i.e. the definition applies at least in principle to all fixed NTPs (there may be some exemptions)

⁴² In Finland, the NRA defined the location of the fixed NTP in a regulation concerning private in-building network infrastructure with regards to passive network infrastructure but not with regard to active network equipment (e.g. modem, router) and therefore this definition does not provide any legal right for end-users or network operators to be allowed to use e.g. in case of an internet access service their own modem and/or router. In Finland, according to national legislation and TSM Regulation, end-users have a right to use the TTE of their choice e.g. their own modem and/or router.

⁴³ i.e. the definition applies at least in principle to all mobile NTPs (there may be some exemptions)

Table 13: Did a national authority define the location of the NTP in general and legal power of the NRA to decide in individual disputes (IT, LV, LT, LU, MT, NL, PL)

Country	Italy	Latvia	Lithuania	Luxembourg	Malta	Netherlands	Poland
Does the NRA have the legal power to decide in individual disputes between end-users and network operators or service providers on the location:							
• Of the fixed NTP?	Yes – All ⁴⁵	Yes – All ⁴⁴	Yes – All ⁴⁵	No	No	No ⁴⁶	No
• Of the mobile NTP?	Yes – All ⁴⁵	Yes – All ⁴⁴	Yes – All ⁴⁵	No	No	No ⁴⁶	No
Did the NRA take a (or several) decision(s) on the location of the (fixed and/or mobile) NTP in individual disputes between end-users and network operators or service providers?	No	No	No	N/A	N/A	N/A	N/A
Did a national authority, either the NRA or another national authority (e.g. parliament), define the location							
• Of the fixed NTP in general? ⁴⁷	Yes ⁴⁸	Yes	No	No	No	Yes	No
• Of the mobile NTP in general? ⁴⁹	Yes	Yes	No	No	No	Yes	No

Source: BEREC

⁴⁴ The NRA has this legal power for all electronic communications services provided to end-users; however, only regarding disputes between Latvian operators and end-users.

⁴⁵ The NRA has this legal power for all electronic communications services provided to end-users

⁴⁶ In the Netherlands, legal power with regard to consumer rights belongs to an independent telecom dispute resolution commission.

⁴⁷ i.e. the definition applies at least in principle to all fixed NTPs (there may be some exemptions)

⁴⁸ NRA Decision 348/18/CONS, see AGCOM's website

https://www.agcom.it/documentazione/documento?p_p_auth=fLw7zRht&p_p_id=101_INSTANCE_2fsZcpGr12AO&p_p_lifecycle=0&p_p_col_id=column-1&p_p_col_count=1&_101_INSTANCE_2fsZcpGr12AO_struts_action=%2Fasset_publisher%2Fview_content&_101_INSTANCE_2fsZcpGr12AO_assetEntryId=11536769&_101_INSTANCE_2fsZcpGr12AO_type=document

⁴⁹ i.e. the definition applies at least in principle to all mobile NTPs (there may be some exemptions)

Table 14: Did a national authority define the location of the NTP in general and legal power of the NRA to decide in individual disputes (PT, RO, SK, SI ES, SE, UK)

Country	Portugal	Romania	Slovakia	Slovenia	Spain	Sweden	United Kingdom
Does the NRA have the legal power to decide in individual disputes between end-users and network operators or service providers on the location:							
• Of the fixed NTP?	No	Yes – All ⁵⁰	Yes – IAS ⁵¹	No ⁵²			
• Of the mobile NTP?	No	Yes – All ⁵⁰	Yes – IAS ⁵¹	No ⁵²			
Did the NRA take a (or several) decision(s) on the location of the (fixed and/or mobile) NTP in individual disputes between end-users and network operators or service providers?	N/A	No	No	No	No	No	No
Did a national authority, either the NRA or another national authority (e.g. parliament), define the location							
• Of the fixed NTP in general? ⁵³	No	No	No	No	Yes	No	No
• Of the mobile NTP in general? ⁵⁴	No	No	No	No	No	No	No

Source: BEREC

⁵⁰ The NRA has this legal power for all electronic communications services provided to end-users⁵¹ The NRA has this legal power only in case of internet access services.⁵² In the United Kingdom, the NRA has powers to define the NTP in the event a dispute arose between service providers but NTPs are generally defined in individual end-user contracts.⁵³ i.e. the definition applies at least in principle to all fixed NTPs (there may be some exemptions)⁵⁴ i.e. the definition applies at least in principle to all mobile NTPs (there may be some exemptions)

Table 15: Legal power of the NRA to define the location of the NTP in general (AT, BE, BG, HR, CY)

Country	Austria	Belgium	Bulgaria	Croatia	Cyprus
Does the NRA have the legal power to define the location of the <u>fixed</u> NTP in general? ⁵⁵	No	No	No	Yes	Yes
The NRA did not define the location of the <u>fixed</u> NTP in general ⁵⁵ so far because of the following reasons:					
<ul style="list-style-type: none"> The location of the fixed NTP is typically at a point which allows end-users to use their own customer premises equipment and does not force them to use the equipment of the service provider?⁵⁶ 	N/A	N/A	N/A	No	N/A
<ul style="list-style-type: none"> No (or only minor) complaints by end-users that they do not have the possibility to use their own router/customer premises equipment? 	N/A	N/A	N/A	Yes	N/A
<ul style="list-style-type: none"> Other reasons? 	N/A	N/A	N/A	No	N/A
Does the NRA have the legal power to define the location of the <u>mobile</u> NTP in general? ⁵⁷	No	No	No	Yes	Yes
The NRA did not define the location of the <u>mobile</u> NTP in general ⁵⁷ so far because of the following reasons:					
<ul style="list-style-type: none"> The location of the mobile NTP is typically at a point which allows end-users to use their own mobile equipment? 	N/A	N/A	N/A	Yes	Yes
<ul style="list-style-type: none"> No (or only minor) complaints by end-users that they do not have the possibility to use their own mobile equipment 	N/A	N/A	N/A	Yes	Yes
<ul style="list-style-type: none"> Other reasons? 	N/A	N/A	N/A	No	No

Source: BEREC

⁵⁵ i.e. the definition applies at least in principle to all fixed NTPs (there may be some exemptions)

⁵⁶ i.e. the location of the NTP is at point A or B (see Figure 2 and Annex 1)

⁵⁷ i.e. the definition applies at least in principle to all mobile NTPs (there may be some exemptions)

Table 16: Legal power of the NRA to define the location of the NTP in general (CZ, DK, EE, FI, FR)

Country	Czech Republic	Denmark	Estonia	Finland	France
Does the NRA have the legal power to define the location of the <u>fixed</u> NTP in general? ⁵⁸	Yes	No ⁵⁹	No	Yes	Yes
The NRA did not define the location of the <u>fixed</u> NTP in general ⁵⁸ so far because of the following reasons:					
<ul style="list-style-type: none"> The location of the fixed NTP is typically at a point which allows end-users to use their own customer premises equipment and does not force them to use the equipment of the service provider?⁶⁰ 	Yes	N/A	N/A	Yes	No
<ul style="list-style-type: none"> No (or only minor) complaints by end-users that they do not have the possibility to use their own router/customer premises equipment? 	Yes	N/A	N/A	Yes	Yes
<ul style="list-style-type: none"> Other reasons? 	No	N/A	N/A	No	No
Does the NRA have the legal power to define the location of the <u>mobile</u> NTP in general? ⁶¹	No	No ⁵⁹ 59	No	No ⁶²	Yes
The NRA did not define the location of the <u>mobile</u> NTP in general ⁶¹ so far because of the following reasons:					
<ul style="list-style-type: none"> The location of the mobile NTP is typically at a point which allows end-users to use their own mobile equipment? 	N/A	N/A	N/A	N/A	Yes
<ul style="list-style-type: none"> No (or only minor) complaints by end-users that they do not have the possibility to use their own mobile equipment 	N/A	N/A	N/A	N/A	Yes
<ul style="list-style-type: none"> Other reasons? 	N/A	N/A	N/A	N/A	No

Source: BEREC

⁵⁸ i.e. the definition applies at least in principle to all fixed NTPs (there may be some exemptions)

⁵⁹ The Danish NRA (DBA) does not have any powers on end-users rights but the power to define the NTP location as part of the access obligation when defining the access products if it finds that necessary. This has not been necessary so far, the NRA has not been involved in any disputes between SMP and ANOs regarding this.

⁶⁰ i.e. the location of the NTP is at point A or B (see Figure 2 and Annex 1)

⁶¹ i.e. the definition applies at least in principle to all mobile NTPs (there may be some exemptions)

⁶² In Finland, the NRA has the power to define the mobile NTP location on a case-by-case basis which may have also an effect on the mobile NTP location in general.

Table 17: Legal power of the NRA to define the location of the NTP in general (DE, GR, HU, IE, LT)

Country	Germany	Greece	Hungary	Ireland	Lithuania
Does the NRA have the legal power to define the location of the <u>fixed</u> NTP in general? ⁶³	N/A	Yes	Yes	No	Yes
The NRA did not define the location of the <u>fixed</u> NTP in general ⁶³ so far because of the following reasons:					
<ul style="list-style-type: none"> The location of the fixed NTP is typically at a point which allows end-users to use their own customer premises equipment and does not force them to use the equipment of the service provider?⁶⁴ 	N/A	Yes	No	N/A	Yes
<ul style="list-style-type: none"> No (or only minor) complaints by end-users that they do not have the possibility to use their own router/customer premises equipment? 	N/A	Yes	Yes	N/A	Yes
<ul style="list-style-type: none"> Other reasons? 	N/A	No	No	N/A	No
Does the NRA have the legal power to define the location of the <u>mobile</u> NTP in general? ⁶⁵	No	Yes	Yes	Yes	Yes
The NRA did not define the location of the <u>mobile</u> NTP in general ⁶⁵ so far because of the following reasons:					
<ul style="list-style-type: none"> The location of the mobile NTP is typically at a point which allows end-users to use their own mobile equipment? 	N/A	Yes	Yes	Yes	Yes
<ul style="list-style-type: none"> No (or only minor) complaints by end-users that they do not have the possibility to use their own mobile equipment 	N/A	Yes	Yes	Yes	Yes
<ul style="list-style-type: none"> Other reasons? 	N/A	No	No	No	No

Source: BEREC

⁶³ i.e. the definition applies at least in principle to all fixed NTPs (there may be some exemptions)

⁶⁴ i.e. the location of the NTP is at point A or B (see Figure 2 and Annex 1)

⁶⁵ i.e. the definition applies at least in principle to all mobile NTPs (there may be some exemptions)

Table 18: Legal power of the NRA to define the location of the NTP in general (LU, MT, PL, PT, RO)

Country	Luxembourg	Malta	Poland	Portugal	Romania
Does the NRA have the legal power to define the location of the <u>fixed</u> NTP in general? ⁶⁶	Yes	No	No	Yes	Yes
The NRA did not define the location of the <u>fixed</u> NTP in general ⁶⁶ so far because of the following reasons:					
<ul style="list-style-type: none"> The location of the fixed NTP is typically at a point which allows end-users to use their own customer premises equipment and does not force them to use the equipment of the service provider?⁶⁷ 	Yes	N/A	N/A	No	Yes
<ul style="list-style-type: none"> No (or only minor) complaints by end-users that they do not have the possibility to use their own router/customer premises equipment? 	Yes	N/A	N/A	Yes	Yes
<ul style="list-style-type: none"> Other reasons? 	No	N/A	N/A	No	No
Does the NRA have the legal power to define the location of the <u>mobile</u> NTP in general? ⁶⁸	Yes	No	No	Yes	Yes
The NRA did not define the location of the <u>mobile</u> NTP in general ⁶⁸ so far because of the following reasons:					
<ul style="list-style-type: none"> The location of the mobile NTP is typically at a point which allows end-users to use their own mobile equipment? 	Yes	N/A	N/A	Yes	Yes
<ul style="list-style-type: none"> No (or only minor) complaints by end-users that they do not have the possibility to use their own mobile equipment 	Yes	N/A	N/A	Yes	Yes
<ul style="list-style-type: none"> Other reasons? 	No	N/A	N/A	No	No

Source: BEREC

⁶⁶ i.e. the definition applies at least in principle to all fixed NTPs (there may be some exemptions)

⁶⁷ i.e. the location of the NTP is at point A or B (see Figure 2 and Annex 1).

⁶⁸ i.e. the definition applies at least in principle to all mobile NTPs (there may be some exemptions)

Table 19: Legal power of the NRA to define the location of the NTP in general (SK, SI, ES, SE, UK)

Country	Slovakia	Slovenia	Spain	Sweden	United Kingdom
Does the NRA have the legal power to define the location of the <u>fixed</u> NTP in general? ⁶⁹	Yes	No	N/A	No	Yes
The NRA did not define the location of the <u>fixed</u> NTP in general ⁶⁹ so far because of the following reasons:					
<ul style="list-style-type: none"> The location of the fixed NTP is typically at a point which allows end-users to use their own customer premises equipment and does not force them to use the equipment of the service provider?⁷⁰ 	Yes	N/A	N/A	N/A	Yes
<ul style="list-style-type: none"> No (or only minor) complaints by end-users that they do not have the possibility to use their own router/customer premises equipment? 	Yes	N/A	N/A	N/A	Yes
<ul style="list-style-type: none"> Other reasons? 	No	N/A	N/A	N/A	No
Does the NRA have the legal power to define the location of the <u>mobile</u> NTP in general? ⁷¹	Yes	No	Yes	No	Yes
The NRA did not define the location of the <u>mobile</u> NTP in general ⁷¹ so far because of the following reasons:					
<ul style="list-style-type: none"> The location of the mobile NTP is typically at a point which allows end-users to use their own mobile equipment? 	Yes	N/A	Yes	N/A	Yes
<ul style="list-style-type: none"> No (or only minor) complaints by end-users that they do not have the possibility to use their own mobile equipment 	Yes	N/A	Yes	N/A	Yes
<ul style="list-style-type: none"> Other reasons? 	No	N/A	No	N/A	No

Source: BEREC

⁶⁹ i.e. the definition applies at least in principle to all fixed NTPs (there may be some exemptions)

⁷⁰ i.e. the location of the NTP is at point A or B (see Figure 2 and Annex 1).

⁷¹ i.e. the definition applies at least in principle to all mobile NTPs (there may be some exemptions)

Table 20: Definition of the term 'NTP' (AT, BE, BG, HR, CY, CZ, DK)

Country	Austria	Belgium	Bulgaria	Croatia	Cyprus	Czech Republic	Denmark
The term 'NTP' is defined in:							
• The national telecommunications act?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
• A different legal provision?	No	No	No	No	Yes, it is further defined in an order to the national telecommunications act ⁷²	No	No
The NTP definition is the same as in the Framework Directive (Art. 2(da))?	Yes	No	Yes	Yes	Yes for the telecommunications act. It is further defined in the regulation (see above)	Yes	No
If this is not the case:							
• Does it differ only slightly?	N/A	Yes	N/A	N/A	N/A	N/A	Yes
• What are the differences?	N/A	"end-user" instead of "subscriber" ⁷³	N/A	N/A	N/A	N/A	The definition is shorter ⁷⁴
• The term "NTP" applies to:							
• Retail services?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
• Wholesale services?	Yes	No	Yes	Yes	Yes	Yes	Yes

Source: BEREC

⁷² An order to the national telecommunications act ("In house wiring infrastructure Order" (P.I. 352/2015)) further defines the term 'NTP'. The purpose was to clearly define the location of the NTP which fulfils the right of communications operators to roll-out their communications infrastructure up to the NTP in buildings and to use existing access points and certain passive infrastructure.

⁷³ The definition of the term "NTP" in the Belgian Telecommunications Act uses the term "end-user" instead of the term "subscriber". "End-user" excludes operators and service providers.

⁷⁴ In Denmark, the definition of the term "NTP" in the national telecommunications act is shorter than in the Framework Directive. It does not include the word "public" and the last part of the sentence on "switching or routing".

Table 21: Definition of the term 'NTP' (EE, FI, FR, DE, GR, HU, IE)

Country	Estonia	Finland	France	Germany	Greece	Hungary	Ireland
The term 'NTP' is defined in:							
• The national telecommunications act?	Yes	No	Yes	Yes	Yes	Yes	No
• A different legal provision?	No	Yes, regulation.	No	No		No	Yes ⁷⁵
The NTP definition is the same as in the Framework Directive (Art. 2(da))?	Yes	Yes	Yes	Yes,	Yes	No	Yes
If this is not the case:							
• Does it differ only slightly?	N/A	N/A	N/A	N/A	N/A	No	N/A
• What are the differences?	N/A	N/A	N/A	N/A	N/A	A different term is used ⁷⁶	N/A
• The term "NTP" applies to:							
• Retail services?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
• Wholesale services?	Yes	Yes	Yes	Yes	No	No	Yes

Source: BEREC

⁷⁵ In the European Communities (Electronic Communications Networks and Services) (Framework) Regulations 2011 (SI 33 of 2011)

⁷⁶ In Hungary, the term "Subscriber access point", which is a specific type of NTP, is used for receiving retail telecommunication network services by the user or subscriber.

Table 22: Definition of the term 'NTP' (IT, LV, LT, LU, MT, NL, PL)

Country	Italy	Latvia	Lithuania	Luxembourg	Malta	Netherlands	Poland
The term 'NTP' is defined in:							
• The national telecommunications act?	Yes ⁷⁷	Yes	Yes	Yes	Yes	Yes	Yes
• A different legal provision?	No	No	No	No	No	Yes, guideline with additional explanations ⁷⁸	No
The NTP definition is the same as in the Framework Directive (Art. 2(da))?	Yes for fixed networks, further clarifications for mobile networks	No	Yes	Yes	Yes	Yes, definition in telecommunications act is the same. The guidelines provide further information.	Yes
If this is not the case:							
• Does it differ only slightly?	Yes	Yes	N/A	N/A	N/A	N/A	N/A
• What are the differences?	See footnote ⁷⁹	The second part of the definition is not included in the national law	N/A	N/A	N/A	N/A	N/A
The term "NTP" applies to:							
• Retail services?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
• Wholesale services?	Yes	Yes	Yes	Yes	Yes	No	Yes

Source: BEREC

⁷⁷ In the Legislative Decree 1 August 2003 n. 259, art. 1(1)(v)

⁷⁸ The guidelines provide additional explanations of the definition of the NTP in the national Telecommunications Act. The guidelines are currently consulted by the Ministry of Economic Affairs and Climate Policy ("beleidsregel inzake de uitleg van het begrip netwerkaansluitpunt als bedoeld in artikel 1.1 van de Telecommunicatiewet (Beleidsregel netwerkaansluitpunt)")

⁷⁹ For mobile networks, it is clarified additionally that NTP is defined as the stationary antenna to which a mobile device connects via radio signal (the base station).

Table 23: Definition of the term 'NTP' (PT, RO, SK, SI, ES, SE, UK)

Country	Portugal	Romania	Slovakia	Slovenia	Spain	Sweden	United Kingdom
The term 'NTP' is defined in:							
• The national telecommunications act?	Yes	Yes	Yes	Yes	Yes	Yes	No
• A different legal provision?	No	No	No	No	Yes, it is further defined in a regulation about telecom infrastructures in buildings	No	Yes
The NTP definition is the same as in the Framework Directive (Art. 2(da))?	Yes	Yes	Yes	Yes	Yes for the telecommunications act. It is further defined in the regulation (see above)	Yes	Yes
If this is not the case:							
• Does it differ only slightly?	N/A	N/A	N/A	N/A	N/A	N/A	N/A
• What are the differences?	N/A	N/A	N/A	N/A	N/A	N/A	N/A
The term "NTP" applies to:							
• Retail services?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
• Wholesale services?	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Source: BEREC

Table 24: Complaints of market players about the current situation on the NTP location (AT, BE, BG, HR, CZ, DK)

Country	Austria	Belgium	Bulgaria	Croatia	Czech Republic	Denmark
Did or do market players (incl. end-users) complain about the current situation on the NTP location?	Only minor complaints by end-users	Yes	No	No	No	No
If this is the case:						
• Which type of market players?	N/A	ANOs and end-users	N/A	N/A	N/A	N/A
• What did or do they complain about?	N/A	<ul style="list-style-type: none"> • ANOs:⁸⁰ certification needs to be limited to the absolute minimum • End-users:⁸¹ No free modem choice 	N/A	N/A	N/A	N/A
• How many?	N/A	<ul style="list-style-type: none"> • ANOs: 1 • End-users: 3 	N/A	N/A	N/A	N/A
• Did these complaints be resolved?	N/A	Yes	N/A	N/A	N/A	N/A
• If this is the case, how?	N/A	<ul style="list-style-type: none"> • End-user: BIPT explained the need for certification testing • ANOs: BIPT analysed the certification process and a certification “light” was included in the reference offer 	N/A	N/A	N/A	N/A

Source: BEREC

⁸⁰ ANOs are allowed to use own CPEs/modems at the wholesale level (wholesale access products on Markets 3a and 3b) but only CPEs/modems which are certified and on a white list.

⁸¹ ANOs offer on a voluntarily basis retail services with an NTP at point A but end-users are only allowed to use CPEs/modems of the white list.

Table 25: Complaints of market players about the current situation on the NTP location (EE, FI, FR, GR, HU, IE)

Country	Estonia	Finland	France	Greece	Hungary	Ireland
Did or do market players (incl. end-users) complain about the current situation on the NTP location?	Yes	No	No	No	No	No
If this is the case:						
• Which type of market players?	End-users	N/A	N/A	N/A	N/A	N/A
• What did or do they complain about?	NTP is not sufficiently near to the end-user's house ⁸²	N/A	N/A	N/A	N/A	N/A
• How many?	Few, maybe up to 10 in one year.	N/A	N/A	N/A	N/A	N/A
• Did these complaints be resolved?	NRA does not resolve end-users complaints ⁸³	N/A	N/A	N/A	N/A	N/A
• If this is the case, how?	Usually rural end-users can choose some mobile operator services, if fixed networks are not near their houses. ⁸⁴	N/A	N/A	N/A	N/A	N/A

Source: BEREC

⁸² Sometimes end-users in rural areas without connection to any fixed networks are not satisfied, that NTP is not sufficiently near to their house, because line from NTP to house belong generally to end-users and end-users have to pay to establish this line. If distance between NTP and house is long, line establishment costs are quite high.

⁸³ Also universal service obligation is not fixed in Estonia.

⁸⁴ Estonia has good mobile service coverage (also LTE coverage).

Table 26: Complaints of market players about the current situation on the NTP location (LT, LU, MT, PL, PT, RO)

Country	Lithuania	Luxembourg	Malta	Poland	Portugal	Romania
Did or do market players (incl. end-users) complain about the current situation on the NTP location?	No	No	No	No	Not known	No
If this is the case:						
• Which type of market players?	N/A	N/A	N/A	N/A	N/A	N/A
• What did or do they complain about?	N/A	N/A	N/A	N/A	N/A	N/A
• How many?	N/A	N/A	N/A	N/A	N/A	N/A
• Did these complaints be resolved?	N/A	N/A	N/A	N/A	N/A	N/A
• If this is the case, how?	N/A	N/A	N/A	N/A	N/A	N/A

Source: BEREC

Table 27: Complaints of market players about the current situation on the NTP location (SK, SI, SE, UK)

Country	Slovakia	Slovenia	Sweden	United Kingdom
Did or do market players (incl. end-users) complain about the current situation on the NTP location?	No	Yes, in the past for bitstream service	No	No
If this is the case:				
• Which type of market players?	N/A	Access seekers	N/A	N/A
• What did or do they complain about?	N/A	Usage of their own equipment	N/A	N/A
• How many?	N/A	Few	N/A	N/A
• Did these complaints be resolved?	N/A	Yes	N/A	N/A
• If this is the case, how?	N/A	ISPs resolved the problem by themselves	N/A	N/A

Source: BEREC

Annex 3: Basic data used in section 3

Table 28: Legal instrument chosen by the national authority to define the NTP location – part 1 (CY, DE, IT)

Country	Cyprus	Germany	Italy
Which legal instrument did the national authority choose to define the NTP location?	Order	Telecommunications Act ⁸⁵	Government Legislative Decree and binding decision ⁸⁶
Which national authority applied this legal instrument?	NRA	Parliament	<ul style="list-style-type: none"> Legislative Decree: Parliament Decision: NRA
When did the national authority adopt this legal instrument?	2015	23 January 2016	<ul style="list-style-type: none"> Legislative Decree: 2003, amended in 2009 (Transposition of the Framework Directive) Decision: August 2018
The legal instrument is of which type:			
<ul style="list-style-type: none"> A national law (e.g. national telecommunications act)? 	No	Yes	Yes, Government Legislative Decree
<ul style="list-style-type: none"> A regulation (e.g. based on the national telecommunications act)? 	Yes "In-house wiring infrastructure Order (P.I. 352/2015)"	No	No
<ul style="list-style-type: none"> Guidelines (e.g. which clarify the NTP location based on existing legal provisions)? 	No	No	Yes, NRA Decision
<ul style="list-style-type: none"> Other? 	No	No	No
In case the NTP was not defined by law, what is the legal basis of the instrument chosen by the national authority to define the NTP location?	N/A	N/A	N/A

Source: BEREC

⁸⁵ Originally in combination with the Law on Radio Equipment and Telecommunications Terminal Equipment (FTEG)

⁸⁶ The NRA published the decision (348/18/CONS), which is mandatory for all operators, on some practical and regulatory aspects related to the implementation of Regulation (EU) 2015/2120 with further information or explanation of the fixed NTP location.

Table 29: Legal instrument chosen by the national authority to define the NTP location – part 1 (LV, NL)

Country	Latvia	Netherlands
Which legal instrument did the national authority choose to define the NTP location?	National Law and regulation ⁸⁷	Telecommunications Act and Concept Guidelines ⁸⁸
Which national authority applied this legal instrument?	<ul style="list-style-type: none"> National Law: Parliament Regulation: Cabinet of Ministries 	<ul style="list-style-type: none"> Telecommunications Act: Parliament Guidelines (planned therefore concept): Ministry of Economic Affairs and Climate Policy
When did the NA adopt this legal instrument?	National law: 2001 Regulation: 2006	The Concept Guidelines are being publicly consulted ⁸⁹
The legal instrument is of which type:		
<ul style="list-style-type: none"> A national law (e.g. national telecommunications act)? 	Yes	Yes
<ul style="list-style-type: none"> A regulation (e.g. based on the national telecommunications act)? 	Yes (The legal act issued by the Cabinet of Ministries)	No
<ul style="list-style-type: none"> Guidelines (e.g. which clarify the NTP location based on existing legal provisions)? 	No	Yes
<ul style="list-style-type: none"> Other? 	No	N/A
In case the NTP was not defined by law, what is the legal basis of the instrument chosen by the national authority to define the NTP location?	N/A	Institutional law of with regards to the guidelines ⁹⁰

Source: BEREC

⁸⁷ National law (year 2001) defines NTP. Possibilities of NTP location are described in legal act issued by the Cabinet of Ministries (year 2006).

⁸⁸ On the definition of network termination point in the telecommunications act.

⁸⁹ Information provided in the tables are based on what is consulted and the policy goal behind it. In so far positions of stakeholders are mentioned these were collected during pre-consultation period. View of stakeholders may therefore change.

⁹⁰ The institutional law of the Netherlands allows the ministry to issue guidelines how to explain certain regulation like the definition of the NTP.

Table 30: Legal instrument chosen by the national authority to define the NTP location – part 2 (CY, DE, IT)

Country	Cyprus	Germany	Italy
The main reasons why the national authority defined the NTP location are:			
• To provide clarity for all market players on the NTP location and eliminate uncertainties?	Yes	Yes	Yes
• To respond to significant complaints by market players (e.g. end-users)	No	Yes	Mobile NTP: No Fixed NTP: Yes ⁹¹
• To enable end-users to use the TTE of their choice?	No ⁹²	Yes	Mobile NTP: No Fixed NTP: Yes
• Others?	No	No	No

Source: BEREC

Table 31: Legal instrument chosen by the national authority to define the NTP location – part 2 (LV, NL)

Country	Latvia	Netherlands
The main reasons for the definition of the NTP location are:		
• To provide clarity for all market players on the NTP location and eliminate uncertainties?	Yes	Yes
• To respond to significant complaints by market players (e.g. end-users)	No	Yes
• To enable end-users to use the TTE of their choice?	Yes	Yes
• Others?	No	Yes ⁹³

Source: BEREC

⁹¹ There are some complaints to enforce the Regulation (EU) 2015/2120 more clearly.

⁹² The main motivation for the definition of the NTP location was to clarify the demarcation line between the network infrastructure (cable) of the public network and the private in-building network infrastructure. The definition does not affect the right of end-users to use their own CPE/modem.

⁹³ Network safety due to diversity (more diversity less sensitive for leaks and vulnerabilities. Only 1 type of equipment and 1 known leak in that device and every user is then vulnerable). Furthermore, to break the trend of operators entering behind the door of users (privacy) by issuing propriety equipment for all kind of OTT services. For instance operator specific set-up boxes and recording facilities.

Table 32: Legal instrument chosen by the national authority to define the NTP location – part 3 (CY, DE, IT)

Country	Cyprus	Germany	Italy
Did all market players accept that the national authority has the legal power to define the NTP location?	Yes	Yes	<ul style="list-style-type: none"> Legislative Decree: Yes NRA Decision: Yes
If this is not the case:			
<ul style="list-style-type: none"> Which type of market players did not accept this? 	N/A	N/A	N/A
<ul style="list-style-type: none"> What were the counter arguments of the NA? 	N/A	N/A	N/A
Did the market players accept the legal instrument of the NA or did some appeal against it?	Yes, they accept it	Yes, they accept it	<ul style="list-style-type: none"> Legislative Decree: Yes, they accept it NRA Decision: Yes
If (a) market player(s) appealed against it:			
<ul style="list-style-type: none"> Which type of market player(s)? 	N/A	N/A	N/A
<ul style="list-style-type: none"> Did the appeal court accept the decision of the NA or is the case still pending? 	N/A	N/A	N/A
<ul style="list-style-type: none"> What were the main positions and arguments against the legal instrument of the NA? 	N/A	N/A	N/A
<ul style="list-style-type: none"> What were the main counter arguments of the NA against these positions/arguments? 	N/A	N/A	N/A

Source: BEREC

Table 33: Legal instrument chosen by the national authority to define the NTP location – part 3 (LV, NL)

Country	Latvia	Netherlands
Did all market players accept that the national authority has the legal power to define the NTP location?	Yes	Not yet known (guidelines are currently in the consultation phase)
If this is not the case:		
• Which type of market players did not accept this?	N/A	N/A
• What were the counter arguments of the NA?	N/A	N/A
Did the market players accept the legal instrument of the NA or did some appeal against it?	Yes, they accept it	Not yet known (guidelines are currently in the consultation phase)
If (a) market player(s) appealed against it:		
• Which type of market player(s)?	N/A	N/A
• Did the appeal court accept the decision of the NA or is the case still pending?	N/A	N/A
• What were the main positions and arguments against the legal instrument of the NA?	N/A	N/A
• What were the main counter arguments of the NA against these positions/arguments?	N/A	The ministry has the legal power to issue guidelines ⁹⁴

Source: BEREC

⁹⁴ In the Netherlands, the ministry is responsible for implementing EU directives and it is clear that it has the legal power to issue guidelines which the NRA (ACM) has to act accordingly to. Only a court decision on a decision of the NRA (ACM) might be the possibility to attack those guidelines..

Table 34: Approach used by the national authority to define the NTP location (CY, DE, IT)

Country	Cyprus	Germany	Italy
Which stakeholders were involved in the process of the definition of the NTP location:			
• Network operators?	Yes	Yes	Yes All
• Service providers?	Yes	Yes	Yes
• CPE manufacturers?	No	Yes	Yes
• Consumers?	No	Yes	Yes
• Others?			Yes (associations)
How were the stakeholders involved:			
• The NA held a public consultation at national level and stakeholders had the possibility to submit comments?	Yes	Yes	Yes as part of the open legislative process
• The NA held workshops with stakeholders and they had the possibility to communicate their views?	No	No	No
• Other involvements?	No	No	No
Please describe in detail the approach the national authority used to define the NTP location	See footnote ⁹⁵	See footnote ⁹⁶	Technical public bodies proposal, interaction with stakeholders during the legislative process.

Source: BEREC

⁹⁵ The NTP term is part of the “In house wiring” Order. The whole document was prepared by a technical committee, where network operators have actively participated. Then a public consultation was carried out.

⁹⁶ The point of departure were the free choice of TTE stated in directive 2008/63/EC and consumer complaints on its factual limitation by network operators. Investigations took place whether there were compelling reasons for allowing network operators to limit that freedom of choice, and whether these concerns could be addressed in other ways than by limiting the choice of terminal equipment. It was found that the combination of existing obligations in civil law on the part of the network operators’/service providers’ end users, the legal ability of the network operator to disconnect equipment harming the network and the ability of the network operator to state the technical requirements for terminal equipment in its NTP/interface description were sufficient to ensure interoperability and safety. This applied to networks of all technologies, so that the principle of technological neutrality could be upheld.

Table 35: Approach used by the national authority to define the NTP location (LV, NL)

Country	Latvia	Netherlands
Which stakeholders were involved in the process of the definition of the NTP location:		
• Network operators?	Yes	Yes (pre consultation and consultation)
• Service providers?	Yes	Yes (only consultation)
• CPE manufacturers?	No	Yes (pre consultation and consultation)
• Consumers?	Yes	Yes (only consultation)
• Others?	No	Yes, NRA, Ministry of internal affairs (safety), Agentschap Telecom ⁹⁷
How were the stakeholders involved:		
• The NA held a public consultation at national level and stakeholders had the possibility to submit comments?	Yes	Yes
• The NA held workshops with stakeholders and they had the possibility to communicate their views?	Yes	Yes
• Other involvements?	No	No
Please describe in detail the approach the national authority used to define the NTP location	See footnote ⁹⁸	See footnote ⁹⁹

Source: BEREC

⁹⁷ Agency of Ministry of Economic Affairs and Climate responsible for spectrum supervision and (radio) equipment fulfilling RTTE directive demands supervision.

⁹⁸ The document was based on practical experience of the working group participants. To determine the NTP location the equipment and cable ownership was considered.

⁹⁹ First the national authority held discussions with manufacturers, providers and NRA. National authority did also speak with German Ministry to learn from their experiences in creating freedom of choice of modem routers. Then the national authority organized a consultaion based on draft guidelines explaining the definition of NTP and in effect designated modem/routers as end user equipment. Consultation is still pending.

Table 36: Main positions and arguments of the stakeholders brought before the national authority when it defined the NTP location (CY, DE)

Country	Cyprus	Germany
What were the main positions and arguments brought before the NA when it defined the NTP location of the:		
• Network operators?	N/A ¹⁰⁰	Several network operators, especially cable and FTTB/H operators, stated that in their networks, control of the modem functionality was necessary to ensure control of their network and to ensure quality of service, especially concerning fault repair and updating software. They argued for an NTP at point B or C.
• Service providers?	N/A ¹⁰⁰	
• CPE manufacturers?	N/A ¹⁰⁰	Manufacturers generally favoured a definition of the NTP at point A to have the broadest customer base possible for their equipment and to secure some independence from network operators.
• Consumers?	N/A ¹⁰⁰	Consumers favoured a definition of the NTP at point A to have the broadest choice of equipment. Some voiced also concerns on data protection and privacy if the NTP were located at point B or C.
• Other stakeholders?	N/A ¹⁰⁰	No
Was it possible to reach consensus (Yes/No)?	N/A ¹⁰⁰	No
If this was the case, how?	N/A ¹⁰⁰	N/A
If this was not the case, what were the main arguments of the national authority when it defined the NTP location?	N/A ¹⁰⁰	It was found that the combination of existing obligations in civil law on the part of the end users, the legal ability of the network operator to disconnect equipment harming the network and the ability of the network operator to state the technical requirements for terminal equipment in its NTP/interface description were sufficient to ensure interoperability and safety.

Source: BEREC

¹⁰⁰ The main reasons why the national authority defined the NTP location are to provide clarity for all market players on the NTP location and eliminate uncertainties and not to enable end-users to use the TTE of their choice (see Table 30Table 28). It was clear from the beginning that the in-building network is private and not public infrastructure and it was "only" necessary to make clear where the public infrastructure ends and where the private begins.

Table 37: Main positions and arguments of the stakeholders brought before the national authority when it defined the NTP location (IT, LV)

Country	Italy	Latvia
What were the main positions and arguments brought before the NA when it defined the NTP location of the:		
<ul style="list-style-type: none"> • Network operators? 	Most operators want to be able to provide integrated offers (connectivity + modem) for scaling, reduced operational expenses, better performance and security. Some "own modem" offers already exist in the market, but they are taken up by <1% customers.	Choosing and defining equipment and cable ownership options
<ul style="list-style-type: none"> • Service providers? 		Choosing and defining equipment and cable ownership options
<ul style="list-style-type: none"> • CPE manufacturers? 	There is no reason to limit users' choice of terminals.	N/A
<ul style="list-style-type: none"> • Consumers? 	There is no reason to limit users' choice of terminals.	Choosing and defining equipment and cable ownership options
<ul style="list-style-type: none"> • Other stakeholders? 	No	N/A
Was it possible to reach consensus (Yes/No)?	No	Yes
If this was the case, how?	N/A	The arguments were the same.
If this was not the case, what were the main arguments of the national authority when it defined the NTP location?	Based on the legal framework of reference, EU and national legislation, in-depth analysis, public consultation and market situation, the modem/router is intended as an independent user terminal regardless of the fact that it integrates increasingly evolved functions in the same device	N/A

Source: BEREC

Table 38: Main positions and arguments of the stakeholders brought before the national authority when it defined the NTP location (NL)

Country	Netherlands
What were the main positions and arguments brought before the NA when it defined the NTP location of the:	
<ul style="list-style-type: none"> Network operators? 	Based on pre-consultation: <ol style="list-style-type: none"> Network safety Disruption of services Not allowed to disconnect/refuse non-compatible equipment Special services make use of propriety standards Higher cost of end-user support.
<ul style="list-style-type: none"> Service providers? 	Consultation is still running, unknown if they have divergent arguments form network providers
<ul style="list-style-type: none"> CPE manufacturers? 	-EU law stipulates competition on end-user equipment -U.S., Germany are clear examples -Publication of specifications of NTP and services is important
<ul style="list-style-type: none"> Consumers? 	Consultation is still running, unknown if they have divergent arguments form network providers
<ul style="list-style-type: none"> Other stakeholders? 	Consultation is still running, unknown if they have divergent arguments form network providers
Was it possible to reach consensus (Yes/No)?	Pending, consultation is running
If this was the case, how?	Pending, consultation is running
If this was not the case, what were the main arguments of the national authority when it defined the NTP location?	Main arguments in pre-consultation phase: <ol style="list-style-type: none"> Network safety: diversity is safer, more danger in end-user equipment for OTT services like web cams, baby monitors, connected fridges etc. Free modem/router choice does not make these dangers worse or less. Disruption of services: Only equipment may be connected which works conform specification of NTP of operators/providers and applies to the EMC/RED directives. Not allowed to disconnect/refuse non-compatible equipment: Operators are allowed to disconnect or refuse equipment which disrupts the services of more users than only the service of the user connection such a device. Such a device is clearly not conform specifications of operator/provider and/or EMC/RED directives. Special services make use of propriety standards: Operator has to publish all specifications of used standards on the NTP to be able to use these services even if they are 'propriety'. Higher costs of end-user support: Support for giving installing settings had to be given already by law even for the possibility of freedom of choice of router/modem equipment. Support for using 3rd party equipment is the responsibility of the seller or manufacturer not the operator.

Source: BEREC

Table 39: Definition of the NTP location – part 1 (CY, DE)

Country	Cyprus	Germany
Please provide the full text of the definition of the NTP location provided in the legal instrument of the national authority	<p>NTP means:</p> <ul style="list-style-type: none"> In case of aerial access to the building, the termination point of the drop wire. In case of underground access to the building, the distributor component where the access cable is terminated. In practice, the NTP is the first distribution box inside the building where operators have to terminate their own cables irrespective of the technology used¹⁰¹ 	<p>The location of the NTP follows from the fact that it is defined as passive in section 45d para 1 TKG: <i>“The access to public telecommunication networks at fixed locations has to be installed at a suitable location agreed with the end user. This access is a passive network termination point; the public telecommunication network ends at the passive network termination point.”</i></p>
Is the fixed NTP location:		
• Exactly at point A?	No	Yes
• At a similar point to point A?	Yes	No
If it is at a similar point to point A:		
• Where is the fixed NTP location exactly?	See full text of the definition	N/A
• What is the difference to point A?	The telephone wall socket (TS) is not part of the physical location of the NTP, but TS area is connected to the physical location of the NTP. TS area is called equipment connection point.	N/A

Source: BEREC

¹⁰¹ The following principles apply: (i) The building owner/s is/are responsible to construct all required infrastructure within the building apart from the access cables to the building which are installed by fixed network operators. (ii) In-house wiring infrastructure belongs to the owner of the building apart from the access cable. The access cable is terminated at the first distribution box which is where the NTP is actually located. Thus the NTP is at a point at which no active equipment is between the NTP and the subscriber access line (similar to point A). The telephone wall socket though is located inside apartments and houses and this point is called equipment connection point. NTP and equipment connection point are connected with ducts. (iii) Access is available for all public deployed networks irrespective of technology used up to the network termination point where operators can access the in-house wiring. (iv) In case of fault repairs, fixed network operators are responsible for their own cables up to the NTP (1st distribution box). The rest is the responsibility of the building owner.

Table 40: Definition of the NTP location – part 1 (IT, LV)

Country	Italy	Latvia
Please provide the full text of the definition of the NTP location provided in the legal instrument of the national authority	Legislative Decree: The definition of the term “NTP” is the same as in the Framework Directive and, in addition, includes the following. <i>“For the mobile and personal communications services the NTP consists of the fixed antenna to which terminal equipment used by service users can be connected via radio.”</i> NRA Decision: regarding the NTP location it is placed at the socket wall. Any electrically powered equipment at the end user premises is not part of operator’s network.	In the legal act of Cabinet of Ministers the NTP location possibilities are defined in graphical way. NTP location depends on a specific case (depends on an ownership of equipment and cables) and therefore the different possibilities of NTP location are graphically described in the legal act. ¹⁰²
Is the fixed NTP location:		
• Exactly at point A?	Yes	No
• At a similar point to point A?	No	Yes (see below.)
If it is at a similar point to point A:		
• Where is the fixed NTP location exactly?	N/A	The fixed NTP location depends on the equipment and cable owner – possible NTP location points A, B, C, C1, C2. It is possible another NTP location points depending on the ownership of equipment and cable.
• What is the difference to point A?	N/A	N/A

Source: BEREC

¹⁰² In case network operators/service providers offer their retail customers the possibility to use (i) their own modem and router, then the NTP is at point A; (ii) their own router (not modem), then the NTP is at point B; and (iii) if the retail customers have to use modem and router from the network operator/service provider the location of the NTP is at point C. The end-users do not have any legal right that they can use their own modem and/or router, however, in practice network operators/service providers offer them this possibility (not in case of fibre modems) because of economic reasons. If they do not do this then they may lose (some) retail customers and their retail customers go to another network operator/service provider who offer this possibility.

Table 41: Definition of the NTP location – part 1 (NL)

Country	Netherlands
Please provide the full text of the definition of the NTP location provided in the legal instrument of the national authority	<p>Summary:</p> <ul style="list-style-type: none"> • Fixed NTP is passive, no equipment that needs power from local mains of users • Mobile NTP: the airwaves, any equipment used on the location of the user is end-user equipment. • Exceptions are: equipment solely used for encryption means (decoding smartcards for TV bundles or mobile operator SIM). Embedded SIM's are not solely for encryption and access means, they have additional functionality. <p>Full text, Article 1:</p> <ol style="list-style-type: none"> 1. A network termination point is a physical point that forms the boundary of a public electronic communications network, and to which, at the location of the subscriber, a device or radio communications device must be connected in order to be able to use an electronic communication service. 2. From the perspective of the public electronic communications network, the network termination point is located in front of any device or radio communications device that is connected to the public electronic communications network, and which, under this article, is not part of this public network. Any other device or radio communications device that, from the perspective of the public electronic communications network, is located behind the former device or radio communications device subsequently is not part of the public electronic communications network. 3. If a public electronic communications network uses a wired connection at the location of the subscriber, any device or radio communication device at the location of the subscriber that has as its purpose to communicate with this network is not part of the public electronic communications network if it uses a power source other than a power source supplied by said public electronic communications network. 4. If a public electronic communications network uses a wireless connection at the location of the subscriber, any device or radio communication device at the location of the subscriber that has as its purpose to communicate with this network is not part of the public electronic communications network. 5. In derogation from paragraphs 2, 3, and 4, to the public electronic communications network also belongs any device or radio communications device that has an exclusive identification, authentication or security function belonging to a specific public electronic communications network in connection with granting access to a public electronic communications network or a public electronic communications service.
Is the fixed NTP location:	
• Exactly at point A?	Yes
• At a similar point to point A?	No
If it is at a similar point to point A:	
• Where is the fixed NTP location exactly?	N/A
• What is the difference to point A?	N/A

Source: BEREC

Table 42: Definition of the NTP location – part 2 (CY, DE, IT)

Country	Cyprus	Germany	Italy
According to the definition of the mobile NTP location, the mobile NTP is:			
At a point which allows end-users to use their own mobile equipment (e.g. mobile phone) with removable SIM card?	N/A	N/A	Yes
At a point which allows end-users to use their own mobile equipment (e.g. IoT device) with non-removable SIM card (embedded SIM)?	N/A	N/A	Yes
The definition of the NTP location of the national authority applies to:			
• All or only some networks?	All operators that deploy fixed network infrastructures.	All	All
• All or only some service providers?	All	All	All
• All or only some retail services?	All	Yes	All
• Residential and business customers?	Yes	Yes	All
• All, some or no wholesale services?	All	All	All
• All media of the subscriber access line (e.g. copper, fibre, coax, air)?	Yes	Yes	All
• All access technologies (e.g. ADSL, VDSL2, GPON, DOCSIS) or are some exempted (e.g. VDSL2 vectoring, G.fast)?	All. No exemptions apply yet (VDSL2 vectoring and GFast technologies have not been implemented yet)	Yes	All

Source: BEREC

Table 43: Definition of the NTP location – part 2 (LV, NL)

Country	Latvia	Netherlands
According to the definition of the mobile NTP location, the mobile NTP is:		
At a point which allows end-users to use their own mobile equipment (e.g. mobile phone) with removable SIM card?	Yes	Yes
At a point which allows end-users to use their own mobile equipment (e.g. IoT device) with non-removable SIM card (embedded SIM)?	Yes	Yes
The definition of the NTP location of the national authority applies to:		
• All or only some networks?	All	All
• All or only some service providers?	All	All
• All or only some retail services?	All	All
• Residential and business customers?	Yes	Yes
• All, some or no wholesale services?	All	None, is retail regulation.
• All media of the subscriber access line (e.g. copper, fibre, coax, air)?	All	All
• All access technologies (e.g. ADSL, VDSL2, GPON, DOCSIS) or are some exempted (e.g. VDSL2 vectoring, G.fast)?	All	All

Source: BEREC

Table 44: Conformity of the definition of the NTP location with the legal provisions (CY, DE, IT)

Country	Cyprus	Germany	Italy
Did market players argue that the definition of the fixed NTP location at point A (or similar point) is not consistent with existing legal provisions at the EU and/or national level (Yes/No)?	No	Yes	No
If this was the case:			
• Which type of market players? ¹⁰³	N/A	Cable operators	N/A
• Which legal provision(s) did they identify as contradictory to the definition of the fixed NTP location at point A?	N/A	The definition of the NTP as the border of the network as such.	N/A
• What were their arguments for the contradiction(s)?	N/A	There were complaints that the definition of the NTP as passive did not take into account that cable networks are shared media in which end-users do not have a dedicated subscriber line/medium, and that they can only be addressed via the modem. The NTP of cable networks must therefore be the modem/point B or router/point C.	N/A
• What were the counter arguments of the NA?	N/A	Any requirement of the network operator could be met by a suitable definition of the NTP/ interface requirements of its network which the CPE manufacturers have to comply with.	N/A

Source: BEREC

¹⁰³ E.g. network operators, service providers, CPE manufacturers, consumer representatives, end-users

Table 45: Conformity of the definition of the NTP location with the legal provisions (LV, NL)

Country	Latvia	Netherlands
Did market players argue that the definition of the fixed NTP location at point A (or similar point) is not consistent with existing legal provisions at the EU and/or national level (Yes/No)?	No	Pending, consultation is still running
If this was the case:		
• Which type of market players? ¹⁰⁴	N/A	N/A
• Which legal provision(s) did they identify as contradictory to the definition of the fixed NTP location at point A?	N/A	N/A
• What were their arguments for the contradiction(s)?	N/A	N/A
• What were the counter arguments of the NA?	N/A	N/A

Source: BEREC

¹⁰⁴ E.g. network operators, service providers, CPE manufacturers, consumer representatives, end-users

Table 46: CPEs/modems end-users can use – part 1 (CY, DE, IT, LV, NL)

Country	Cyprus	Germany	Italy	Latvia	Netherlands
End-users are legally allowed to use the following CPEs/modems:					
• CPEs/modems which fulfil the characteristics of the NTP defined by the network operator and/or service provider?	Yes ¹⁰⁵	Yes	Yes	No	Yes
• CPEs/modems which are listed in a white list?	No	No	No	Yes ¹⁰⁶	No ¹⁰⁷
If this is the case, do consumer representatives, end-users or CPE manufacturers have the possibility to add CPEs/modems to the white list?	N/A	N/A	N/A	No	
• CPEs/modems which are certified for connection with the access network operator? If “Yes”, is this a voluntary or mandatory certification scheme?	No	No ¹⁰⁸	No	No	Yes, if certification scheme is really voluntary ¹⁰⁹ .
• Other CPEs/modems?	No	No	Yes ¹¹⁰	Modems sold by operators ¹⁰⁶	Yes ¹¹⁰ .

Source: BEREC

¹⁰⁵ Although end-users have this legal right, in practice, most of them use the modem/router provided by the network operator/service provider since these are included in the service.

¹⁰⁶ The end-user can use a CPE/modem from the white list or a CPE/modem sold by the operators in case a service provider offers this possibility.

¹⁰⁷ White listing is not allowed, creates an entry barrier for manufacturers to have modems certified by every network operator using a whitelist

¹⁰⁸ Manufacturers have the possibility to label their products in order to indicate to their customers with which networks the equipment interworks properly, however, end-users are allowed to use also CPEs/modems which do not have such a label.

¹⁰⁹ i.e. if it is not an entry barrier for manufacturers and provides transparency for customers which equipment interworks with which networks

¹¹⁰ As long as the CPEs/modem fulfils the characteristics of the NTP defined by the network operator and/or service provider and is built according to the EMC/RED directive rules.

Table 47: CPEs/modems end-users can use – part 2 (CY, DE, IT)

Country	Cyprus	Germany	Italy
Did end-users (or other market players) complain that they do not legally have the possibility to use the CPE/modem of their choice?	Limited number of cases ¹¹¹	Yes, prior the amendment of the Telecommunications Act which further defined the fixed NTP location in January 2016	TSM regulation complemented with NRA decision 348/18/CONS
If this was the case:			
• Which type of market players?	End-users, terminal equipment supplier	End-user, CPE-manufacturers	CPE manufacturers, consumers
• What did they complain about:			
○ End-users can only use CPEs/modems of a white list?	No	Yes	No
○ End-users can only use CPEs/modems which are certified for connection with the access network operator?	No	No	No
○ Other complaints?	<ul style="list-style-type: none"> • Denial of the network operator to connect private terminal equipment to the NTP without using operator's modem • Request of end users to use their own terminal equipment (modem) on the NTP 	That they could only use CPE provided by the network operator	Some complaints to enforce the TSM regulation more clearly
• How were these complaints resolved?	NRA clarified to all interested parties the existing legislation that obliges network operators to publish the characteristics of their network interfaces so that end-users are able to use their own equipment to have access to the services	Amendment of the Telecommunications Act (Jan. 2016)	TSM regulation complemented with NRA decision 348/18/CONS

Source: BEREC

¹¹¹ However, these complaints are not related to the preparation and publication of the In-house wiring infrastructure Order but were submitted at a different time.

Table 48: CPEs/modems end-users can use – part 2 (LV, NL)

Country	Latvia	Netherlands
Did end-users (or other market players) complain that they do not legally have the possibility to use the CPE/modem of their choice?	No	Yes
If this was the case:		
<ul style="list-style-type: none"> Which type of market players? 	N/A	<ul style="list-style-type: none"> Only end-users. No wholesale complaints
<ul style="list-style-type: none"> What did they complain about: 	N/A	
<ul style="list-style-type: none"> End-users can only use CPEs/modems of a white list? 	N/A	No
<ul style="list-style-type: none"> End-users can only use CPEs/modems which are certified for connection with the access network operator? 	N/A	No
<ul style="list-style-type: none"> Other complaints? 	N/A	End-users can only use CPEs/modems which are issued by the provider
<ul style="list-style-type: none"> How were these complaints resolved? 	N/A	Resolution is pending on the outcome of the consultation and publication of the guidelines.

Source: BEREC

Table 49: Publication of the NTP characteristics (CY, DE, IT, LV, NL)

Country	Cyprus	Germany	Italy	Latvia	Netherlands
Do the characteristics of the NTPs have to be published?	Yes	Yes	Yes	Yes ¹¹²	Yes
If this is the case, which organisation has the obligation to publish the characteristics of the NTP:					
• The NRA?	No	No	No	No	No
• Another national authority (e.g. ministry)?	No	No	ISCOM ¹¹³ publishes the technical specification	No	No
• Network operators?	Yes	Yes ¹¹⁴	No	Yes (all)	Yes, all ¹¹⁵
• Service providers?	Yes	No	No	Yes ¹¹⁶	Yes, all ¹¹⁵
• Other organisations?	No	No	No	No	No
In case the NRA or another national authority has to publish the characteristics of the NTP, do the following organisations have the obligation to provide this information to them:					
• Network operators?	N/A	Network operators have to provide information to the NRA about the publication	Yes All	Yes (All)	N/A
• Service providers?	N/A	No	Yes All	Yes ¹¹⁶	N/A
• Other organisations?	N/A	No	No	No	N/A

Source: BEREC

¹¹² Requirement to publish characteristics of NTPs has been included into National Law. As the Directive 99/5/EC has lost force 12th of June year 2016, the requirement to publish characteristics of NTPs has been also removed from the national law, because mentioned law requirement was based on the Directive 99/5/EC reference. It is planned to include renewed requirement to publish physical characteristics of NTPs into National Law, adding the reference to Directive 2008/63/EC.

¹¹³ Istituto superiore delle comunicazioni, a technical body connected with the Ministry of Economic Development

¹¹⁴ Publication in BNetzA Gazette, see § 41 c TKG

¹¹⁵ In order to enable manufacturers to develop equipment and customers to install the end-user equipment of their choosing

¹¹⁶ Which have an impact to NTP characteristics

Table 50: Interoperability between public network and CPE/modem (CY, DE)

Country	Cyprus	Germany
Why was it considered to be possible that interoperability between the CPEs/modems of the end-users and the network of the (access network operator and the) service provider can be ensured?	Network Operator publish the characteristics of their interfaces and if a terminal equipment is causing any technical malfunctions, the network operator may request from the NRA to allow disconnection of the terminal equipment from the network (provision in Telecommunication's Act)	Any requirement of the network operator could be met by a suitable definition of the NTP/interface requirements of its network which the CPE manufacturers have to comply with.
Do network operators use rather recently (or non) standardised and/or complex access technologies (e.g. VDSL2 vectoring, G.fast)?	No	Yes
If this is the case, why was it considered to be possible that interoperability can also be ensured in these cases?	N/A	Suitable definition of the NTP/interface requirements ¹¹⁷
In practice, were there any issues with regard to interoperability?	No	No, at least not yet. ¹¹⁸
If in practice there were issues with regard to interoperability:		
• How many and how often?	N/A	N/A
• What were the issues?	N/A	N/A
• Did market players complain about these issues?	N/A	N/A
If this is the case, which type of market players?	N/A	N/A
• How were these problems resolved?	N/A	N/A

Source: BEREC

¹¹⁷ The technical requirements for compatibility with vectoring technology can be stated in a suitable definition of the NTP/interface requirements of its network which the CPE manufacturers have to comply with. There is no need to preclude CPE manufacturers from offering compliant CPEs to the customers of a network operator.

¹¹⁸ In some cases, it is difficult to establish whether an interoperability issue results from faults in the network, the CPE or the behaviour of the end-user. The number of these cases is however very small.

Table 51: Interoperability between public network and CPE/modem (IT, LV)

Country	Italy	Latvia
Why was it considered to be possible that interoperability between the CPEs/modems of the end-users and the network of the (access network operator and the) service provider can be ensured?	Because they are standardised. All CPEs/modems must comply with standards from official technical bodies.	N/A
Do network operators use rather recently (or non) standardised and/or complex access technologies (e.g. VDSL2 vectoring, G.fast)?	Yes	Yes
If this is the case, why was it considered to be possible that interoperability can also be ensured in these cases?	CPEs/modems have to comply with standards	CPEs/modems are listed in a white list or end-user can chose modem, from those that are sold by operators
In practice, were there any issues with regard to interoperability?	NRA Decision entered into force only rather recently (August 2018)	No
If in practice there were issues with regard to interoperability:		
• How many and how often?	N/A	N/A
• What were the issues?	N/A	N/A
• Did market players complain about these issues?	N/A	N/A
If this is the case, which type of market players?	N/A	N/A
• How were these problems resolved?	N/A	N/A

Source: BEREC

Table 52: Interoperability between public network and CPE/modem (NL)

Country	Netherlands
Why was it considered to be possible that interoperability between the CPEs/modems of the end-users and the network of the (access network operator and the) service provider can be ensured?	Proper publication of specifications by providers
Do network operators use rather recently (or non) standardised and/or complex access technologies (e.g. VDSL2 vectoring, G.fast)?	Yes ¹¹⁹
If this is the case, why was it considered to be possible that interoperability can also be ensured in these cases?	It depends on the willingness of manufacturers to build equipment to cope with such deviations. ¹²⁰
In practice, were there any issues with regard to interoperability?	N/A. Still in consultation phase, unknown ¹²¹
If in practice there were issues with regard to interoperability:	
• How many and how often?	N/A
• What were the issues?	N/A
• Did market players complain about these issues?	N/A
If this is the case, which type of market players?	N/A
• How were these problems resolved?	N/A

Source: BEREC

¹¹⁹ The large majority uses standardised technologies, however some deviations have been detected like a different implementation of VoB services than the rather default SIP standard regarding authentication and security. Digital Rights Management (DRM) systems are not really standardised yet, there are 2 to 3 major types of implementations. A DRM system is a kind of a public key encryption system used e.g. between a media box at the customer premises and the public network in order to copyright protect the signals.

¹²⁰ Regarding DRM it is possible to implement more than one 'standard' of DRM in a device.

¹²¹ However there was recently a case of 'illegal modems' on a cable network. Criminals with knowledge of the safety settings of that cable network were able to copy those settings in other cable modems of another manufacturer. They sold those modems to end-users and they were able to use services without any contract or payment. Network security of that cable network appeared to be primarily arranged at CPE/modem level with default safety settings and not settings on individual customer level.

Table 53: Simplicity of network operation (CY, DE, IT)

Country	Cyprus	Germany	Italy
Did network operators and/or service provider complain that:			
<ul style="list-style-type: none"> Network operation is more difficult due to the variety of different CPEs/modems which may be connected to their networks? 	No	Yes	Yes
<ul style="list-style-type: none"> Troubleshooting is more difficult since the CPEs/modems are owned by the end-users? 	No	Yes	Yes
<ul style="list-style-type: none"> In case of leased lines, NTP at point A is difficult/not possible since the service provider needs to have control over the modem? 	No	No	N/A
<ul style="list-style-type: none"> Other issues with regard to simplicity of network operation? 	No	No	Yes (for security)
If network operators and/or service provider complained:			
<ul style="list-style-type: none"> Which type of operator(s)? 	N/A	Mostly cable operators	Mostly network operators
<ul style="list-style-type: none"> How were these problems resolved? In case they were not resolved, why did the national authority define the NTP location at point A despite these complaints? 	N/A	Any requirement of the network operator could be met by a suitable definition of the NTP/interface requirements of its network which the CPE manufacturers have to comply with.	NRA Decision

Source: BEREC

Table 54: Simplicity of network operation (LV, NL)

Country	Latvia	Netherlands
Did network operators and/or service provider complain that:		
<ul style="list-style-type: none"> Network operation is more difficult due to the variety of different CPEs/modems which may be connected to their networks? 	No	Yes (pre consultation)
<ul style="list-style-type: none"> Troubleshooting is more difficult since the CPEs/modems are owned by the end-users? 	No	Yes (pre-consultation)
<ul style="list-style-type: none"> In case of leased lines, NTP at point A is difficult/not possible since the service provider needs to have control over the modem? 	Yes (NTP location is in point B, because the modem belongs to the network operator according to the definition of the leased line)	No (pre consultataion)
<ul style="list-style-type: none"> Other issues with regard to simplicity of network operation? 	No	No
If network operators and/or service provider complained:		
<ul style="list-style-type: none"> Which type of operator(s)? 	N/A	N/A
<ul style="list-style-type: none"> How were these problems resolved? In case they were not resolved, why did the national authority define the NTP location at point A despite these complaints? 	N/A	N/A, however, in case a provider needs access to the CPE/Modem in order to repair a failure, it can ask for permission from the end-use (who wants to have the problem fixed. Line tests are typically measured to the NTP.

Source: BEREC

Table 55: End-users may have no interest to be responsible for the modem in case of certain services (CY, DE, IT, LV, NL)

Country	Cyprus	Germany	Italy	Latvia	Netherlands
Did end-users (or other market players) complain that in case of certain services they are responsible for the modem although they do not have an interest to choose the modem? ¹²²	No	NTP definition does not exclude that ISP offers modem/router as a bundle with the IAS. Therefore this problem did not occur.	No	No	Pending, consultation still running
If this is the case:					
• How many?	N/A	N/A	N/A	N/A	N/A
• How was this issue resolved?	N/A	N/A	N/A	N/A	N/A

Source: BEREC

¹²² E.g. in case of standalone voice services (see cases (2), (3) and (4) in Annex 1) since end-users may have no advantages from the freedom to choose the modem.

Table 56: Discrimination of end-users which use own CPE/modem (CY, DE, IT)

Country	Cyprus	Germany	Italy
Are there known cases of network operators and/or service providers discriminating end-users which use their own CPE/modem?	There are not any known cases of discrimination	Yes	NRA Decision entered into force only rather recently (August 2018)
If this is the case:			
• How many?	N/A	A few (around 60)	N/A
• What disadvantages did/do end-users have which use their own CPE/modem compared to those end-users which use the CPE/modem of the network operator/service provider:			
○ The service provided to the end-user is no longer guaranteed?	N/A	Not known	N/A
○ The service provided to the end-user has a lower quality of service?	N/A	Yes, inferior speed.	N/A
○ Some services are not available for end-users which use their own CPE/modem?	N/A	Yes: Amount of numbers and lines that can be managed by a customer at a single network access.	N/A
○ Disadvantages with regard to service support and/or repair?	N/A	Yes: Fault repair offered for network operators own CPEs is not offered for customers own CPEs. ¹²³	N/A
○ Other disadvantages?	N/A	Not known	N/A
• Did the NA take any measures against this discrimination?	N/A	Not/not yet.	N/A
• If this is the case, which measures?	N/A	N/A	N/A
• If this is not the case, why not?	N/A	Because investigations are still ongoing, and there are difficulties for establishing inferior service and performance where the responsibility may lie with the end-user, e. g. negligence in updating software.	N/A
• How were these problems resolved?	N/A	Ongoing	N/A

Source: BEREC

¹²³ Network operators only offer repair of their own CPE/modem not for the CPE/modem owned by the end-user.

Table 57: Discrimination of end-users which use own CPE/modem (LV, NL)

Country	Latvia	Netherlands
Are there known cases of network operators and/or service providers discriminating end-users which use their own CPE/modem?	No	Pending, implementation/ publication date is not yet known.
If this is the case:		
• How many?	N/A	N/A
• What disadvantages did/do end-users have which use their own CPE/modem compared to those end-users which use the CPE/modem of the network operator/service provider:		
○ The service provided to the end-user is no longer guaranteed?	N/A	N/A
○ The service provided to the end-user has a lower quality of service?	N/A	N/A
○ Some services are not available for end-users which use their own CPE/modem?	N/A	N/A
○ Disadvantages with regard to service support and/or repair?	N/A	N/A
○ Other disadvantages?	N/A	N/A
• Did the NA take any measures against this discrimination?	N/A	N/A
• If this is the case, which measures?	N/A	N/A
• If this is not the case, why not?	N/A	N/A
• How were these problems resolved?	N/A	N/A

Source: BEREC

Table 58: Security and data protection (CY, DE, IT)

Country	Cyprus	Germany	Italy
Did market players complain about security and/or data protection issues which result from the definition of the NTP location at point A?	No	Yes	Yes
If this is the case:			
• Which type of market players?	N/A	Network operators and end-users	Big network operators
• The specific issues were:			
○ Security breaches of the CPE/modem owned by the end-users may compromise the security and/or data protection of the public network?	N/A	Yes	Yes
○ Other?	N/A	Yes. Fear that network operators may have access to end user's data if NTW were to be situated at point B or C.	Yes (network integrity, identity of the end-user control, local network firewalling policy, possible CLI spoofing)
• How were these problems resolved?	N/A	Concerning the problems raised by the network operators, suitable definitions of the NTP/interface requirements of its network which the CPE manufacturers have to comply with should address these problems as well.	NRA Decision

Source: BEREC

Table 59: Security and data protection (LV, NL)

Country	Latvia	Netherlands
Did market players complain about security and/or data protection issues which result from the definition of the NTP location at point A?	No	Pending (Yes during pre-consultation)
If this is the case:		
• Which type of market players?	N/A	N/A
• The specific issues were:	N/A	N/A
o Security breaches of the CPE/modem owned by the end-users may compromise the security and/or data protection of the public network?	N/A	N/A
o Other?	N/A	N/A
• How were these problems resolved?	N/A	N/A

Source: BEREC

Annex 4: Basic data used in section 4

Table 60: L2 WAP – part 1 (AT, BE, CZ, HR)

Country	Austria	Belgium	Croatia
The NRA imposed on a regulated market on the SMP operator a L2 WAP (e.g. VULA)	Yes	Yes (L2 WAP with central access)	Yes
If this is the case:			
• On market	3a and 3b	3a and 3b ¹²⁴	3a and 3b
• The ANOs have the possibility to use their own CPEs/modems on:			
○ Copper-based subscriber access lines	Yes (modem and router)	Yes (modem and router)	Yes (modem and router)
○ Fibre-based subscriber access lines	Yes (CPE/router only) ¹²⁵	Yes modem and router in case of VULA combined with WLU ¹²⁶ , otherwise only router (not fibre modem)	Yes router, but not fibre modem (ONT) ¹²⁷
If ANOs can use their own CPEs/modems:			
ANOs are only allowed to use:			
• CPEs/modems which fulfil certain requirements defined by the SMP operator	Yes (also CPEs/modems which are not on the white list)	Yes, but in case of VDSL, coax and VULA on fibre combined with WLU the CPEs/ modems also have to be on the white list	• Copper: Yes, but CPEs/ modems also have to be on the white list • Fibre: Yes
• CPEs/modems which are listed in a white list	Yes	• VDSL2, coax and VULA on fibre combined with WLU: Yes • ADSL, L2 WAP on fibre not combined with WLU: No	• Copper: Yes • Fibre: No white list
• CPEs/modems which are tested by the SMP operator	No	• VDSL2 and coax and VULA on fibre combined with WLU: Yes, but the CPEs/ modems also have to be on the white list ¹²⁸ • ADSL, L2 WAP on fibre not combined with WLU: No	• Copper: Yes, but only CPEs/modems which are on the white list are allowed • Fibre: Not necessary
• Other CPEs/modems	No	No	No

Source: BEREC

¹²⁴ On Market 3a a VULA on copper and fibre, on Market 3b1 a bitstream central access on copper and fibre and on Market 3b2 a bitstream central access on coax.

¹²⁵ According to the reference offer in case of fibre-based access, the fibre modem (ONT) is provided by the SMP operator.

¹²⁶ Wavelength Unbundling

¹²⁷ SMP's ONT must be used.

¹²⁸ In case of coax testing is also required but is done by 3rd party on commercial basis

Table 61: L2 WAP – part 1 (CZ, DK, FR)

Country	Czech Republic	Denmark	France
The NRA imposed on a regulated market on the SMP operator a L2 WAP (e.g. VULA)	Yes	Yes	Yes
If this is the case:			
<ul style="list-style-type: none"> On market 	<ul style="list-style-type: none"> 3a (VULA) 3b (enhanced bitstream) 	3a and 3b	<ul style="list-style-type: none"> 3b (only for copper) 4 (copper & fibre)
<ul style="list-style-type: none"> The ANOs have the possibility to use their own CPEs/modems on: <ul style="list-style-type: none"> Copper-based subscriber access lines Fibre-based subscriber access lines 	Yes (modem and router)	Only regulated when copper is upgraded with vectoring – then yes	Yes (3b, 4) (modem and router)
	Yes (modem and router)	Not regulated	<ul style="list-style-type: none"> N/A (3b) Yes (4) (FTTO - CPE only)¹²⁹
If ANOs can use their own CPEs/modems:			
ANOs are only allowed to use:			
<ul style="list-style-type: none"> CPEs/modems which fulfil certain requirements defined by the SMP operator CPEs/modems which are listed in a white list CPEs/modems which are tested by the SMP operator Other CPEs/modems 	Yes, in addition CPEs/ modems have to be tested and on the white list	Yes – the SMP operator maintains a whitelist ¹³⁰	Yes (3b, 4) ¹³¹
	Yes, in addition CPEs/ modems have to fill the requirements (see above) and to be tested	Yes – see above	Yes (3b) (optional)
	Yes, in addition CPEs/ modems have to fill the requirements and have to be on the white list (see above)	Yes – see above	No
	No	No – in the case of copper upgraded with vectoring, only CPE's on the whitelist can be used.	No

Source: BEREC

¹²⁹ The L2 WAP on Market 4 is based on FTTO (not on PON) and therefore a fibre modem is not necessary.

¹³⁰ The SMP operator maintains a whitelist of approved CPEs that are compatible with the use of vectoring. ANOs can request that additional equipment is tested and placed on the whitelist if it fulfils the requirements.

¹³¹ ANOs may choose any CPE (whichever they want) provided it is compatible with the network. The specifications of the SMP network are published.

Table 62: L2 WAP – part 1 (GR, HU, IE, LT)

Country	Greece	Hungary	Ireland	Lithuania
The NRA imposed on a regulated market on the SMP operator a L2 WAP (e.g. VULA)	Yes	Yes	Yes	No
If this is the case:				
• On market	3a and 3b	3a	3a	N/A
• The ANOs have the possibility to use their own CPEs/modems on:				
○ Copper-based subscriber access lines	Yes (modem and router)	Yes (modem and router)	Yes (modem and router)	N/A
○ Fibre-based subscriber access lines	Yes (modem and router)	Yes (modem and router)	Yes (modem and router)	N/A
If ANOs can use their own CPEs/modems:				
ANOs are only allowed to use:				
• CPEs/modems which fulfil certain requirements defined by the SMP operator	Yes ¹³²	No	Yes ¹³³	N/A
• CPEs/modems which are listed in a white list	No	Yes	No	N/A
• CPEs/modems which are tested by the SMP operator	No	No	SMP provide optional test facility if requested	N/A
• Other CPEs/modems	No	No	N/A	N/A

Source: BEREC

¹³² In case of fibre-based access lines (FTTH), the L2 WAP provider (the SMP operator and also the ANOs which have to offer a L2 WAP) has to publish a list of recommended compatible ONTs which retail providers can use. Currently 2 to 3 ONTs are certified by the wholesale operators deploying FTTH.

¹³³ In practice to date, the ONT is provided by the SMP Operator only.

Table 63: L2 WAP – part 1 (LU, MT, PT, SI)

Country	Luxembourg	Malta	Portugal	Slovenia
The NRA imposed on a regulated market on the SMP operator a L2 WAP (e.g. VULA)	Yes	Yes	Yes	Yes
If this is the case:				
• On market	3b	3a	4	3a, 3b and 4
• The ANOs have the possibility to use their own CPEs/modems on:				
○ Copper-based subscriber access lines	Yes (modem and router)	N/A	Not applicable	Yes (modem and router)
○ Fibre-based subscriber access lines	Yes (modem and router)	Yes (CPE/router only)	Yes CPE, not NT (P2P fibre) ¹³⁴	Yes in case of P2P and P2MP only CPE (router only) ¹³⁵
If ANOs can use their own CPEs/modems:				
ANOs are only allowed to use:				
• CPEs/modems which fulfil certain requirements defined by the SMP operator	Yes (also CPEs/modems which are not on the white list)	Yes ¹³⁶	Yes, CPE with specified Ethernet interfaces	Yes, in case of PON ¹³⁷
• CPEs/modems which are listed in a white list	Yes (very short, only SMP's CPEs)	No	No	No
• CPEs/modems which are tested by the SMP operator	No	No	No	Yes, in case access based on copper and P2P fibre
• Other CPEs/modems	Yes ¹³⁸	No	No	No

Source: BEREC

¹³⁴ NT is provided by the SMP operator¹³⁵ In case of PON, ANOs have to use the ONT and in addition a bridge (between ONT and CPE of ANO).¹³⁶ The FTTH network of the SMP operator is based on PON and the ONT (fibre modem) is provided by the SMP operator. The demarcation point of the access provider is the user-sided Ethernet interface on the ONT. The ANO may then connect its own gateway or Set Top Box to the Ethernet port provided it is 802.1Q compliant.¹³⁷ In case of PON, the ANO has to connect its CPE to the bridge (between ONT and CPE of ANO) with a standard Ethernet interface and special tests of ANO's CPE are not necessary.¹³⁸ ANOs are free to use any kind of CPEs/modems as long as they are compatible with the SMP's network. ANOs can test their CPE at the SMP's test lab. However, in general, ANOs use the same equipment as the SMP.

Table 64: L2 WAP – part 2 (AT, BE, CZ, HR)

Country	Austria	Belgium	Croatia	Czech Republic
Were there any issues so far with regard to interoperability between CPEs/modems of ANOs and network of the SMP operator?	No	No	No	No
If this is the case:				
• How many and how often?	N/A	N/A	N/A	N/A
• What were the issues?	N/A	N/A	N/A	N/A
• How were these issues resolved?	N/A	N/A	N/A	N/A
Since when is this L2 WAP used by ANOs?	Q1 2014	ADSL since 2005 VDSL2 since 2008 Coax since 2015 Fibre: L2 WAP was imposed in 2018	2009	2015
Total number of subscriber access lines on which ANOs use the L2 WAP	Q3 2017: 18,745	ADSL: 32k VDSL2: 33k Coax: 72k Fibre. Not yet used	Q2 2017: 163,333	0

Source: BEREC

Table 65: L2 WAP – part 2 (DK, FR, GR, HU, IE)

Country	Denmark	France	Greece	Hungary	Ireland
Were there any issues so far with regard to interoperability between CPEs/modems of ANOs and network of the SMP operator?	No	No	Yes	No	No
If this is the case:					
• How many and how often?	N/A	N/A	One case	N/A	N/A
• What were the issues?	N/A	N/A	Non-compatible CPE with activation of vectoring	N/A	N/A
• How were these issues resolved?	N/A	N/A	The SMP operator that implemented vectoring offered a grace period in order for the service providers to upgrade the CPEs to be compatible with vectoring standards	N/A	N/A
Since when is this L2 WAP used by ANOs?	2013	More than 10 years	Since the beginning of 2013	L2 WAP was imposed only recently ¹³⁹	Since 2013
Total number of subscriber access lines on which ANOs use the L2 WAP	<ul style="list-style-type: none"> • Copper BSA+VULA: 124,000 on L2 and L3 together (not possible to split) • Fiber BSA: 3,700 on L2 and L3 together (not possible to split) 	210 K lines for market 4 1,4 M lines for market 3b	Around 60,000 access lines at the end of the first semester 2017 (this number comprises both L2 WAP and L3 WAP)	Not yet used	Confidential

Source: BEREC

¹³⁹ The decision of the Hungarian NRA (NMHH) imposing L2-WAP obligation was issued in December 2017. The execution is under the way.

Table 66: L2 WAP – part 2 (LT, LU, MT, PT, SI)

Country	Lithuania	Luxembourg	Malta	Portugal	Slovenia
Were there any issues so far with regard to interoperability between CPEs/modems of ANOs and network of the SMP operator?	N/A	No, no issues have been reported.	No	Not yet used by ANOs	No
If this is the case:					
• How many and how often?	N/A	N/A	N/A	N/A	N/A
• What were the issues?	N/A	N/A	N/A	N/A	N/A
• How were these issues resolved?	N/A	N/A	N/A	N/A	N/A
Since when is this L2 WAP used by ANOs?	N/A	N/A	Not yet used by ANOs	Not yet used by ANOs	<ul style="list-style-type: none"> • Enhanced L2 bitstream – 2006 • VULA – January 2018 • High quality L2 access – mid 2018
Total number of subscriber access lines on which ANOs use the L2 WAP	N/A	N/A	0	0	Approximately 55,000

Source: BEREC

Table 67: L3 WAP – part 1 (AT, BE, CZ, HR)

Country	Austria	Belgium	Croatia	Czech Republic
The NRA imposed on market 3b on the SMP operator a L3 WAP (IP bitstream)	Yes	No	Yes	Yes
If this is the case, the ANOs have the possibility to use their own CPEs/modems on:				
• Copper-based subscriber access lines	No ¹⁴⁰	N/A	Yes (modem and router)	Yes (modem and router)
• Fibre-based subscriber access lines	No	N/A	Yes router, but not fibre modem (ONT) ¹⁴¹	Yes (modem and router)
If ANOs can use their own CPEs/modems:				
ANOs are only allowed to use:				
• CPEs/modems which fulfil certain requirements defined by the SMP operator	N/A	N/A	• Copper: Yes, but CPEs/modems also have to be on the white list • Fibre: Yes	Yes, in addition CPEs/modems have to be tested and on the white list
• CPEs/modems which are listed in a white list	N/A	N/A	• Copper: Yes • Fibre: No white list	Yes, in addition CPEs/modems have to fill the requirements (see above) and to be tested
• CPEs/modems which are tested by the SMP operator	N/A	N/A	• Copper: Yes, but only CPEs/modems which are on the white list are allowed • Fibre: Not necessary	Yes, in addition CPEs/modems have to fill the requirements and have to be on the white list (see above)
• Other CPEs/modems	N/A	N/A	No	No

Source: BEREC

¹⁴⁰ ANOs have the possibility to use the L2 WAP instead of the L3 WAP which is available at the same regional and national PoHs as the L3 WAP and allows ANOs to use their own CPE/modem.

¹⁴¹ SMP's ONT must be used.

Table 68: L3 WAP – part 1 (DK, FR, GR, HU, IE)

Country	Denmark	France	Greece	Hungary	Ireland
The NRA imposed on market 3b on the SMP operator a L3 WAP (IP bitstream)	Yes	Yes (copper)	Yes (copper)	Yes	Yes
If this is the case, the ANOs have the possibility to use their own CPEs/modems on:					
<ul style="list-style-type: none"> Copper-based subscriber access lines 	Only regulated when copper is upgraded with vectoring – then yes	Yes (modem and router)	Yes (CPE and modem)	Yes (modem and router)	Yes (modem and router)
<ul style="list-style-type: none"> Fibre-based subscriber access lines 	Not regulated	N/A	N/A	Yes (modem + router)	Yes (modem + router)
If ANOs can use their own CPEs/modems:					
ANOs are only allowed to use:					
<ul style="list-style-type: none"> CPEs/modems which fulfil certain requirements defined by the SMP operator 	Yes – the SMP operator maintains a whitelist ¹⁴²	Yes ¹⁴³	Yes	No	Yes ¹⁴⁴
<ul style="list-style-type: none"> CPEs/modems which are listed in a white list 	Yes – see above	Yes (optional)	No	Yes	No
<ul style="list-style-type: none"> CPEs/modems which are tested by the SMP operator 	Yes – see above	Yes (optional)	No	No	SMP provide optional test facility if requested
<ul style="list-style-type: none"> Other CPEs/modems 	No – in the case of copper upgraded with vectoring, only CPE's on the whitelist can be used.	No	No	No	N/A

Source: BEREC

¹⁴² The SMP operator maintains a whitelist of approved CPEs that are compatible with the use of vectoring. ANOs can request that additional equipment is tested and placed on the whitelist if it fulfils the requirements.

¹⁴³ ANOs may choose any CPE (whichever they want) provided it is compatible with the network. The specifications of the SMP network are published

¹⁴⁴ In practice to date, the ONT is provided by the SMP Operator only.

Table 69: L3 WAP – part 1 (LT, LU, MT, PT, SI)

Country	Lithuania	Luxembourg	Malta	Portugal	Slovenia
The NRA imposed on market 3b on the SMP operator a L3 WAP (IP bitstream)	Yes	Yes	No	Yes	No
If this is the case, the ANOs have the possibility to use their own CPEs/modems on:					
• Copper-based subscriber access lines	Yes (modem and router)	Yes (modem and router)	N/A	Yes (modem and router)	N/A
• Fibre-based subscriber access lines	Yes (router only, since P2P)	Yes (modem and router)	N/A	N/A	N/A
If ANOs can use their own CPEs/modems:					
ANOs are only allowed to use:					
• CPEs/modems which fulfil certain requirements defined by the SMP operator	Yes	Yes (also CPEs/modems which are not on the white list)	N/A	Yes (specified Ethernet protocol)	N/A
• CPEs/modems which are listed in a white list	No	Yes (very short, only SMP's CPEs)	N/A	No	N/A
• CPEs/modems which are tested by the SMP operator	No	No	N/A	No	N/A
• Other CPEs/modems	No	Yes ¹⁴⁵	N/A	No	N/A

Source: BEREC

¹⁴⁵ ANOs are free to use any kind of CPEs/modems as long as they are compatible with the SMP's network. ANOs can test their CPE at the SMP's test lab. However, in general, ANOs use the same equipment as the SMP.

Table 70: L3 WAP – part 2 (AT, BE, CZ, HR)

Country	Austria	Belgium	Croatia	Czech Republic
Were there any issues so far with regard to interoperability between CPEs/modems of ANOs and network of the SMP operator?	N/A	N/A	No	No
If this is the case:				
• How many and how often?	N/A	N/A	N/A	N/A
• What were the issues?	N/A	N/A	N/A	N/A
• How were these issues resolved?	N/A	N/A	N/A	N/A
Since when is this L3 WAP used by ANOs?	April 2000	N/A	2006	2006
Total number of subscriber access lines on which ANOs use the L3 WAP	30.09.2017: 37,400	N/A	Q2 2017: 826	901,116 ¹⁴⁶

Source: BEREC

¹⁴⁶ Number of bitstream lines used by ANOs including O2 which is the retail company of the incumbent (a few years ago the incumbent separated its business voluntarily into a wholesale company (CETIN) and a retail company (O2)).

Table 71: L3 WAP – part 2 (DK, FR, GR, HU, IE)

Country	Denmark	France	Greece	Hungary	Ireland
Were there any issues so far with regard to interoperability between CPEs/modems of ANOs and network of the SMP operator?	No	No	No	No	No
If this is the case:					
• How many and how often?	N/A	N/A	N/A	N/A	N/A
• What were the issues?	N/A	N/A	N/A	N/A	N/A
• How were these issues resolved?	N/A	N/A	N/A	N/A	N/A
Since when is this L3 WAP used by ANOs?	2013	Since 2005	Since the beginning of 2013	Since 2006	1993
Total number of subscriber access lines on which ANOs use the L3 WAP	<ul style="list-style-type: none"> • Copper BSA+VULA: 124,000 on L2 and L3 together (not possible to split) • Fiber BSA: 3,700 on L2 and L3 together (not possible to split) 	210 K lines	Around 60,000 access lines at the end of the first semester 2017 (this number comprises both L2 WAP and L3 WAP)	48,000 in December 2016	Confidential

Source: BEREC

Table 72: L3 WAP – part 2 (LT, LU, MT, PT, SI)

Country	Lithuania	Luxembourg	Malta	Portugal	Slovenia
Were there any issues so far with regard to interoperability between CPEs/modems of ANOs and network of the SMP operator?	No	No, no issues have been reported.	N/A	Not known	N/A
If this is the case:					
• How many and how often?	N/A	N/A	N/A	N/A	N/A
• What were the issues?	N/A	N/A	N/A	N/A	N/A
• How were these issues resolved?	N/A	N/A	N/A	N/A	N/A
Since when is this L3 WAP used by ANOs?	Since ~2002	N/A	N/A	2001/2002	N/A
Total number of subscriber access lines on which ANOs use the L3 WAP	1,194 (3 rd quarter 2017)	N/A	N/A	~12.000	N/A

Source: BEREC