

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
1 September 2011 (01.09.2011)

PCT

(10) International Publication Number
WO 2011/104070 A1

- (51) **International Patent Classification:**
H04M 3/22 (2006.01) H04B 10/08 (2006.01)
- (21) **International Application Number:**
PCT/EP2011/051389
- (22) **International Filing Date:**
1 February 2011 (01.02.2011)
- (25) **Filing Language:** English
- (26) **Publication Language:** English
- (30) **Priority Data:**
10305195.9 26 February 2010 (26.02.2010) EP
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- (81) **Designated States (unless otherwise indicated, for every
kind of national protection available):** AE, AG, AL, AM,

AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ,
CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO,
DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT,
HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP,
KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD,
ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI,
NO, NZ, OM, PE, PG, PH, PL, PT, RO, RS, RU, SC, SD,
SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR,
TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) **Designated States (unless otherwise indicated, for every
kind of regional protection available):** ARIPO (BW, GH,
GM, KE, LR, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG,
ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ,
TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK,
EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU,
LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK,
SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ,
GW, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

- as to applicant's entitlement to apply for and be granted
a patent (Rule 4.17(ii))
- of inventorship (Rule 4.17(iv))

Published:

- with international search report (Art. 21(3))

(54) **Title:** METHOD TO ASSIGN A CUSTOMER PREMISES EQUIPMENT TO A SUBSCRIBER'S DATA RECORD, DE-
MARCATION POINT UNIT, AND NETWORK ELEMENT

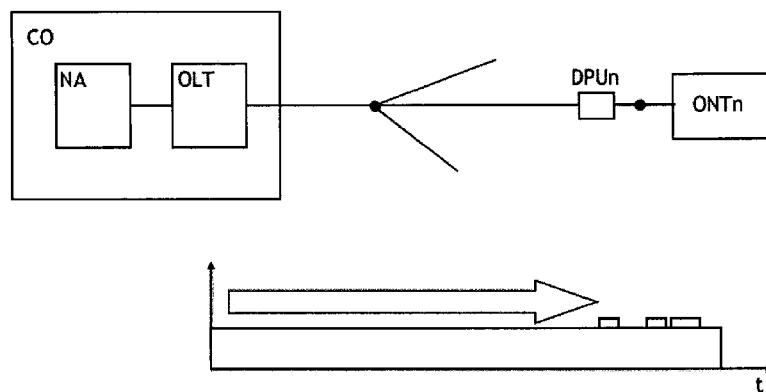


Fig. 1

(57) **Abstract:** The invention relates to a method for a telecommunication's network with a central office (CO), an access network, a multiple of demarcation point units (DPU) and customer premises equipment (ONTn) connected thereto, to assign a customer premises equipment (ONTn) to a subscriber's data record registered in the central office (CO), where when a customer premises equipment (ONTn) reports the received signal amplitude in regular reporting intervals to the central office (CO), a customer premises equipment (ONTn) is assigned to a subscriber's data record by uniquely influencing the signal amplitude by the demarcation point unit (DPU) assigned to the customer premises equipment (ONTn), the assignment of which to a certain subscriber's data record is known in the central office (CO), where the influencing of the signal amplitude is performed such that a digital signature proper to the demarcation point unit (DPU) is imprinted on the signal amplitude, where the bit clock underlying the signature is adapted to the reporting intervals, and that the central office (CO) recovers the signature of the demarcation point unit (DPU) from the sequence of signal amplitudes reported from the customer premises equipment (ONTn) and derives therefrom the assignment between customer premises equipment (ONTn) and subscriber's data record, as well as to a demarcation point unit, and to a network element.



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Method to assign a Customer Premises
Equipment to a Subscriber's Data Record,
Demarcation Point Unit, and Network Ele-
ment

The invention relates to a method to assign a customer prem-
5 ises equipment to a subscriber's data record according to the
preamble of claim 1, to a demarcation point unit according to
the preamble of claim 4, and to a network element for a central
office, according to the preamble of claim 5.

Such telecommunication's networks are well known, for example
10 from EP 1 986 351 A1, and EP 2 015 480 A1.

Both, optical and wireless access networks normally are
point-to-multipoint networks. Each customer has a connection
point, where he or she can connect whatever customer premises
equipment like simple telephones, servers, or multimedia de-
15 vices. Such connecting equipment is being done by the customer
himself or herself and can also be changed at whatever time.
There is a need to register the used equipment in the central
office of the network operator and to unambiguously assign it
to a subscriber's data record.

20 To this end it is known that the customer performs a certain
procedure, in the course of which a code received from the op-
erator is to be entered. Such registration procedure is time
consuming, cumbersome and error-prone.

The invention deals with the problem of providing a method and respective devices to assign a customer premises equipment to a subscriber's data record registered in the central office of the network operator.

5 This problem according to the invention is solved by a method according to the teaching of claim 1, by a network terminating unit according to the teaching of claim 4, and by a network element for a central office, according to the teaching of claim 5.

10 The invention makes use of two circumstances:

On the one hand network operators often insist on terminating their network with each customer by a device being separated from any customer's devices and being in their own responsibility. It is known also that such units, then called demarcation point units, also are assigned unambiguous and individual identifiers. Such demarcation point units are installed under the responsibility of the network operator, who thus knows the customer in whose location such demarcation point unit is installed. The classical network terminating element called Network Termination thus is separated into two parts. One part, the Optical Network Termination, physically is terminating the network, but is in the responsibility of the subscriber; the other part, the Demarcation Point Unit, is terminating the responsibility of the operator.

25 On the other hand any customer premises equipment foreseen for connecting to an optical access line nowadays is built such that, when in operation, it regularly reports the received signal amplitude to the central office, to which it is connected.

The inventors' idea now is to impose the demarcation point unit's identifier on the signal coming from the central office to the customer's device by influencing the signal amplitude of this signal and have it reported to the central office. Of
5 course the chronological sequence of the imposing of the identifier has to be adapted to the reporting intervals of the customer's device.

Further embodiments of the invention can be found in the sub-claims and in the accompanying description.

10 In the following the invention will be described with reference to the accompanying drawing, in which

Figure 1 shows a telecommunication's network, in which a method according to the invention can be performed.

Figure 2 shows a demarcation point unit according to the invention.

Figure 3 shows a central office including a network analyzer as an example of a network element according to the invention.

Figure 1 shows both, a telecommunication's network, and a diagram representing the signal flow therein.

15 The telecommunication's network includes a central office CO, an access network, not labeled, a demarcation point unit DPU_n representing one of a multiple of network terminating units, and an optical network termination unit ONT_n representing a subscriber's customer premises equipment.

20 The central office CO here is shown as including an optical line termination unit OLT and a network analyzer NA.

The optical line termination unit OLT performs the conversion between optical and electrical part and the transmission technological functions like adapting power levels.

The network analyzer NA performs some kind of network operation tasks.

It is to be noticed, that in practical realization the network analyzer NA as mentioned above often is spatially separated from the optical line termination unit OLT and then mostly is a network element in common to more than one optical line termination unit OLT. This does not influence the idea of the invention.

The signal flow represented thereunder is a signal flow from the optical line termination unit OLT within the central office CO to the optical network termination unit ONTn. From the demarcation point unit DPUn on additional signal elements are added imposed by the demarcation point unit DPUn.

This signal flow representation is by no means to scale: The duration of either of the imposed signal elements has nothing to do with the propagation time it undergoes. The clock of the signal from the optical line termination unit OLT is such high in relation to the clock of the imposed signal elements from the demarcation point unit DPUn, that it is not even represented. The relation between the amplitude of the signal from the optical line termination unit OLT to the imposed signal elements from the demarcation point unit DPUn is small, namely in the range of some few percents, not more than 20% but rather in the range of 5%. The attenuation of the signal on its way from the optical line termination unit OLT to the optical network termination unit ONTn is not represented either.

The additional signal elements imposed by the demarcation point unit DPUn represent the unambiguous and individual identifier assigned to exactly this demarcation point unit DPUn. It thus represents a digital signature proper to this demarcation point unit DPUn.

The amplitude of these additional signal elements on the one hand has to be chosen such that it can be clearly detected by a transceiver parameter monitor allegedly being part of the network termination unit ONTn. On the other hand this amplitude is to be kept such low that the regular data flow between the optical line termination unit OLT and the optical network termination unit ONTn is not disturbed.

The same considerations concerning the relation between the amplitude of the signal from the optical line termination unit OLT and the imposed signal elements from the demarcation point unit DPUn apply when the signal elements from the demarcation point unit DPUn are imposed by attenuating the signal from the optical line termination unit OLT within the demarcation point unit DPUn.

Increasing the overall signal amplitude requires an optical signal source like a laser or a light emitting diode. Reducing the overall signal amplitude requires some kind of a switchable attenuator like a coupler with a coupling factor that can be influenced or either of the terminations of which can be switched.

The clock with which such signature is to be imposed onto the signal flow has to be such low, that it is ensured that the transceiver parameter monitor in the optical network termination unit ONTn while performing its monitoring and reporting task for sure also monitors and reports the variations recog-

nized. This clock therefor has to be adapted to the reporting intervals of such transceiver parameter monitor such that the reporting intervals are not shorter than one bit of the signature imposed.

5 Figure 2 shows an example of such demarcation point unit DPUn according to the invention. The optical line between the central office CO and the network termination unit ONTn within the subscriber's customer premises equipment is looped through through this demarcation point unit DPUn, shown as drawn
10 through line. The demarcation point unit DPUn further includes a control element, here designated as uP, a usual abbreviation of a microprocessor, an optical transmitter Tx, and an optical coupler coupling the optical transmitter Tx to the looped through optical line.

15 The use of a microprocessor uP as control element is justified by other tasks such demarcation point unit DPUn normally is to perform. To this end it might also be coupled to the looped through optical line with receiving means for receiving data from either of both directions or with means for also
20 transmitting towards the central office.

In principle the invention works, when the demarcation point unit DPUn continuously imposes its signature on the signal flow. Depending on the intelligence provided by the control element and on the way it is coupled to the optical line, the
25 imposing the signature could be limited to short periods at the beginning of communications or on demand from the central office.

Figure 3 shows a central office CO including a network analyzer NA as an example of a network element according to the
30 invention.

As already previously mentioned the central office CO here is shown as including an optical line termination unit OLT and network analyzer NA.

The optical line termination unit OLT performs the conversion
5 between optical and electrical part and the transmission technological functions like adapting power levels.

The network analyzer NA performs some kind of network operation tasks.

The optical line termination unit OLT needs not to vary from
10 known such optical line termination units. There is only a need to adapt the network analyzer NA in the central office, such that from the parameters reported from the customer premises' equipment, especially the received power levels, the signature of the assigned known demarcation point unit DPUn can be de-
15 rived and thereby the customer premises equipment can be assigned to the respective subscriber's data record.

As already mentioned it is to be noticed, that in practical realization the network analyzer NA as mentioned above often is spatially separated from the optical line termination unit OLT
20 and then mostly is a network element in common to more than one optical line termination unit OLT and more than one central office.

Claims

5 1. Method for a telecommunication's network with a
central office (CO), an access network, a multiple
of demarcation point units (DPU_n) and customer prem-
ises equipment (ONT_n) connected thereto, to assign a
customer premises equipment (ONT_n) to a subscriber's
10 data record registered in the central office (CO),
characterized in, that when a customer premises
equipment (ONT_n) reports received signal amplitudes
in regular reporting intervals to the central office
(CO), a customer premises equipment (ONT_n) is as-
15 signed to a subscriber's data record by uniquely in-
fluencing the signal amplitude by the demarcation
point unit (DPU_n) assigned to the customer premises
equipment (ONT_n), the assignment of which to a cer-
tain subscriber's data record is known in the cen-
20 tral office (CO), where the influencing of the sig-
nal amplitude is performed such that a digital sig-
nature individually assigned to the demarcation
point unit (DPU_n) is imprinted on the signal ampli-
tude, where the bit clock underlying the signature
25 is such that one bit of the signature imposed is at
least as long as a reporting interval, and that the
central office (CO) recovers the signature of the
demarcation point unit (DPU_n) from the sequence of
signal amplitudes reported from the customer prem-
30 ises equipment (ONT_n) and derives therefrom the as-
signment between customer premises equipment (ONT_n)
and subscriber's data record.

2. Method according to claim 1, characterized in,
that the demarcation point unit (DPU_n) influences
the signal amplitude by additively adding the signa-
5 ture as supplementary signal with an amplitude being
small compared to the signal amplitude.

3. Method according to claim 1, characterized in,
that the demarcation point unit (DPU_n) influences
10 the signal amplitude by attenuating the signal am-
plitude by a small amount according to the signa-
ture.

4. Demarcation point unit (DPU_n) for a telecommuni-
15 cation's network with a central office (CO), an ac-
cess network, a multiple of demarcation point units
(DPU_n) and customer premises equipment (ONT_n) con-
nected thereto, where customer premises equipment
(ONT_n) report received signal amplitudes in regular
20 reporting intervals to the central office (CO),
characterized in, that the demarcation point unit
(DPU_n) is built such that the demarcation point unit
(DPU_n) is in position to uniquely influence the am-
plitude of a signal from the central office (CO) to
25 a customer premises equipment (ONT_n) connected to
the demarcation point unit, where the influencing of
the signal amplitude is performed such that a digi-
tal signature individually assigned to the demarca-
tion point unit (DPU_n) is imprinted on the signal
30 amplitude using a bit clock underlying the signature
that is such that one bit of the signature imposed
is at least as long as a reporting interval.

5 5. Network element (NA) for a central office (CO)
for a telecommunication's network with a central of-
fice (CO), an access network, a multiple of demarca-
tion point units (DPUn) and customer premises equip-
ment (ONTn) connected thereto, **characterized in,**
that the network element (NA) is built such that the
network element (NA) is in position to recover a
signature of a demarcation point unit (DPUn) from
the sequence of signal amplitudes reported from a
10 customer premises equipment (ONTn) and to derive
therefrom the assignment between customer premises
equipment (ONTn) and subscriber's data record.

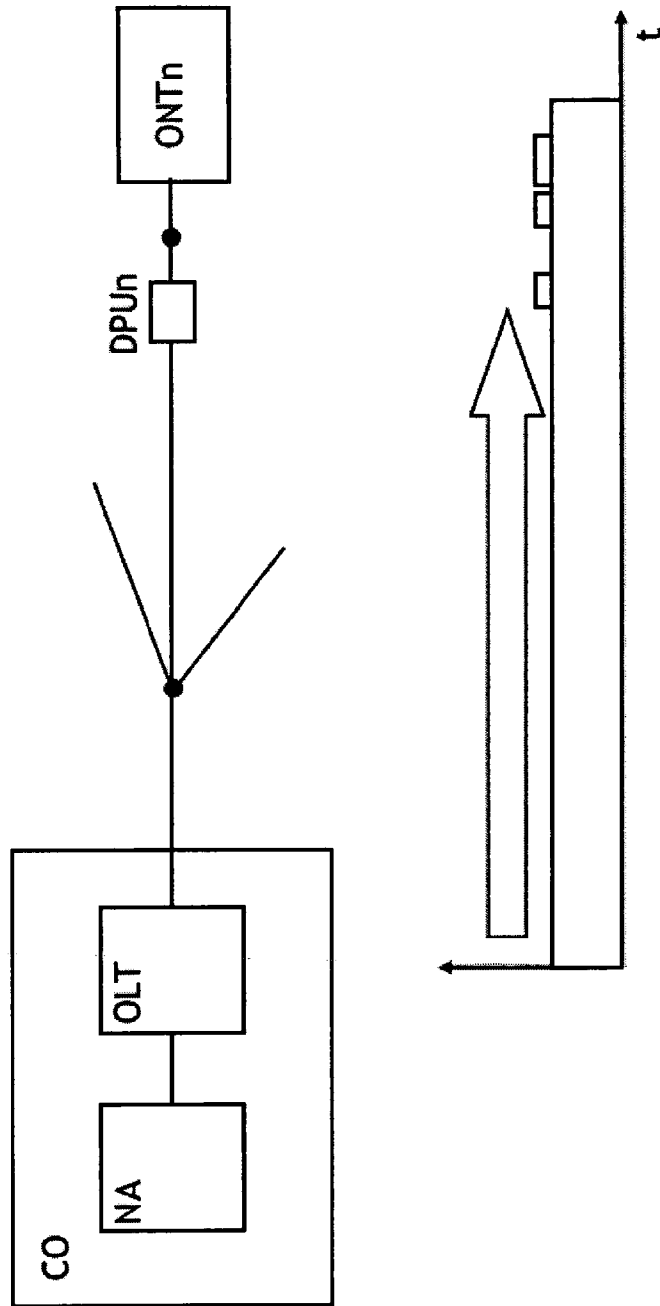


Fig. 1

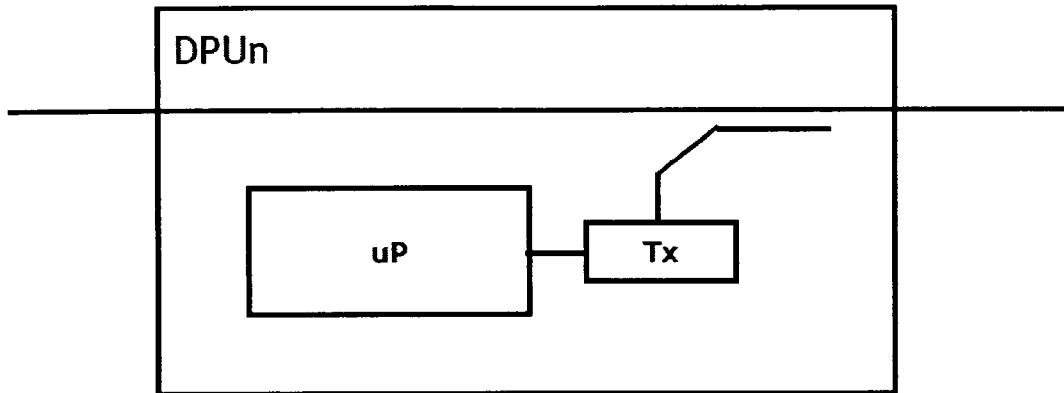


Fig. 2

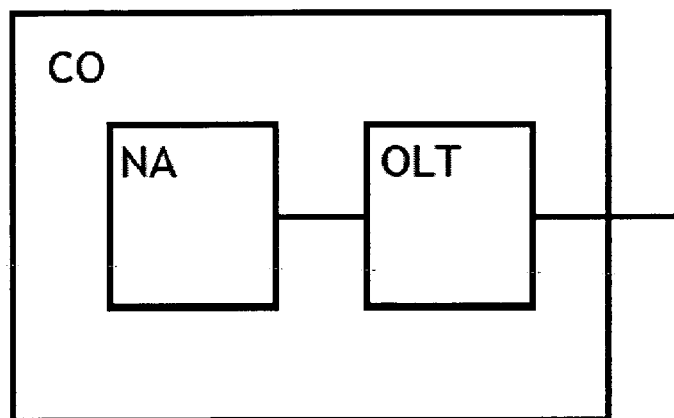


Fig. 3

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2011/051389

A. CLASSIFICATION OF SUBJECT MATTER
 INV. H04M3/22 H04B10/08
 ADD.
 According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED
 Minimum documentation searched (classification system followed by classification symbols)
 H04M H04B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
 EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 1 986 351 A1 (ALCATEL LUCENT [FR]) 29 October 2008 (2008-10-29) cited in the application paragraphs [0001], [0002] paragraphs [0010], [0013], [0017], [0018] paragraph [0021] - paragraph [0031] -----	1-5
X	EP 2 015 480 A1 (ALCATEL LUCENT [FR]) 14 January 2009 (2009-01-14) cited in the application	5
A	* abstract; figures 1-3 paragraph [0001] - paragraph [0020] paragraph [0037] - paragraph [0041] paragraph [0076] - paragraph [0082] ----- -/--	1-4

Further documents are listed in the continuation of Box C. See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"E" earlier document but published on or after the international filing date	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
"O" document referring to an oral disclosure, use, exhibition or other means	"&" document member of the same patent family
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search 21 March 2011	Date of mailing of the international search report 25/03/2011
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Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Authorized officer Ohanovici, Z
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INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2011/051389

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 2007/048226 A1 (EXFO ELECTRO OPTICAL ENG INC [CA]; PERRON STEPHANE [CA]; RUCHET BERNAR) 3 May 2007 (2007-05-03) * abstract; figures 2-5, 6a-6c page 3, line 13 - page 4, line 31 page 7, line 20 - line 26 page 14, line 29 - page 15, line 2 -----	1-5
A	EP 1 748 580 A1 (CIT ALCATEL [FR]) 31 January 2007 (2007-01-31) the whole document -----	1-5

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2011/051389

Patent document cited in search report	Publication date	Publication date	Patent family member(s)	Publication date
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