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(71) Applicant (for all designated States except US): **Nokia Siemens Networks Oy** [—/FI]; P.O. Box 365, FI-02610 Espoo (FI).

(72) Inventor; and

(75) Inventor/Applicant (for US only): **GOLDSTEIN, Peter** [CH/CH]; Rainstrasse 45, Thalwil, 8800 (CH).

(74) Agent: **KLEY, Hansjörg**; c/o Nokia Siemens Networks GmbH & Co. KG, Patentabteilung, P.O. Box 80 17 60, 81617 München (DE).

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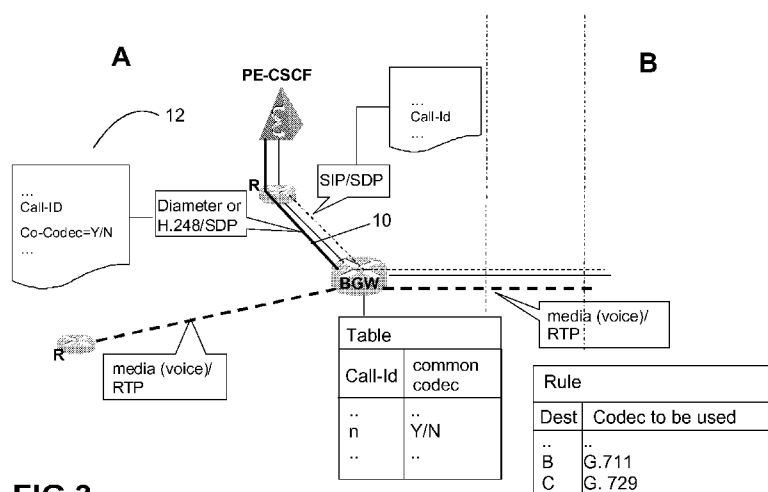
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(54) Title: METHOD AND SYSTEM FOR TRANSCODING AVOIDANCE IN BORDER GATEWAYS



(57) Abstract: The architecture framework for Next Generation Network NGN, as defined by ITU-T and ETSI, includes border gateways (BGW) to connect different networks of different network providers or to connect access networks to the core network. Based on bilateral agreement a specific codec is used in the interconnecting network or a specific codec may be used in the core network independent of the codec used in the access network, respectively. If the two IP end devices do have a common codec, the problem of unwanted transcoding arises, which leads to additional delay and reduces the audio quality caused by converting one coding scheme into another coding scheme. In order to avoid unnecessary transcoding, an information element (12) is introduced which contains the result of an end-to-end negotiation on common codecs.

Method and system for transcoding avoidance in Border Gateways

This invention relates to a method and system for transcoding avoidance in Border Gateways according to the preamble of
5 claim 1 respectively claim 6.

The architecture framework for Next Generation Network NGN, as defined by ITU-T and ETSI, describes beside others the functional entities of the gateway connecting different
10 networks. The different networks could be either core networks of different network providers or access networks connected to a core network. The Service Stratum contains besides others the functional entity Call/Session Control, whereas the Transport Stratum contains in the Resource and
15 Admission Control Area the Policy Decision Functional Entity PD-FE and in the Transport Area the Policy Enforcing Functional Entity PE-FE. Network operators do assign a specific codec to be used in the interconnecting network (between networks of different network operators) based on
20 bilateral agreement or specify a specific codec to be used in their core network independent of the codec used in the access network, based on criteria such as bandwidth; see EP 1 758 333 A1 and WO 2007/022818 A1 [1] or to connect IP end devices using different codecs. The network element
25 connecting the different networks is hereafter called border gateway BGW.

A number of different (bit rate) codecs are defined for the transport of voice over IP. However it is not economical
30 feasible to provide all these codecs in IP based devices. That is why network operators provide in their networks network elements with the "transcoding" capability. This makes it possible to "connect" IP end devices with different codecs.

35 The above mentioned method suffers from the drawback that unnecessary transcoding may be present. Transcoding intro-

duces additional delay and reduces the audio quality caused by converting one coding scheme into another coding scheme.

On the other hand an end to end based codec negotiation has been defined (ITU-T, IETF) to agree, if possible, to a codec available in both end devices, considering that transcoding reduces the voice quality by adding delay and decreasing the audio quality.

Nevertheless this negotiation does not avoid transcoding per se, because the Border Gateways, where the transcoding takes place are not involved in the codec negotiation, see Fig. 1 BGW.

It is therefore a task of the present invention, to provide a method and a system for avoiding unwanted transcoding causing a reduced voice service quality.

WO 2004/006597 A1 / EP 1 586 209 B1 [2] discloses the «Avoidance of transcoding or interruption on live load coding exchange in extant connections». This disclosure does not solve the above mentioned problem, since it is restricted to a media gateway MG between a TDM- and a packet-based network and is related to a media change during an extant connection, e.g. voice to fax and vice versa. An example would be where person A assures by voice communication with a person B, that the person B will be able to receive a confidential fax and only then sends the fax. This can be done by using a normal telephone apparatus combined with a Fax-Device Gr.3.

The object to provide a method and a system for avoiding unwanted transcoding causing a reduced voice service quality is solved by the method steps specified in claim 1 and by a system given with the features in claim 6.

By the introduction of

- i) an information element containing at least a field «call/connection identifier» Call-Id and a field «common codec» of type «true/false» (Y/N) in the information exchange between a Physical Entity Call/Session Controller PE-CSCF and a Physical Entity containing the Policy Decision Functional Entity PD-FE and by a table in the Policy Decision Functional Entity PD-FE, where the table elements store the information «common codec» on a per call basis and a procedure for the Policy Decision Functional Entity PD-FE whereby
- ii) in the involved border gateway BGW in case of «common codec» = true the transcoding is avoided or in case of «common codec» = false a predefined transcoding is performed according to the rule based on origin and destination , and contained in the the Policy Decision Functional Entity;

an unwanted transcoding between the two peers A and B can be avoided. This information element («common codec») does not affect other protocols and can easily be implemented in existing systems.

Further advantageous embodiments of the present invention are given in dependent claims.

The invention will be now described in preferred embodiments with reference to the accompanying figures wherein:

- Figure 1 Transcoding in the Border Gateways of network A and network B according to the state of the art;
- Figure 2 Transcoding avoidance in the Border Gateways of network A and network B according to a preferred embodiment of the invention;
- Figure 3 Protocol elements and table for «common codec»;
- Figure 4 Media (voice)/RTP - Codec Analysis in the Policy Decision Functional Entity;
- Figure 5 BGW containing Policy Enforcing Functional Entity and Policy Decision Functional Entity;

Figure 6 BGW containing Policy Enforcing Functional Entity and an interface to Policy Decision Functional Entity.

Fig. 2 shows the end-to-end negotiation between two subscribers A and B, where an A-subscriber initiates a call to a B-subscriber and the call is identified by a call/connection identifier «Call-Id».

Each IP end device of the subscribers A, B is connected to an access router R of an access network, where the media stream is routed to a border gateway BGW. The signalling SIP, SDP is routed via an access router R to the Physical Entity «Call/Session Control Function» PE-CSCF, the latter is called for the sake of simplicity just «Call/Session Controller» PE-CSCF. The protocol used between the Call/Session Controller PE-CSCF and the Physical Entity containing a Policy Decision Functional Entity PD-FE, which may or may not be an integrated part of the Border Gateway BGW is enhanced by a new information element 12. Further details see Fig. 3. The information element 12 contains a field «common codec» of type«true/false» or «Y/N» or «yes/no», this field is accompanied by another field «Call-Id» identifying the call by a call/connection identifier, see e.g. SIP.

With reference to Fig. 3 the logic of the Policy Decision Functional Entity PD-FE is enhanced by a table containing the information «common codec» for each active call identified by the «Call-Id». The «Call-Id» is used to generate the appropriate address to access (read/write) the said table. Furthermore a procedure is provided to analyze for each RTP stream, if transcoding is to be applied or not by determining the media type and in case of voice accessing the corresponding element of the said table to get the «common codec» information and set the appropriate flag for the further processing in the Policy Decision Functional Entity PD-FE.

Protocol 10 (based on Diameter as specified in Q.3301.1 or H.248/SDP which is also a possible candidate) is used to transmit these information elements «Call-Id» and «common codec» from the Call/Session Control Function PE-CSCF to the Border Gateway BGW. The enhancements to the protocol 10 are shown exemplary by using H.248/SDP in table 1.

Messages_

ADD, MODIFY

10

Message format:

MEGACO/x.y. ...

Transaction = ...

Context = ...

15

Call-Id = ... ; new info element

ADD (MODIFY)= ...

.

.

.

20

v= ...

c= ...

m= audio, ...

a= **common codec** ; new attribute line

25

.

.

.

Table 1: Messages and Message format with additional fields.

30

If the Policy Decision Functional Entity PD-FE is not integrated in the Border Gateway BGW, then the protocol 11 used between the Policy Decision Functional Entity PD-FE contained in a separate Physical Entity and the Policy Enforcing Functional Entity PE-FE in the Border Gateway BGW is preferably according to an open standard, see Fig. 5 and

35

6. An example for such a protocol is H.248 (accompanied by SDP) or COPS.

The Policy Decision Functional Entity PD-FE maintains a table to store the new information element «common codec» on a per call basis. If the information «common codec» is true («Y», «yes»), then the Policy Decision Function Entity PD-FE ignores the existing rule stored in the Policy Decision Functional Entity PD-FE for applying the assigned codec (for crossing network borders) for this voice call and instructs the Policy Enforcing Functional Entity PE-FE accordingly. That means for the media «voice» no codec information will be sent to the Policy Enforcing Functional Entity when requesting the creation of the appropriate context.

Fig. 4 shows the new procedure introduced in the Policy Decision Functional Entity PD-FE:

For each RTP stream the media type is determined and in case of voice, the corresponding element in said table is accessed to get the «common codec» information and the flags for the further processing are set, i.e. preparing the instruction to be sent to the Policy Enforcing Functional Entity PE-FE.

The Border Gateways BGW includes either only the Policy Enforcing Functional Entity PE-FE and thus provides the voice related signal processing resources or in addition to the Policy Enforcing Functional Entity PE-FE also the Policy Decision Functional Entity PD-FE.

Session Border Controllers of pre-NGN networks handling media and signalling can be considered as a physical implementation of a NGN Border Gateway containing the Policy Decision Functional Entity PD-FE and the Policy Enforcing Functional Entity PE-FE combined with a Signalling Gateway.

The Policy Enforcing Functional Entity PE-FE of the Border Gateway BGW providing the signal processing functions for

voice, e.g. one or more codecs, is informed either by the integrated or external Policy Decision Functional Entity PD-FE based on the information received from the Call/Session Controller PE-CSCF, where the call set up handling takes place, if a common codec has been negotiated or not.

In another embodiment of this invention the codec could be negotiated between the Policy Decision Functional Entities PD-FE involved in the call.

List of reference numerals

- 10 Resource control protocol, Rs interface; ITU-T Rec. Q.3301.1 or alternatively H.248/SDP (another
- 15 possible candidate for the resource control protocol at the Rs interface)
- 11 protocols H.248/SDP, COPS
- 12 Common codec Information Element

List of used symbols

- BGW Border Gateway
- Call-Id Call (Connection) Identifier
- Co-Codec Common Codec
- COPS Common Open Policy Service, Protocol; IETF RFC 2748
- 25 CSCF Call/Session Control Function
- ETSI European Technical Standardization Institute
- IETF Internet Engineering Task Force
- ITU-T International Telecommunication Union
- PD-FE Policy Decision Functional Entity
- 30 PE-FE Policy Enforcing Functional Entity
- PE-CSCF Physical Entity «Call/Session Control Function»
- R Router

	RFC	Request For Comment
	RTP	Real Time Transport Protocol, IETF RFC 1889
	SBC	Session Border Controller
	SDP	Session Description Protocol, IETF RFC 2327
5	SIP	Session Initiation Protocol, IETF RFC 2543
	H.248	MEGACO (Media Gateway Control Protocol/Resource Control Protocol), ITU-T/IETF

References

- 10 [1] WO 2007/022818 A1
«Method for the manipulation of speech packets in
an IP-Gateway»
Siemens Schweiz AG; CH - 8047 Zürich.
- 15 [2] WO 2004/006597 A1 / EP 1 586 209 B1
«Avoidance of transcoding or interruption on live
load coding exchange in extant connections»
Siemens Aktiengesellschaft, DE - 80333 Munich

Claims

1. Method for avoiding transcoding in a Border Gateway (BGW) of an IP network evaluating the result of a Codec negotiation between two IP end devices (A, B), where

- 5 - to the IP end devices an A- and a B-subscriber are associated;
- each IP end device of the subscribers (A, B) is connected to an access router (R) of an access network,
- the A-subscriber initiates a call to the B-subscriber and the call is identified by a call/connection
10 identifier (Call-Id),

the method comprising the steps:

- i) an information element (12) containing at least a field
15 «call/connection identifier» (Call-Id) and a field «common codec» is introduced in the information exchange between a Physical Entity Call/Session Controller (PE-CSCF) and a Policy Decision Functional Entity (PD-FE);
- ii) the Policy Decision Functional Entity (PD-FE) maintains a table, where each element of the table stores the
20 information «common codec» as received by the Call/Session Controller;
- iii) in the involved Policy Decision Functional Entity (PD-FE) a procedure is introduced, wherein in case of
25 «common codec» = true a flag with the meaning «transcoding avoidance» is set or in case of «common codec» = false a flag with the meaning «process rule» is set;
- iv) the Policy Decision Functional Entity informs (PD-FE) the Policy Enforcing Functional Entity (PE-FE) to
30 - create a context for an RTP-stream with transcoding according the indicated codec from the «process rule» or to
- create a context for an RTP-stream without trans-
35 coding.

2. Method according to claim 1;
characterised in that
in step iii) the involved Policy Decision Functional Entity
(PD-FE) is integrated in the border Gateway (BGW).

5

3. Method according to claim 1;
characterised in that
in step iii) the involved Policy Decision Functional Entity
(PD-FE) is external to the border Gateway (BGW).

10

4. Method according to one of the claims 1 to 3;
characterised in that
the Codec negotiation is performed by the Policy Decision
Functional Entities (PD-FE) in the involved networks.

15

5. Method according to one of the claims 1 to 4;
characterised in that
in step i) the information exchange between a Physical Entity
Call/Session Controller (PE-CSCF) and a Policy Decision
Functional Entity (PD-FE) is based on the protocols H.248
accompanied by SDP.

20

6. System for avoiding transcoding in a Border Gateway (BGW) of an IP network evaluating the result of a Codec negotiation between two IP end devices (A, B), where

- to the IP end devices an A- and a B-subscriber are associated;
- each IP end device of the subscribers (A, B) is connected to an access router (R) of an access network,
- the A-subscriber initiates a call to the B-subscriber and the call is identified by a call/connection identifier (Call-Id),

characterised in that

- i) an information element (12) containing at least a field «call/connection identifier» (Call-Id) and a field «common codec» is contained in the information exchange between a Physical Entity Call/Session Controller (PE-CSCF) and a Policy Decision Functional Entity (PD-FE);
- ii) the Policy Decision Functional Entity (PD-FE) maintains a table, where each element of the table stores the information «common codec» as received by the Call/Session Controller;
- iii) in the involved Policy Decision Functional Entity (PD-FE) a procedure is introduced, wherein in case of «common codec» = true a flag "transcoding avoidance" is set or in case of «common codec» = false a flag "process rule" is set;
- iv) the Policy Decision Functional Entity informs (PD-FE) the Policy Enforcing Functional Entity (PE-FE) to
 - create a context for an RTP-stream with transcoding according the indicated codec from the rule
 - or to
 - create a context for an RTP-stream without transcoding.

Border Gateway including Policy Decision Functional Entity and Policy Enforcing Functional Entity.

7. System according to claim 6;
characterised in that
in step iii) the involved Policy Decision Functional Entity
(PD-FE) is integrated in the border Gateway (BGW).

5

8. System according to claim 6;
characterised in that
in step iii) the involved Policy Decision Functional Entity
(PD-FE) is external to the border Gateway (BGW).

10

9. System according to one of the claims 6 to 8;
characterised in that
the Codec negotiation is performed by the Policy Decision
Functional Entities (PD-FE) in the involved networks.

15

10. System according to one of the claims 6 to 9;
characterised in that
in step i) the information exchange between a Physical Entity
Call/Session Controller (PE-CSCF) and a Policy Decision
Functional Entity (PD-FE) is based on the protocols H.248
accompanied by SDP.

20

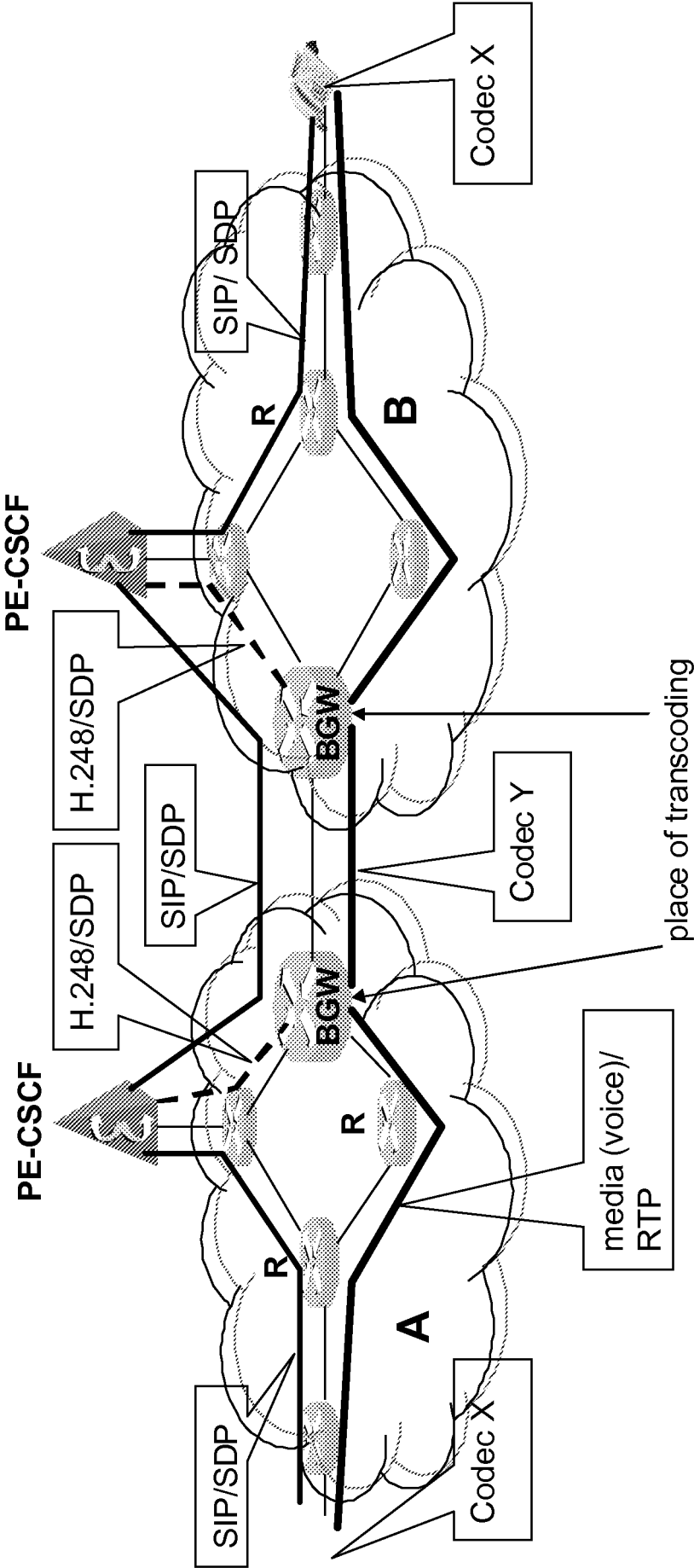


FIG 1

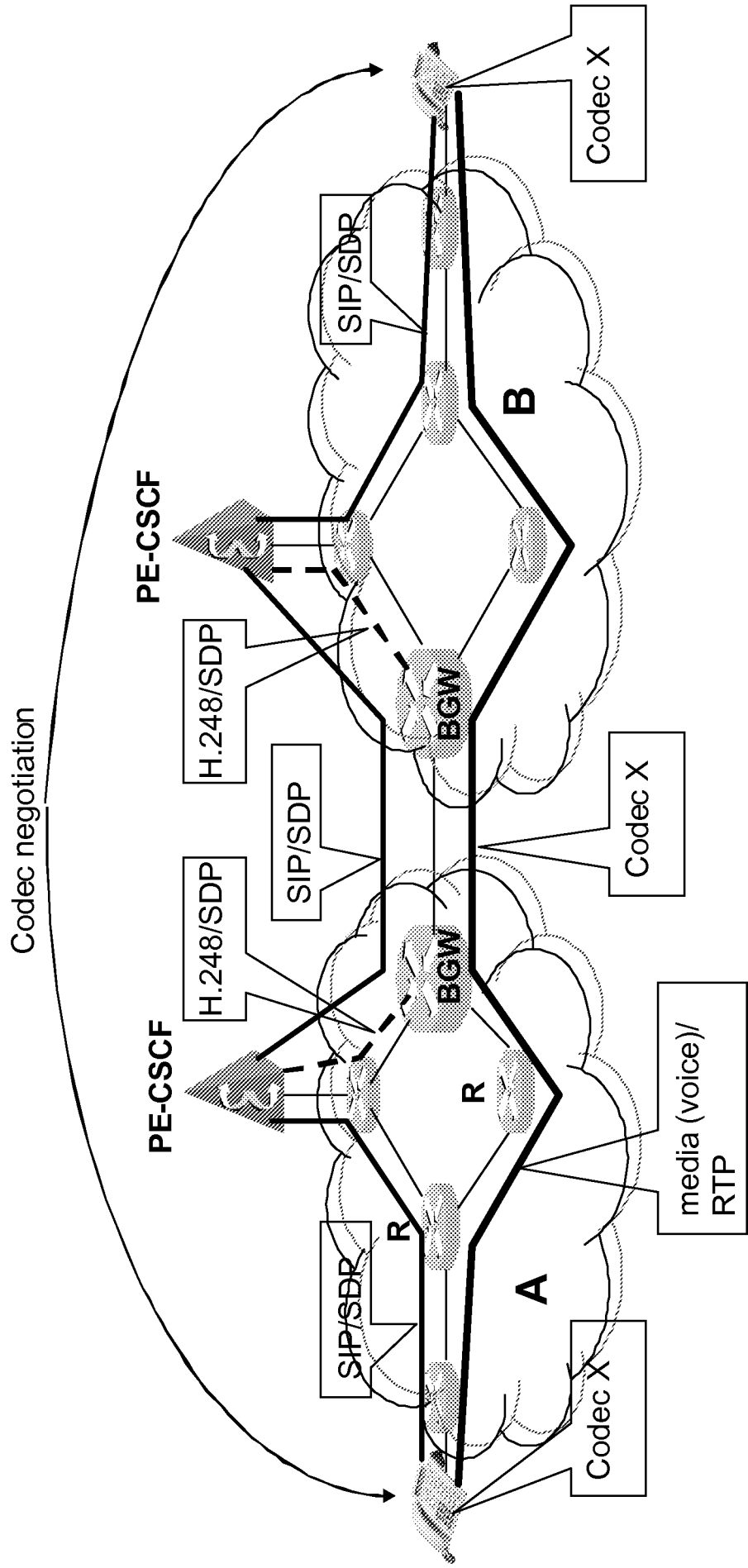


FIG 2

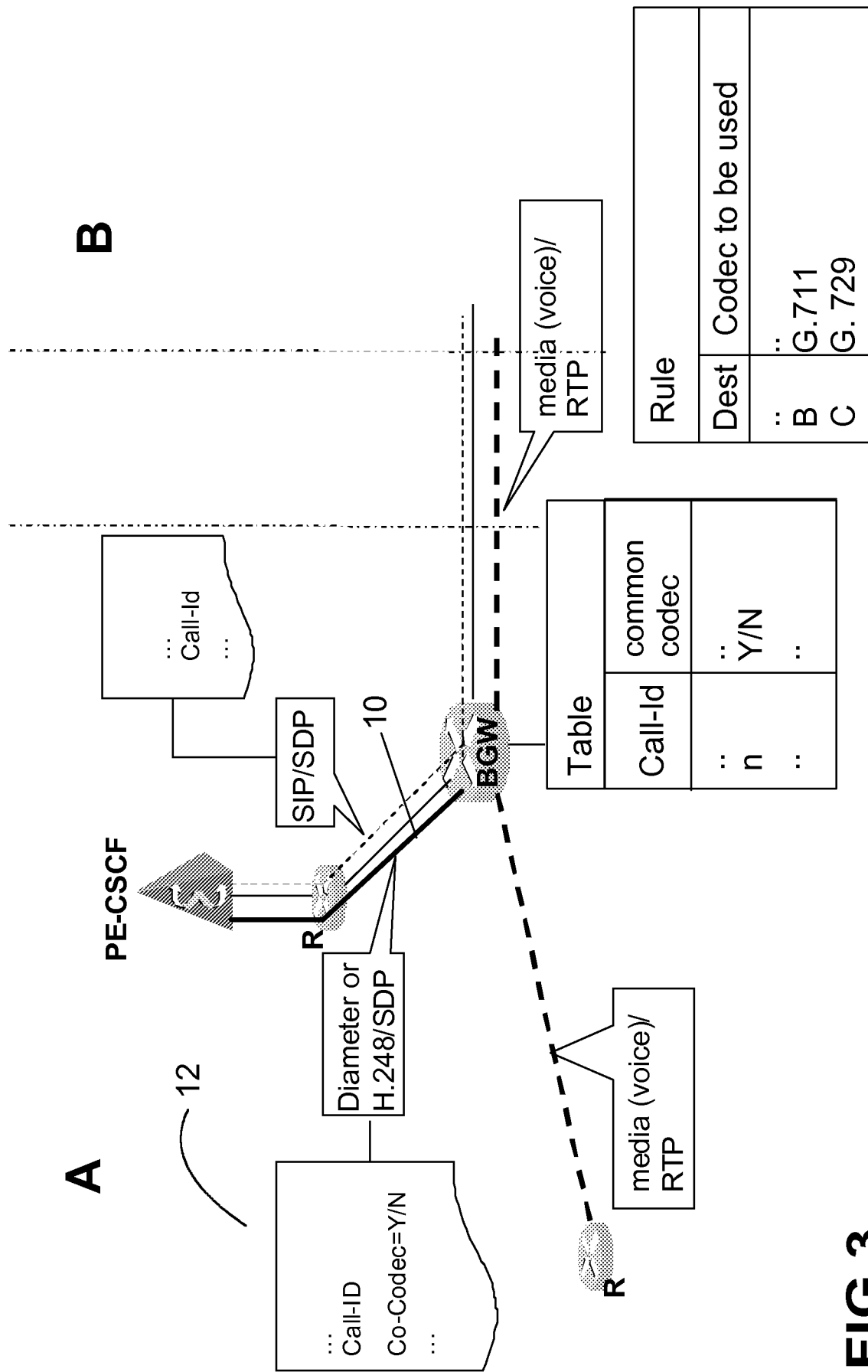


FIG 3

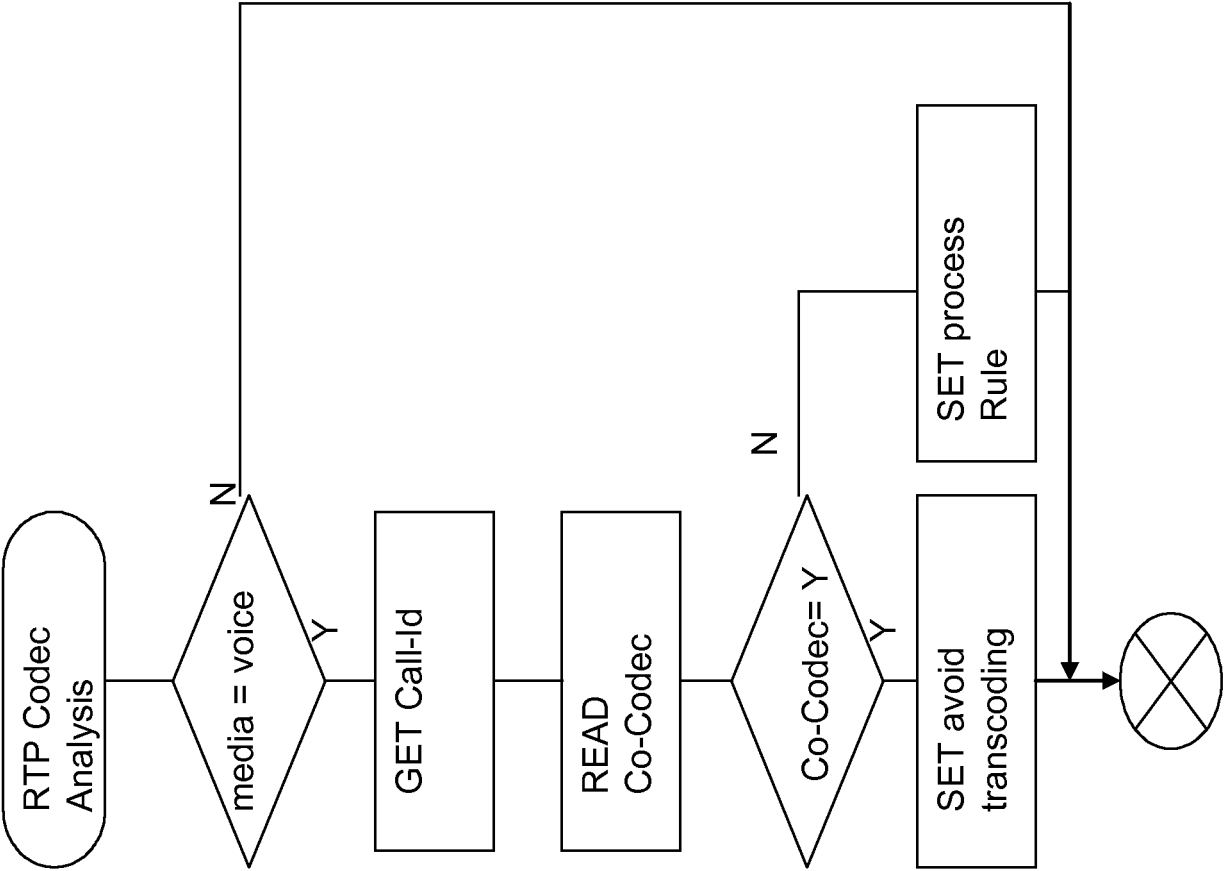


FIG 4

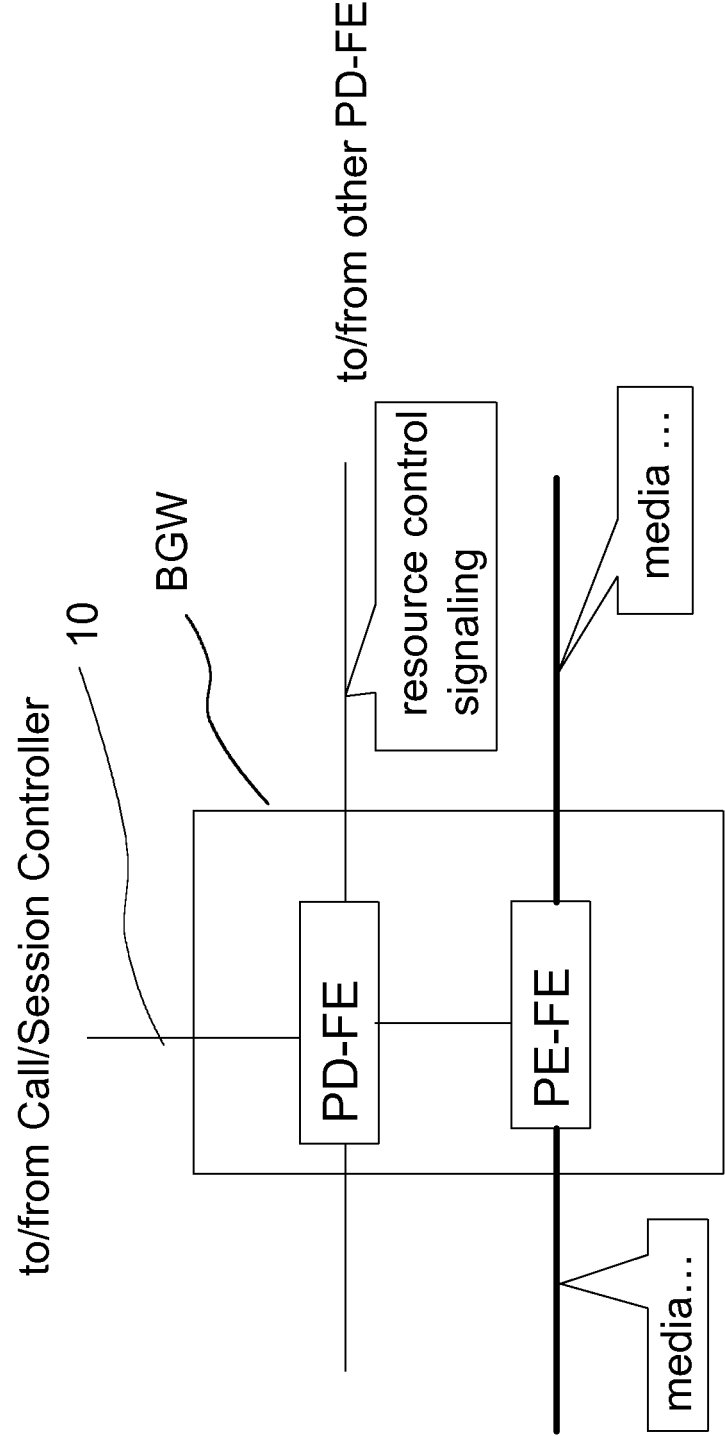


FIG 5

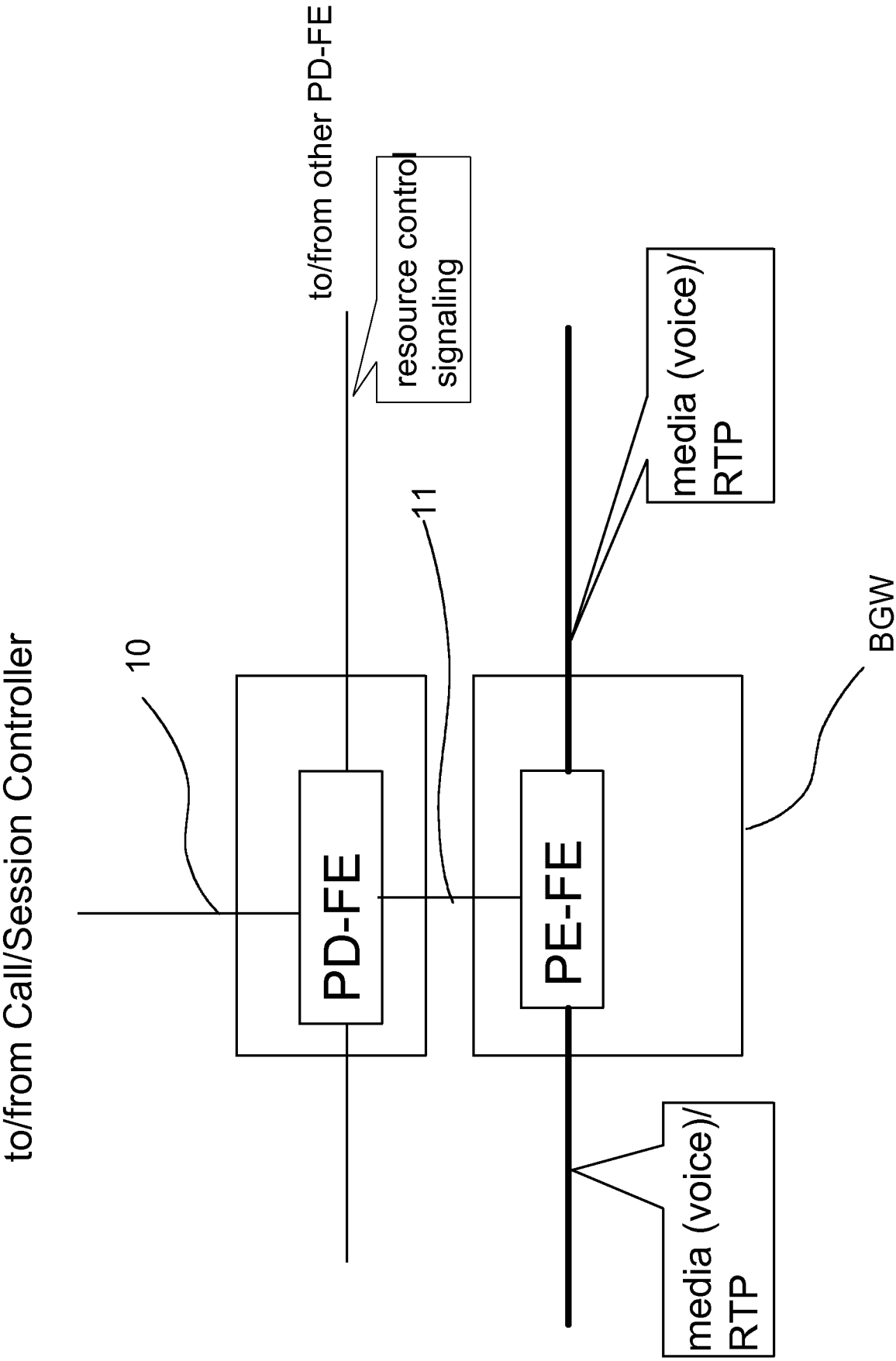


FIG 6

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2008/066064

A. CLASSIFICATION OF SUBJECT MATTER
INV. H04L29/06

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)

H04L H04M

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, IBM-TDB, INSPEC, COMPENDEX

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 1 758 333 A (SIEMENS SCHWEIZ AG [CH]) 28 February 2007 (2007-02-28) cited in the application paragraph [0014]; figure 3	1-10
A	INTERNATIONAL TELECOMMUNICATION UNION: "Resource control protocol no. 1 (rcpl) Protocol at the interface between service control entities and the Policy Decision Physical Entity (PD-PE) (Rs interface)" SERIES Q: SWITCHING AND SIGNALLING SIGNALLING REQUIREMENTS AND PROTOCOLS FOR THE NGN - RESOURCE CONTROL PROTOCOLS Q.3301.1, March 2007 (2007-03), pages 1-54, XP002487599 GENEVA, CH the whole document	1-10

☒ 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
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- *&* document member of the same patent family

Date of the actual completion of the international search

6 March 2009

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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

Eraso Helguera, J

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2008/066064

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	"Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); Resource and Admission Control: H.248 Profile for controlling Border Gateway Functions (BGF) in the Resource and Admission Control Subsystem (RACS); Protocol specification; ETSI ES 283 018" ETSI STANDARDS, LIS, SOPHIA ANTIPOLIS CEDEX, FRANCE, vol. TISPAN, no. V2.3.0, 1 November 2007 (2007-11-01), XP014040864 ISSN: 0000-0001 the whole document -----	1-10
A	CHU K: "Latest Draft of G.IP2IP (ver 1.7)" TELECOMMUNICATIONS INDUSTRY ASSOCIATION TR-30.1 MEETING, 21 August 2007 (2007-08-21), - 22 August 2007 (2007-08-22) pages 1-19, XP002487600 Arlington, VA, US the whole document -----	1-10
A	ANDERSON T W ET AL: "THE EMERGING RESOURCE AND ADMISSION CONTROL FUNCTION STANDARDS AND THEIR APPLICATION TO THE NEW TRIPLE-PLAY SERVICES" BELL LABS TECHNICAL JOURNAL, WILEY, CA, US, vol. 12, no. 1, 21 March 2007 (2007-03-21), pages 5-21, XP001541382 ISSN: 1089-7089 table I -----	1-10

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2008/066064

Patent document cited in search report		Publication date		Patent family member(s)	Publication date
EP 1758333	A	28-02-2007	WO	2007022818 A1	01-03-2007