

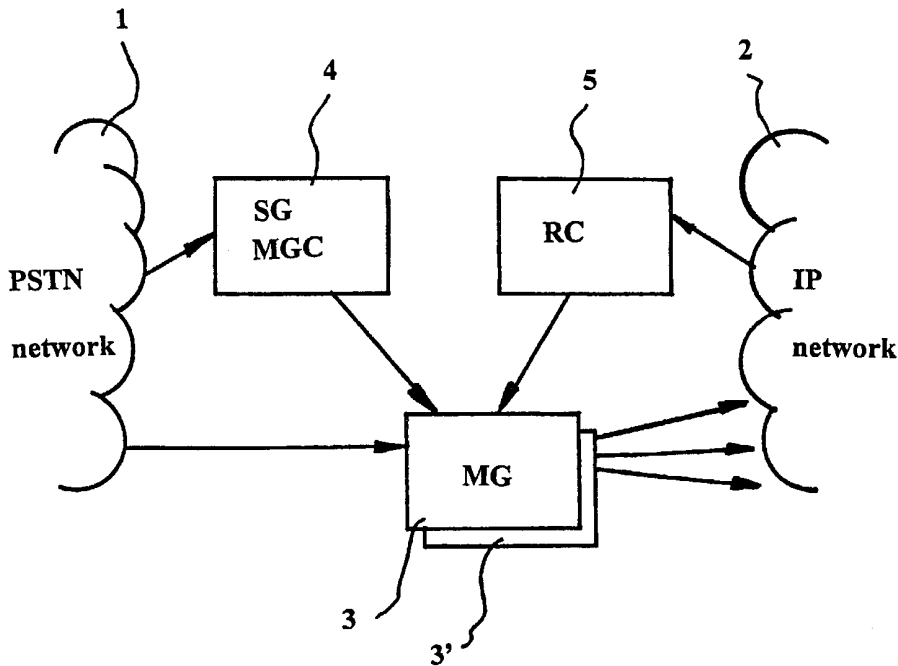


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(54) Title: ROUTING BETWEEN COMMUNICATION NETWORKS



(57) Abstract

The present invention relates to a method of routing a call between a circuit switched network and a packet switched network in a network system comprising a media gateway between the circuit switched network and the packet switched network. In the method all routing procedures for the call are handled by a separate routing controller common for several media gateways. The invention relates further to an arrangement for performing the same.

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**ROUTING BETWEEN COMMUNICATION NETWORKS**FIELD OF THE INVENTION

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The present invention relates to a method of routing in telecommunication networks, and more precisely to a method of routing between a telephone network and a data network. The invention relates further to an arrangement for performing the routing operations between two different networks.

BACKGROUND OF THE INVENTION

15 An interfacing gateway or access node is required in the communication path or route between two different communication networks. For instance, an interfacing access node is required in cases where the other network is a telephone network, such as a Public Switched Telephone  
20 Network (PSTN) and the other network is a data network, such as a packet switched data network (PSDN). Examples of the packet switched networks include the global connectionless Internet utilising TCP/IP (Transport Control Protocol/Internet Protocol) protocol suite and various  
25 Intranet applications.

One possibility to implement the access node AN between the PSTN and the packet switched data network is a routing device referred to as Network Access Server (NAS). NAS can  
30 be defined as a device which receives calls from the PSTN and translates the calls into Internet IP packet form.

At least some degree of routing functionality is required in the communication network system for the transmission of the  
35 data packets over the data network in order to be able to

sent the data packets to a correct next router and finally  
to a correct destination address. This functionality is  
usually integrated to the NAS, or then all traffic goes  
through a separate router especially and solely arranged to  
5 accomplish the routing tasks. Routing protocols based on  
international agreements are used in order to be able to  
provide this functionality. The routing protocols are used  
to adapt dynamically to the variations in networks  
structures and also to the possible failures occurring  
10 during various stages of transmission of the data packets.

#### SUMMARY OF THE INVENTION

The routing protocols, like OSPF (Open Shortest Path First)  
15 and BGP (Border Gateway Protocol), are substantially complex  
and do not suit especially well to simple network elements  
the NAS otherwise would utilise. Thus the integration of the  
routing protocols to each NAS unit of the network system is  
in most cases an excessively complex task, and requires  
20 otherwise unnecessary modifications and/or additional  
hardware and/or software implementations to each of the  
access servers in the system.

In case separate routers are used the routing causes one  
25 extra step, and every packet has to be handled still once in  
the NAS. This may cause delays in the traffic and increases  
the risk for failures.

The current development is leading towards a model in which  
30 the PSTN network control is separated from the NAS to a  
signalling gateway (SG; SS7 to ISUP over IP conversion) and  
Media Gateway Controller (MGC) handling the PSTN call  
related control, whereby NAS remains only as a simple Media  
Gateway (MG). A MG typically contains only one generic DSP  
35 (Digital Signal Processor) that can be programmed

dynamically to form a modem or a voice over IP codec. This simplifies the structure of the MG (i.e. the access node for media) a lot, but does not solve the routing problem.

- 5 It is an object of the present invention to overcome the disadvantages of the prior art solutions and to provide a new type of solution for routing calls between different networks.
- 10 Another object of the present invention is to provide a method and arrangement by means of which the structure of the access node can be made less complex and unnecessary double processing of the data packets can be avoided.
- 15 According to a first aspect, the objects are obtained by a method of routing a call between a circuit switched network and a packet switched network in a network system comprising a media gateway between the circuit switched network and the packet switched network, wherein routing procedures for the
- 20 call are handled by a separate routing controller common for several media gateways.

The routing controller can give routing information to an appropriate media gateway concerning the destination of the

25 call traffic. The routing information may comprise the IP interface to be used and the IP address of the next router in the packet switched network. The routing controller for the packet switched network and signalling controller for the circuit switched network may also form a symmetric

30 structure relative to the media gateway. The call can originate both from the circuit switched network side and the packet switched network side.

According to another aspect the invention provides an

35 arrangement in a communication network system comprising: a

circuit switched network; a packet switched network; a plurality of media gateways between the networks; a signalling controller for handling circuit switched traffic; and a separate routing controller for handling packet  
5 switched traffic routing, said separate routing controller being common to said plurality of media gateways.

The routing controller and the signalling controller can form a symmetric structure relative to the media gateway.  
10 The plurality of media gateways can also be arranged in a stack.

According to a further aspect the invention provides a routing controller for a communication network system  
15 comprising a circuit switched network, a packet switched network, a plurality of media gateways between the networks, and a signalling controller for handling circuit switched traffic, wherein the routing controller is arranged to form a separate routing controller for handling packet switched  
20 traffic routing such that said separate routing controller is common to said plurality of media gateways.

Several advantages are obtained by means of the present invention, since the solution provides a simplified  
25 structure for the media gateway between different communications networks. Since the required media gateway apparatus is less complex than in the prior art solutions, it is thus economically more advantageous and also more reliable in use and less vulnerable for hardware and/or  
30 software failures. The proposed solution does not have any disadvantageous effects in the performance or functionality of the system since the traffic is separated to different outgoing interfaces. The proposed system adapts well to any dynamic changes in the network system. In addition, by means  
35 of the invention it becomes more easy to stack media gateway

units to a tight space.

In the following the present invention and the other objects  
and advantages thereof will be described in an exemplifying  
5 manner with reference to the annexed drawings, in which  
similar reference characters throughout the various figures  
refer to similar features.

#### BRIEF DESCRIPTION OF THE DRAWINGS

10

Figure 1 is a schematic presentation of network system  
including a telephone network and a data network and linking  
apparatus there between; and

15 Figure 2 discloses signalling flow according to one  
embodiment of the present invention.

#### DETAILED DESCRIPTION OF THE DRAWINGS

Figure 1 is a schematical presentation of one network system  
20 including a PSTN 1, IP network 2 (e.g. the TCP/IP Internet  
or an intranet application) and an access node or a gateway  
apparatus therebetween. The arrows indicate the signalling  
directions in situation where a call has been initiated by a  
terminal of the PSTN (not shown). In this example the  
25 gateway apparatus comprises a plurality of media gateways 3,  
3', a signalling gateway SG (for SS7 to ISUP over IP  
conversion) and media gateway controller MGC handling call  
related control 4.

30 Each MG 3,3' may contain only one generic DSP (Digital  
Signal Processor) which can be programmed dynamically to  
form a modem or a voice over IP codec. Thus the structure of  
the MG can be made substantially simple, which reduces  
remarkably the costs of the MG and also increases the  
35 reliability of the MG. As disclosed, the MGs can be stacked

in a substantially tight space in a manner similar to ordinary telephone exchanges. It is noted that even though figure 1 discloses only two MGs, the number of them could be substantially higher.

5

The gateway apparatus is further provided with a separate routing controller RC 5, the arrangement being such that the routing is separated similarly to the signalling gateway and media gateway controller 4 to the routing controller 5. In  
10 other words, the system is "symmetric" relative to the MGs in view of the PSTN and the IP network. Thus the former access servers are now simplified to form only media gateway units 3, 3'.

15 In a manner similar to the SG+MGC unit 4, the routing controller unit 5 is common for several media gateway units 3, 3'. The routing controller 5 is arranged to communicate to the IP network 2 by using appropriate routing protocols, such as the OSPF and the BGP, and to give required routing  
20 orders to the particular media gateway unit 3 or 3'. The main information required by the particular media gateway is the current situation concerning the destination of the traffic originating in the PSTN side and coming via a certain PSTN line. The required information typically  
25 consists of indication of correct IP interface which should be used and the IP address of the next router (i.e. the next "hop" in the data network).

An example of the routing protocols is the OSPF routing  
30 protocol (RFC2178) which is one of the IP protocols, more precisely IP protocol number 89. All those IP packets that are coming to the media gateway MG and are of protocol 89 are tunnelled to the routing controller RC. The routing controller 5 sees all MG interfaces as its own interfaces,  
35 and when something is sent to a RC interface, it is



tunnelled to the MG and sent there. There are 5 types of OSPF packets and they all must fit in to an IP packet of size of 576 bytes (in case operated according to RFC2178 appendix A). Another typical protocol is RIP (RFC1723) that  
5 is a UDP based protocol (a transport level datagram layer above the IP layer, port 520). A similar tunnelling approach works in this as well when the traffic from UDP port 520 is forwarded to the routing controller.

10 The media gateway MG unit can be made as simple as possible by removing both IP routing handling and call control from it. This does not affect negatively to the performance or the functionality of the system because the traffic is separated to different outgoing ("egress") interfaces in a  
15 manner similar to a router. The system also adapts to any dynamic changes in the network in a manner similar to a router.

The PSTN users often have a dynamically assigned IP address.  
20 In this case the RC must "advertise" (i.e. announce) these addresses so that the other routers of the system are enabled to transmit the data packets to a correct MG.

It is also possible for an PSTN user to have a known IP  
25 network address or a subnet of an IP network. In this case the RC can call back to the PSTN telephone number associated with this IP address when somebody tries to reach said IP address from the IP network side. In case the connection has already been setup, this case will be like the one already  
30 discussed above.

The RC advertises routes to the fixed network addresses even in instances where the connections are down i.e. disconnected. The RC can accomplish this by using one, some  
35 or available ports based on local policy (for instance, some

MGs may be closer to the destination in the PSTN). When a packet addressed to a predefined destination arrives, the MG routes it to a special dynamic interface that makes the SG to set-up the requested telephone call. This may involve  
5 utilisation of one additional server, e.g. an AAA server (Authentication, Authorisation and Accounting server; most often used protocol for an AAA server being RADIUS) that maintains customer information in a database which is common for the SC and the RC.

10

Figure 2 discloses signalling flows 11 to 13 (numbers in circles) for the above described solution. At flow step 11 the AAA server 7 defines fixed routes and the RC 5 controls that the MG 3 becomes advertised of the addresses and sets  
15 up the MG 3 to start a connection should a data packet arrive. In flow step 12 a data packet arrives, whereafter the MG 3 contacts SG/MGC 4 in order to establish a connection. SG 4 ask for a telephone number from the AAA server 7 and establishes the connection to that number. Then  
20 the MG 3 forwards the data packet to the established connection 13. In case the same route is advertised in many MGs, it must in most cases be ensured that only one connection is established at the same time. However, there may be instances where it could be desirable to establish  
25 several connections, e.g. such that the user can receive several calls at the same time and/or that the bandwidth is increased by this and/or that the call may go to many geographical locations at the same time.

30 Thus the invention provides an apparatus and a method by which a significant improvement can be achieved in the area of routing between different networks. It should be noted that the foregoing exemplifying embodiments of the invention are not intended to restrict the scope of the invention to  
35 the specific forms presented above but the present invention

is meant rather to cover all modifications, similarities and alternatives which are included in the spirit and scope of the present invention, as defined by the appended claims.

**Claims**

1. A method of routing a call between a circuit switched network and a packet switched network in a network system  
5 comprising a media gateway between the circuit switched network and the packet switched network, wherein routing procedures for the call are handled by a separate routing controller common for several media gateways.
- 10 2. A method in accordance with claim 1, wherein the routing controller gives routing information to an appropriate media gateway concerning the destination of the call traffic.
3. A method in accordance with claim 2, wherein the routing  
15 information comprises the IP interface to be used and the IP address of the next router in the packet switched network.
4. A method in accordance with any of the preceding claims,  
20 wherein the routing controller for the packet switched network and signalling controller for the circuit switched network form a symmetric structure relative to the media gateway.
5. A method in accordance with any of the preceding claims,  
25 wherein the call comes to the media gateway from the circuit switched network side.
6. A method in accordance with any of claims 1 to 4,  
30 wherein the call comes to the media gateway from the packet switched network side and is destined to a terminal connected to the circuit switched network.
7. A method in accordance with claim 6, wherein, in case the terminal has a dynamically assigned IP address, the IP

address of the terminal is advertised by the routing controller to routers of the system.

8. A method in accordance with claim 6, wherein, in case  
5 the terminal has a known IP address, the routing controller calls back to a called circuit switched terminal number associated with said IP address.

9. An arrangement in a communication network system  
10 comprising:  
a circuit switched network;  
a packet switched network;  
a plurality of media gateways between the networks;  
a signalling controller for handling circuit switched  
15 traffic; and  
a separate routing controller for handling packet switched traffic routing, said separate routing controller being common to said plurality of media gateways.

20 10. An arrangement in accordance with claim 9, wherein the routing controller and the signalling controller form a symmetric structure relative to the media gateway.

11. An arrangement in accordance with claim 9 or 10, wherein  
25 the plurality of media gateways is arranged in a stack.

12. A routing controller for a communication network system comprising a circuit switched network, a packet switched network, a plurality of media gateways between the networks,  
30 and a signalling controller for handling circuit switched traffic, wherein the routing controller is arranged to form a separate routing controller for handling packet switched traffic routing such that said separate routing controller is common to said plurality of media gateways.

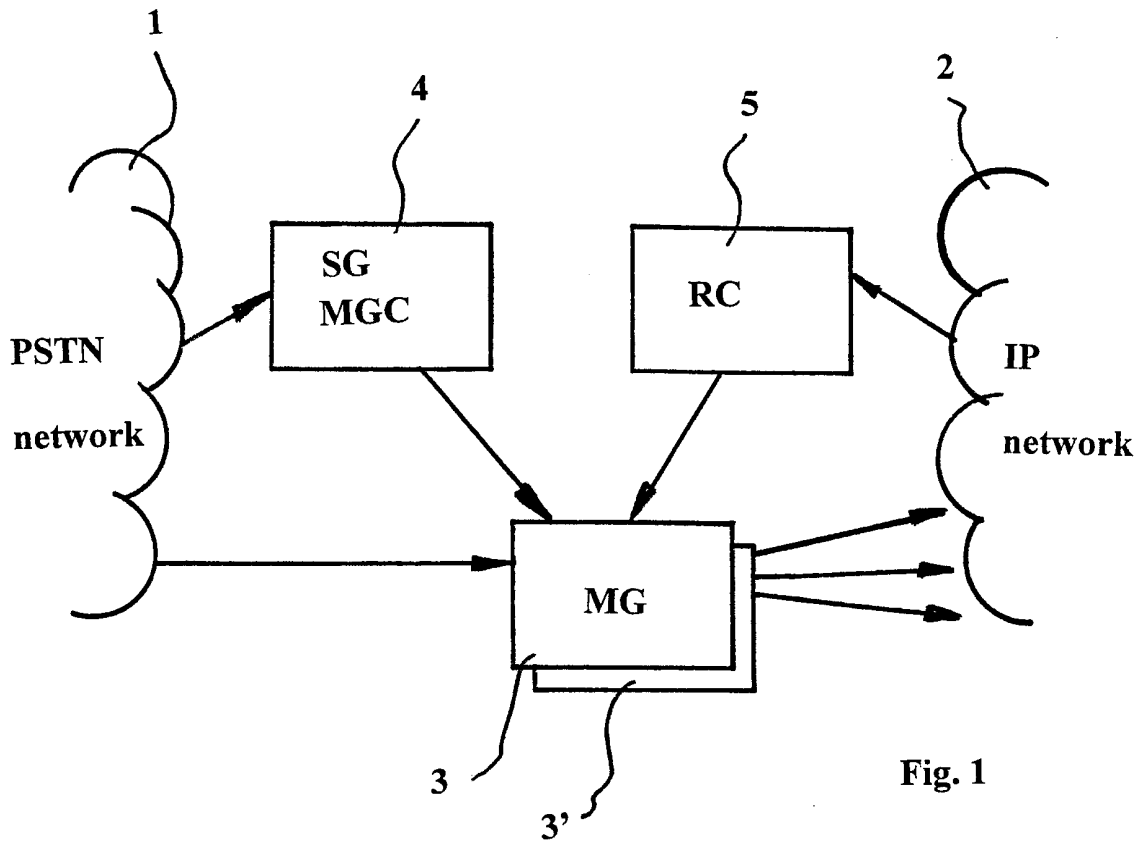
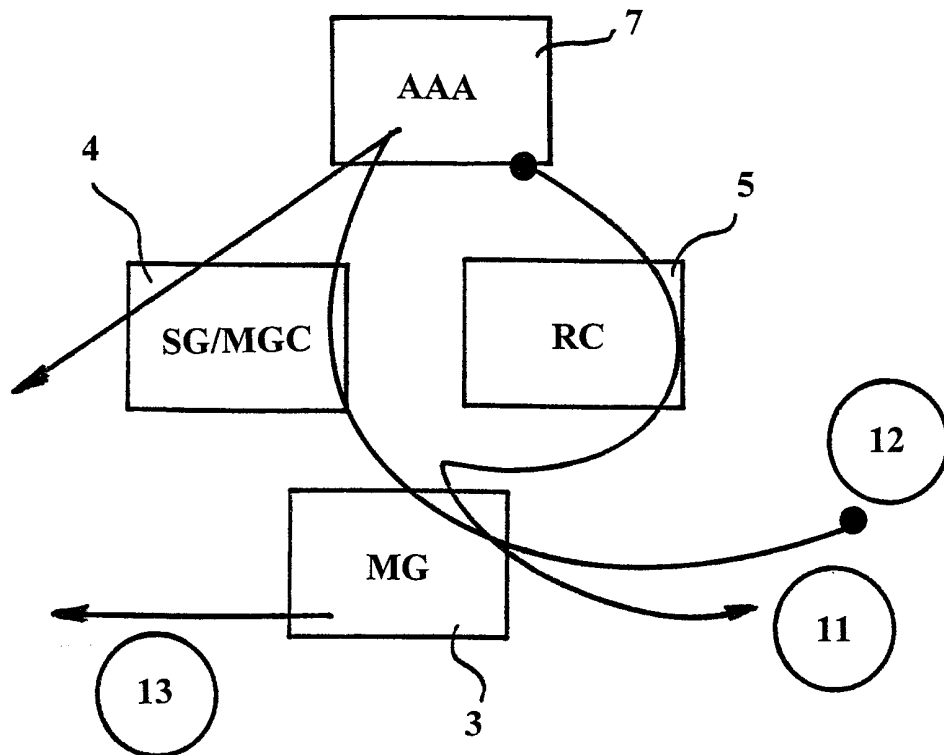


Fig. 1

Fig. 2



INTERNATIONAL SEARCH REPORT

International Application No

PC., FI 00/00324

A. CLASSIFICATION OF SUBJECT MATTER  
 IPC 7 H04L12/56 H04L12/66 H04L12/46 H04Q11/04

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)  
 IPC 7 H04L H04Q

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.
X	US 5 546 452 A (ANDREWS G W ET AL) 13 August 1996 (1996-08-13) column 2, line 35 -column 3, line 10 column 5, line 20 - line 50 column 7, line 25 - line 41; figures 1-3	1-6,8-12
Y	---	7
X	EP 0 880 255 A (NORTHERN TELECOM LTD) 25 November 1998 (1998-11-25) column 4, line 3 - line 47 column 6, line 37 - line 57 column 8, line 45 -column 9, line 5 column 9, line 25 - line 43; figure 1 ---	1-6,8-11
	-/--	

Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

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Date of the actual completion of the international search

25 July 2000

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## INTERNATIONAL SEARCH REPORT

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PC., FI 00/00324

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	EP 0 474 427 A (AMERICAN TELEPHONE & TELEGRAPH CO) 11 March 1992 (1992-03-11) column 1, line 45 - column 2, line 13 column 4, line 1 - line 18 column 6, line 12 - line 40 ---	7
P,X	WO 99 62242 A (3COM CORP) 2 December 1999 (1999-12-02) page 2, line 1 - line 28 page 4, line 1 - line 24 page 5, line 10 - line 32 page 6, line 5 - line 29 page 7, line 12 - line 22; figures 3A-3C abstract ---	1-6,8-12
P,X	DATABASE WPI Section EI, Week 200015 Derwent Publications Ltd., London, GB; Class T01, AN 2000-167115 XP002901125 & JP 2000 022735 A (NIPPON DENKI ENG KK), 21 January 2000 (2000-01-21) abstract ---	12
P,X	HUITEMA CH ET AL: "An architecture for residential internet telephony service" IEEE INTERNET COMPUTING, vol. 33, May 1999 (1999-05), pages 73-82, XP002901126 the whole document ---	1-6,8-12
A	WO 97 28628 A (LABS OF ADVANCED TECHNOLOGIES INT CO) 7 August 1997 (1997-08-07) the whole document ---	1-6,8-12
A	ATASLAR ET AL: "Decentralized routing controller design for networks with more than two overlapping subnetworks" IEEE INTERNATIONAL CONF. ON SYSTEMS, MAN AND CYBERNETICS. INTELLIGENT SYSTEMS FOR THE 21ST CENTURY, vol. 4, 1995, pages 2960-2965, XP002901127 the whole document -----	7



# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/ FI 00/00324

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5546452    A	13-08-1996	AU 696984 B	24-09-1998
		AU 5357396 A	18-09-1996
		CA 2188875 A	06-09-1996
		EP 0758508 A	19-02-1997
		US 5878130 A	02-03-1999
		WO 9627254 A	06-09-1996
		US 5848143 A	08-12-1998
-----			
EP 0880255    A	25-11-1998	CA - 2205731 A	20-11-1998
-----			
EP 0474427    A	11-03-1992	US 5166931 A	24-11-1992
		AU 629486 B	01-10-1992
		AU 8340891 A	12-03-1992
		DE 69114090 D	30-11-1995
		DE 69114090 T	30-05-1996
		JP 4227150 A	17-08-1992
		JP 8031884 B	27-03-1996
-----			
WO 9962242    A	02-12-1999	AU 4223999 A	13-12-1999
-----			
JP 2000022735 A	21-01-2000	NONE	
-----			
WO 9728628    A	07-08-1997	AU 1851397 A	22-08-1997
		JP 2000504183 T	04-04-2000
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