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(54) PACKET SWITCHING SYSTEM, PACKET SWITCHING METHOD, ROUTING APPARATUS, STRUCTURE OF PACKET, AND PACKET GENERATING METHOD

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(57) **ABSTRACT**

The packet switching system for transmitting and receiving a packet via a packet switching network **100**, which comprises a plurality of routing tables (**#0, #1, #2 . . .**), each of which has been generated by a unique routing policy, stored in the routing apparatuses deployed at the border, at the origin or at the end of the respective routing domains, an identifier (RTI) inserted in the packet to specify the routing tables, and an identifier changer to change a value of the identifier on the packet switching network **100.** The routing apparatus selects one of the routing tables (**#0, #1, #2 . . .**) according to the RTI in the received packet and transfers the packet to a destination that is specified by the selected routing table.

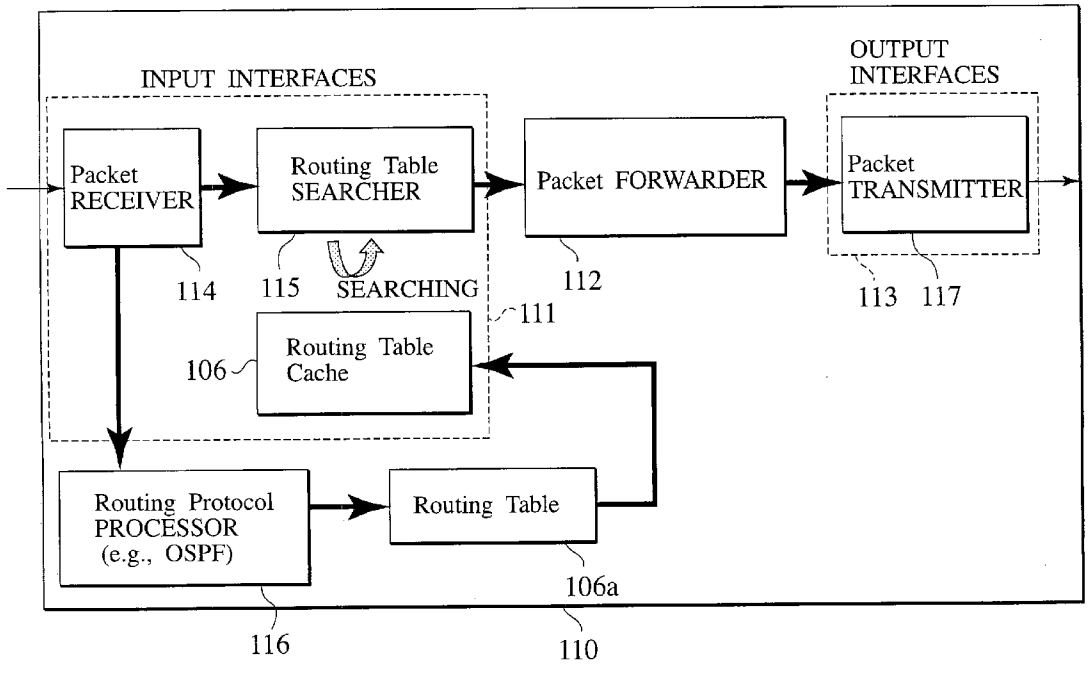


FIG. 1

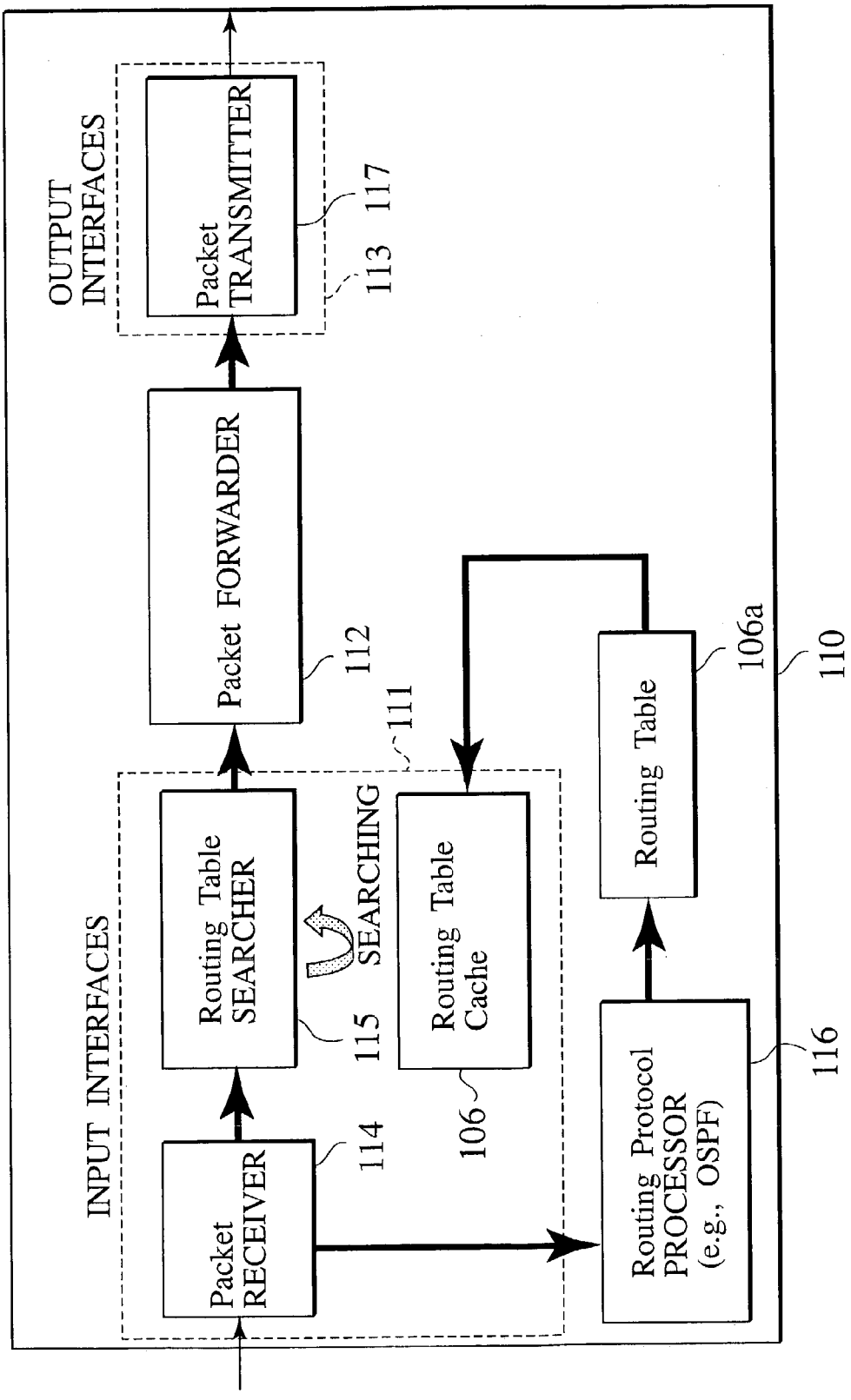

OUTPUT INTERFACES
Packet TRANSMITTER
113
117
Packet FORWARDER
112
111
INPUT INTERFACES
Routing Table SEARCHER
SEARCHING
115
Routing Table Cache
106
114
Packet RECEIVER
Routing Table
106a
110
Routing Protocol PROCESSOR (e.g., OSPF)
116

FIG. 2

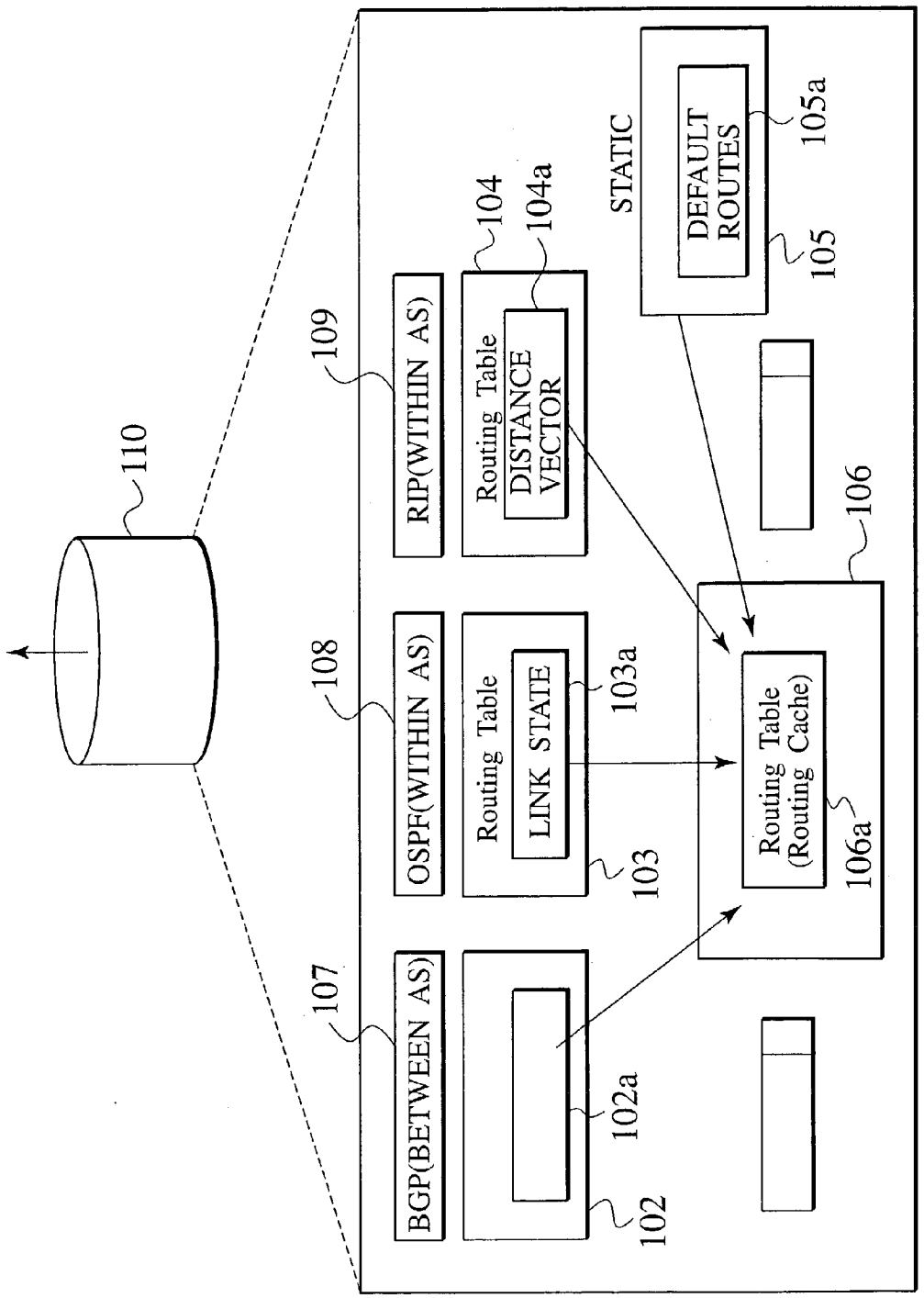

110
109
RIP(WITHIN AS)
104
104a
Routing Table
DISTANCE VECTOR
STATIC
DEFAULT ROUTES
105a
105
108
OSPF(WITHIN AS)
Routing Table
LINK STATE
103a
103
106
Routing Table (Routing Cache)
106a
107
BGP(BETWEEN AS)
102a
102

FIG. 3

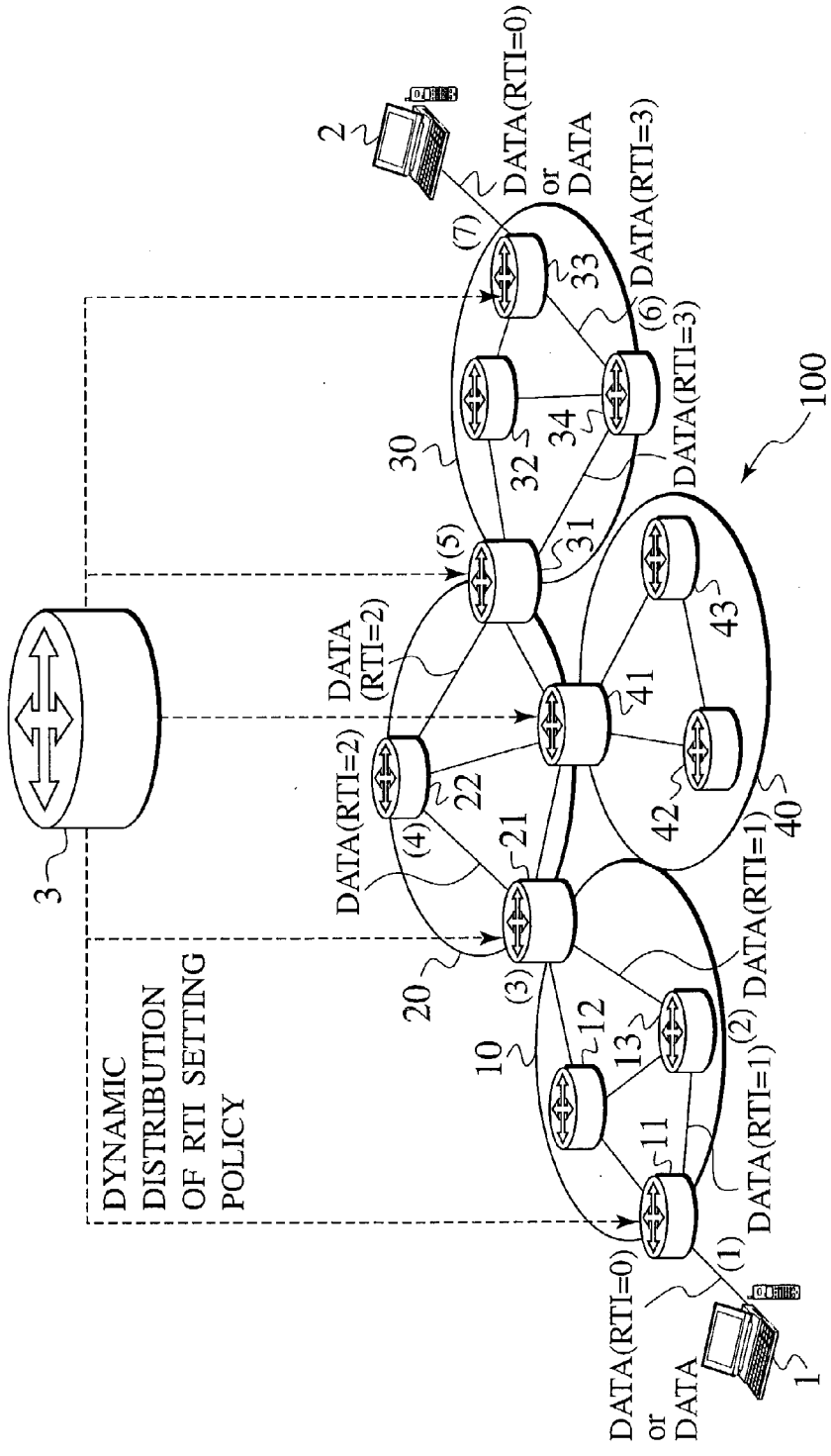

DYNAMIC DISTRIBUTION OF RTI SETTING POLICY
3
2
1
100
10
11
12
13
20
21
22
30
31
32
33
34
40
41
42
43
(1)
(2)
(3)
(4)
(5)
(6)
(7)
DATA(RTI=0) or DATA
DATA(RTI=1)
DATA(RTI=2)
DATA(RTI=3)
DATA (RTI=2)

FIG. 4

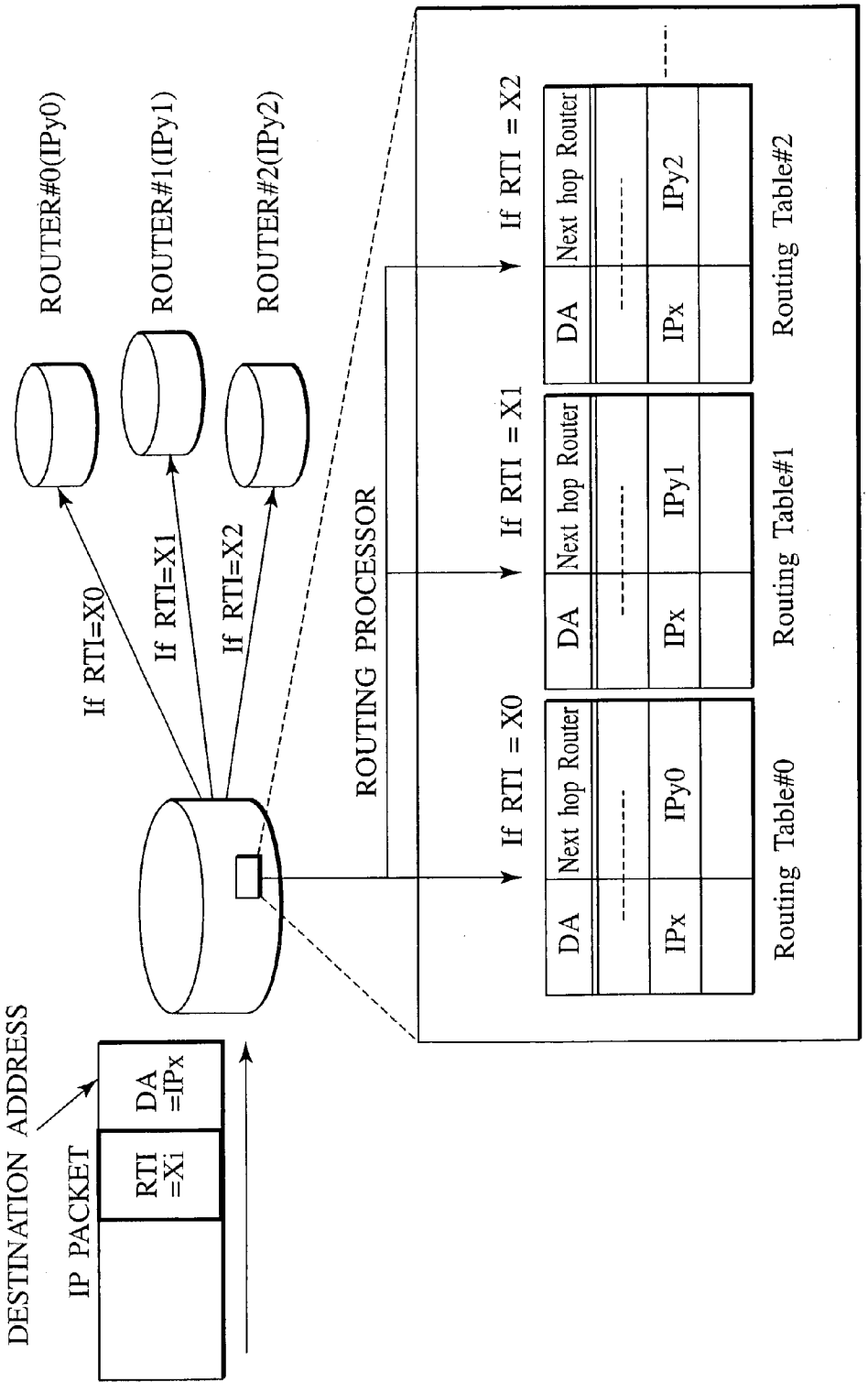

DESTINATION ADDRESS
IP PACKET
DA =IPx
RTI =Xi
If RTI=X0
If RTI=X1
If RTI=X2
ROUTER#0(IPy0)
ROUTER#1(IPy1)
ROUTER#2(IPy2)
ROUTING PROCESSOR
If RTI = X0
If RTI = X1
If RTI = X2
DA
Next hop Router
IPx
IPy0
IPy1
IPy2
Routing Table#0
Routing Table#1
Routing Table#2

FIG. 5

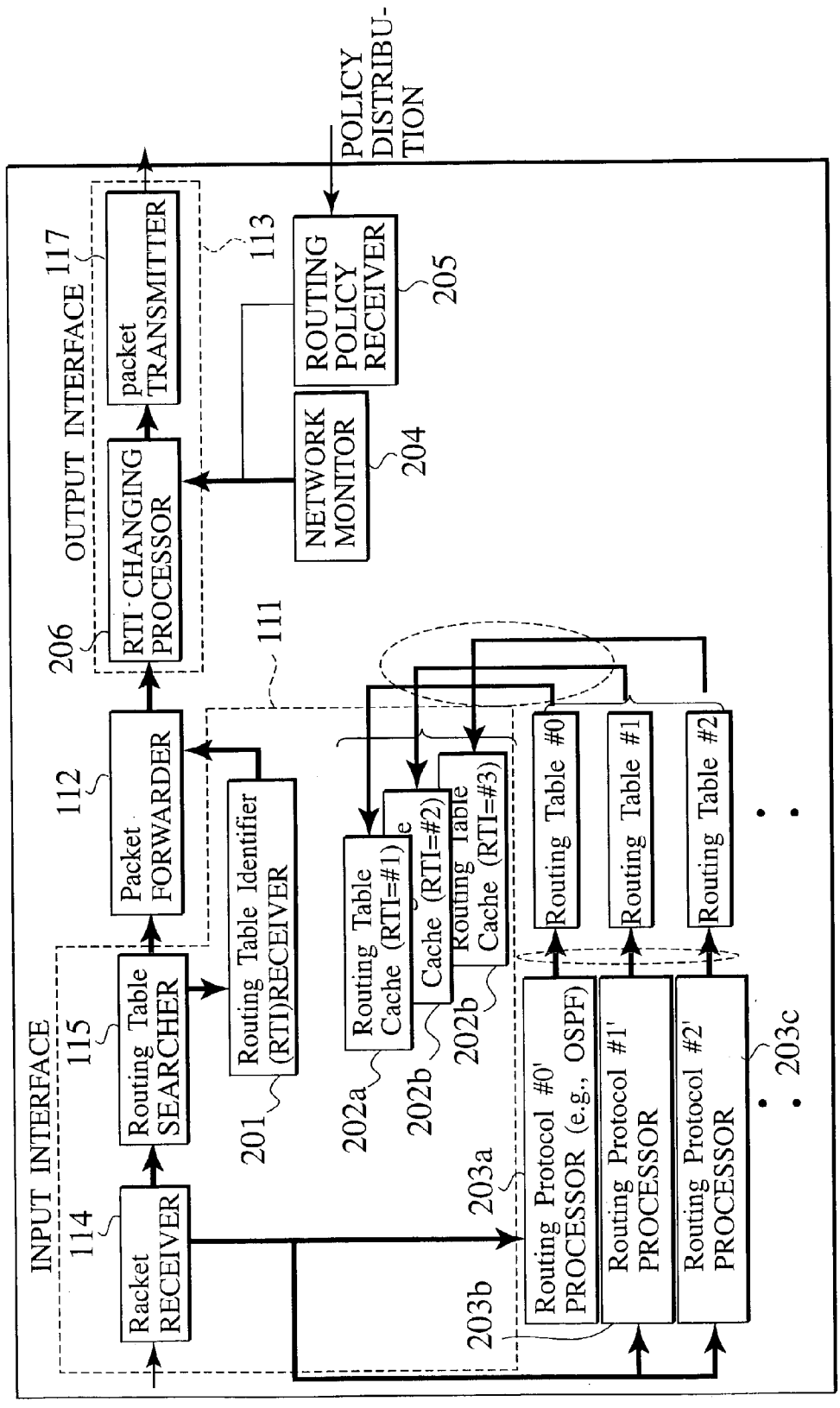

POLICY DISTRIBU-TION
OUTPUT INTERFACE
117
113
packet TRANSMITTER
ROUTING POLICY RECEIVER
205
RTI CHANGING PROCESSOR
206
NETWORK MONITOR
204
111
Packet FORWARDER
112
Routing Table Identifier (RTI)RECEIVER
201
INPUT INTERFACE
114
115
Racket RECEIVER
Routing Table SEARCHER
202a
Routing Table Cache (RTI=#1)
202b
Routing Table Cache (RTI=#2)
202b
Routing Table Cache (RTI=#3)
203a
203b
Routing Protocol #0' PROCESSOR (e.g., OSPF)
Routing Protocol #1' PROCESSOR
Routing Protocol #2' PROCESSOR
203c
Routing Table #0
Routing Table #1
Routing Table #2

FIG. 6

Routing Table ID	Routing Policy ID (Routing Protocol or Control Message)	RTI (Routing Table Identifier)
Routing Table #0	RIP	RTI=X0
Routing Table #1	OSPF	RTI=X1
Routing Table #2	Host Address Routing	RTI=X2
Routing Table #3	FUNCTIONAL TRANSFER ROUTING	RTI=X3
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T1

PACKET SWITCHING SYSTEM, PACKET SWITCHING METHOD, ROUTING APPARATUS, STRUCTURE OF PACKET, AND PACKET GENERATING METHOD

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application is based upon and claims the benefit of priority from the prior Japanese Patent Applications No. P2002-003799, filed on Jan. 10, 2002; the entire contents of which are incorporated herein by reference.

BACKGROUND OF THE INVENTION

[0002] 1. Field of the Invention

[0003] The present invention relates to a packet switching system, a packet switching method, a routing apparatus, a structure of packet, and packet generating method, which are configured to transfer packets via a packet switching network that is configured by interconnecting a plurality of routing apparatuses.

[0004] 2. Description of the Related Art

[0005] In the conventional packet switching network, such as the Internet for example, IP address is assigned to each host (terminal) so that a physical location of the host can be identified. Then a routing apparatus (hereinafter referred to as router) on the network performs forwarding of packets to a destination host, which is called "routing", according to a routing table that shows a relationship between destination IP address and a next hop router.

[0006] Normally, various dynamic routing protocols, e.g., RIP, OSPF, are utilized in the router to generate routing tables. Respective routing protocols generate and update a routing table in the router based on the prescribed algorithm and the major difference between these routing protocols is how to handle the routing table, i.e., a routing policy.

[0007] **FIG. 1** shows an internal configuration of a conventional router. As shown in **FIG. 1, a** conventional router **110** is configured with an input interface **111**, a packet forwarder **112**, an output interface **113**, a routing protocol processor **116** and a routing table **106***a*. The input interface **111** has a packet receiver **114**, a routing table searcher **115** and a routing table cache **106**.

[0008] In the conventional router **110**, when the packet receiver **114** receives a packet, a packet destined for the conventional router **110** itself is transferred to the routing protocol processor **116**, and a packet destined for a router other than the conventional router **110** is transferred to the routing table searcher **115**. The routing protocol processor **116** updates the routing table **106***a* according to the received packet destined for the conventional router **110** itself and stores the updated routing table in the routing table cache **106**. The routing table searcher **115** decides on an output interface by searching the routing table cache **106** for the received packet destined for other than the conventional router **110**. The received packet destined for a router other than the conventional router **110** is then forwarded to a packet transmitter **117** of the output interface **113** via the packet forwarder **112**, and finally forwarded to external devices by the packet transmitter **117**.

[0009] As described above, although the conventional router **110** can store the plural routing tables by supporting the plural routing protocols, the routing table searcher **115** can select only one routing table, which is generated by a unique routing policy, from the plural routing tables stored in the conventional router **110**. Therefore, in the conventional router **110**, routing of input traffic can only be performed according to a single routing policy.

[0010] **FIG. 2** shows how the routing tables are handled in the conventional router **110**. As shown in **FIG. 2**, the conventional router **110** can support various routing protocols, for example, BGP**107**, OSPF**108**, RIP**109**, and generates routing tables **102***a*, **103***a*, **104***a* based on an algorithm of each routing protocol. The routing tables **102***a*, **103***a*, **104***a* can be stored into a routing cache **102**, **103** and **104** in the conventional router **110**, respectively. A static routing table **105** that shows default routes can also be stored into a routing cache **105***a*.

[0011] However, manual intervention is required to select one routing table from the routing tables **102***a*, **103***a*, **104***a* so that the routing table cache **106** which stores a selected routing table can recognize a routing table to be utilized. In addition, conventional router **110** may select an appropriate routing table according to a priority which is manually given to respective routing tables and the routing table is selected according to the priority and loaded into the routing table cache **106** as the routing table **106***a*. As a result, only a single routing table can be utilized for routing in one timeframe and it is of concern that a routing policy utilized for the packet switching network is limited to a single routing policy.

[0012] Accordingly, since the single routing policy has to be selected even the optimum routing policy differs from area to area on the packet switching network. It is therefore a problem that the switching of a routing policy dynamically, for example, per packet or per flow cannot be achieved.

[0013] In the existing TCP/IP network, a structure of an IP address results in routing based on a physical address of a client terminal and a server, and a routing algorithm is fixed by the routing algorithm utilized by RIP or OSPF, etc. It is not therefore feasible on the network to route a specific packet via a specific path in order to achieve a certain purpose.

[0014] Moreover, since routing is performed based on a single routing policy in the conventional art, the simultaneous use of more than one route for the same destination IP address and routing to a specific device on the network per packet, per flow or per block of traffic without the knowledge of such routing process of the client terminal is not feasible. Further, the network has no right to dynamically change the routing of a packet according to a certain signal.

[0015] As described above, since only a single routing table is utilized for the actual transfer of a packet, a routing policy is decided automatically in the router that configures a conventional TCP/IP network even if the router (an interface of the router) supports plural routing protocols.

[0016] However, there is demand to change a routing policy dynamically per packet, per flow or per input interface and to apply different routing policies per routing domain in the case where the network is formed by an aggregation of routing domains.

BRIEF SUMMARY OF THE INVENTION

[0017] The present invention has been made in view of the above problems, and thus has an object of providing a packet switching system, packet switching method and a router which enable flexible and highly functional routing by the simultaneous use of plural routing policies in a packet switching network that is configured by interconnecting a plurality of routers.

[0018] To achieve the object, it is preferred that in the present invention, the packet switching network is configured by interconnecting a plurality of routing domains formed in a prescribed area, a plurality of the routing tables, which have each been generated by a unique routing policy, are utilized in each of the routing domains, the router is deployed at a border with an adjacent routing domain, the origin or the end of the routing domain, and the router changes the value of the identifier in view of a routing policy utilized in the routing domain to which the packet is to be transferred.

[0019] In the present invention, it is preferred that the same process is performed to change the value of the identifier for a prescribed block of packets in accordance with a type of the packet. Here, change the value of the identifier for the prescribed block of packets means the process to change the value of the identifier per flow of packet, regarding input interface, or regarding all the traffic. In other words, the prescribed block of packets is a unit determined based on various conditions in the packet (e.g., port number, TOS field and source address).

[0020] In the present invention, it is preferred to instruct an applicable router to change the value of the identifier in accordance with variation in a status of communication by monitoring. the status on the packet switching network. Incidentally, monitoring a status of communication on the packet switching network may be performed by a controlling apparatus which is independent from the router, or may be performed in the router.

[0021] Here, the routing policy means a design policy for generating the routing table that is used to control routing. Examples of the routing policy include "Distance vector routing control", "Link state routing control", "Host address routing control", "Load balancing routing control", "Functional transfer routing control", and so on.

[0022] The "Distance vector routing control" is a policy to perform packet transfer via a route that has the smallest number of physical hops to a destination. The "Distance vector routing control" simplifies the configuration of a network and thus flattens a network hierarchy.

[0023] The "Link state routing control" selects a route depending on the metrics of cost calculated based on a type of interface, bandwidth, etc and it utilizes an available bandwidth, propagation delay, number of hops, etc. as parameters for calculating the metrics. The "Link state routing control" is able to build a hierarchal network (i.e., backbone and area) as well as a large-scale network.

[0024] The "Host address routing control" decides on an output interface (next hop) according to a destination address which has no dependency on a network topology so as to secure the mobility of the client terminal.

[0025] The "Load balancing routing control" enables the simultaneous use of more than one route for the same IP address and the dynamic change of a route depends on traffic volume.

[0026] The "Functional transfer routing control" is a controlling method for transferring a packet to a specific router without changing a destination address if a certain signal is received.

[0027] It is to be noted that "change of an identifier" in the present invention includes addition, update and deletion of the identifier.

[0028] According to the present invention, the selection of the plural routing protocols dynamically on the network, for example, per packet, per IP address, per flow of packet, per packet according to information contained in the TOS field or the Flow-Label of IPv6, per input interface and regarding all the traffic, are feasible, and highly functional traffic control as well as routing control is achieved on the network accordingly.

[0029] In addition, the present invention avoids the situation in a conventional system that a routing policy to be used on the network or in the router is decided automatically. Therefore, as the plural routing policies can be selected dynamically by changing the identifier, it allows the performance of optimum routing for certain areas on the network. Further, routing a packet to a specific router without the knowledge of routing process of the client terminal is also achieved and it enables flexible as well as highly functional routing.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

[0030] **FIG. 1** is a block diagram showing an internal configuration of a router of a conventional system;

[0031] **FIG. 2** is a block diagram showing a process in the router of the conventional system;

[0032] **FIG. 3** is a schematic diagram showing the overall configuration of a packet switching system according to an embodiment of the invention;

[0033] **FIG. 4** is a schematic diagram explaining a routing table stored in a router according to the embodiment of the invention;

[0034] **FIG. 5** is a block diagram showing an internal configuration of the router according to the embodiment of the invention; and

[0035] **FIG. 6** is a schematic diagram explaining a routing policy table according to the embodiment of the invention.

DETAILED DESCRIPTION OF THE INVENTION

[0036] An embodiment of a packet switching system according to the invention is described with reference to associated drawings. **FIG. 3** schematically describes the overall configuration of the packet switching system according to the embodiment of the invention. Here, a routing of a packet from a client terminal **1** to a destination client terminal **2** via a route **(1)** through **(7)** on a packet switching network **100** will be described as a typical example.

[0037] As shown in **FIG. 3**, the packet switching network **100** is configured by interconnecting routing domains **10**, **20**, **30** and **40**. Each routing domain is configured by routers. In **FIG. 3**, the routing domain **10** is configured by routers **11** through **13**, the routing domain **20** is configured by routers **21** and **22**, the routing domain **30** is configured by routers **31** through **34**, and the routing domain **40** is configured by routers **41** through **43**, respectively. The routing domains are interconnected via border routers **21**, **31** and **41**. A network management apparatus **3** manages network elements, e.g., routers, on the packet switching network **100**.

[0038] In this embodiment, a packet transferred on the packet switching network **100** has an identifier (routing table identifier, hereinafter referred to as RTI) for selecting an appropriate routing table from the plural routing tables (**#0**, **#1**, **#2** . . .) that are stored in the routers (**11-13**, **21**, **22**, **31-34**,**41-43**). The RTI is inserted in the packet and a value of the RTI can be changed within the packet switching network **100** according to the routing policy utilized in the routing domain to which the packet is to be transferred. Further, as the status of traffic on the packet switching network **100** varies, the value of RTI can be changed. In this embodiment, the RTI is inserted in the packet header field, e.g., a Flow-Label field in a header of IPv6 and the other field in the header. The RTI may be inserted at the border router on the packet switching network **100**.

[0039] The value of RTI is changed for a unit according to the prescribed number of packet's, e.g., flow of packets, input interface, all the incoming traffic and specific information contained in the packet. The "specific information" means, for example, a port number, TOS field, a source address and so on.

[0040] The client terminal I is connected to the routing domain **10** via an edge router **11**. The destination client terminal **2** is connected to the routing domain **30** via an edge router **33**.

[0041] As shown in **FIG. 4**, routers **11** through **13**, **21**, **22**, **31** through **34**, and **41** through **43** have the plural routing tables (**#0**, **#1**, **#2** . . .), respectively, and the router selects one routing table from these tables according to the value of the RTI. The router then decides on a router to which the packet is to be transferred by referring to a destination address indicated on the selected routing table so as to transfer packets conltinuously.

[0042] The routing tables (**#0**, **#1**, **#2** . . .) are generated based on respective routing policies and one of the routing tables is specified by the value of RTI, which is called a routing table ID (RTI: Xi). The routing tables are utilized to search an address of a next hop router (Ipy**0**-IPy**2**) that corresponds with a destination address (IPx).

[0043] In this embodiment, the routing tables (**#0**, **#1**, **#2** . . .) contain a network prefix of a destination IP address as well as an IP address of the next hop router, and are generated by RIP or OSPF routing protocol and so on. It is also accepted that the routing table utilized in this embodiment specifies the IP address of the next hop router for all the destination IP addresses, and the routing table is generated by a newly created routing algorithm. Further, the routing table can be configured and the IP address of next hop router can be set taking various information into account, e.g., value of TOS field, port number and Flow-Label of IPv6 header, which are contained in the packet including a packet header, additional information in the router, e.g., the number of packets per input interface, the status of network resources and all the incoming packets at the router.

[0044] In this embodiment, the border router **21**, **31**, **41** as well as the edge router **11**, **33** halve a function of adding and changing the ID of the RTI that is inserted in the packet. **FIG. 5** is a block diagram showing an internal configuration of the border router that has a function of adding and changing the ID of the RTI.

[0045] As shown in **FIG. 5**, the border router is configured with an input interface **111**, a packet forwarder **112**, an output interface **113**, a routing protocol processor **203***a*/**203***b*/**203***c*, a network monitor **204**, and a routing policy receiver **205**.

[0046] The input interface **111** has a packet receiver **114** for receiving the packet, a routing table searcher **115** for searching for a routing table, a RTI receiver **201** for receiving the RTI, and a routing table cache **202***a*/**202***b*/**202***c* for storing the routing table.

[0047] The packet forwarder **112** decides on an address of the next hop router, which the packet to be transferred, based on a routing table searched by the routing table searcher **115**, and then sends an instruction to the output interface **113** to transfer the packet to the address.

[0048] The routing protocol processor **203***a*/**203***b*/**203***c* updates the routing table (**#0**, **#1**, **#2** . . .) according to a routing protocol (**#0'**, **#1'**, **#2'** . . .) which is selected based on the value of the RTI informed by the RTI receiver **201**. The updated routing tables (**#0**, **#1**, **#2** . . .) are stored in the routing table cache **202***a*/**202***b*/**202***c*, respectively.

[0049] The output interface **113** has a packet transmitter **117** and a RTI changing processor **206**. The packet transmitter **117** transmits the packet according to an instruction sent by the packet forwarder **112**.

[0050] The RTI changing processor **206** changes the ID (value) of the RTI in the packet to be transferred according to an instruction from the network monitor **204** and the routing policy receiver **205**.

[0051] The ID of the RTI is properly decided taking into account the static status of the edge routers as well as the border routers (e.g., the situation of traffic, priority of the routing policies, IP address of the packet to be transferred, port number, type of an application contained in the packet and so on) and an instruction is dynamically sent by the network management apparatus **3**.

[0052] Further, if the conventional router, which has no function of adding/changing/deleting of the RTI or has no capability of storing the plural routing tables, exists on the network, the routers in this embodiment ignore the ID of the RTI (or it is handled as "0", which is the default value), and perform routing by a routing table generated by RIP, OSPF, etc. This maintains connectivity to the conventional packet switching network.

[0053] The network monitor **204** measures the existing priority of the routing policies in the routing domain, the status of traffic on the network, the usage of network resources, throughput and supported routing protocols, in

order to analyze the load on the network, and determines the priority of routing policies accordingly.

[0054] The routing policy receiver **205** is connected to the other apparatuses, e.g., the network management apparatus **3** and sends a changing instruction to the RTI changing processor **206** based on a request from the other apparatuses. The request from the other apparatuses means a signal informed by a network management layer including the network management apparatus **3** (e.g., an instruction by a specific address, input interface, port number, Flow-Label of IPv6 or value of TOS field), negotiation with the other routers and so on.

[0055] The RTI changing processor **206** has a routing policy table T1 and performs a process of changing the ID of the RTI when it receives the changing instruction from the network monitor **204** or the routing policy receiver **205**. **FIG. 6** illustrates the content of the routing policy table T1 in this embodiment.

[0056] The routing policy table T1 indicates a relationship between the RTI, the routing policy and the routing table in order to discriminate which routing table is generated by which routing policy, i.e., the routing protocol. Specifically, as shown in **FIG. 6**, the routing policy table T1 is configured with a routing table ID, a routing policy ID and the RTI. The routing policy table T1 may include additional information other than these IDs.

[0057] The routing table ID is an identifier specifying routing tables that is stored in the border router, the edge router and the client terminal, etc.

[0058] The routing policy ID is an identifier specifying the routing protocol as well as the various controlling protocols so as to generate the routing tables, or for specifying the static status based on a certain routing policy.

[0059] The RTI is inserted in the packet, and is an identifier for specifying a routing table to be referred. In this embodiment, the same number is utilized between the routing table ID and the RTI for specifying the routing table.

[0060] Incidentally, the routing policy table Ti may commonly be utilized among all the routers on the packet switching network. It is not necessary to utilize the same routing policy table TI commonly on the packet switching network if a certain routing domain cannot support the specific routing protocol, and a different routing policy table may also be utilized within the respective routing domains.

[0061] On the packet switching network **100** which has the above described functions, the edge router **11** first recognizes the RTI and the destination address (DA) of the received packet when the packet is transmitted from the client terminal **1** to the destination client terminal **2** (refer to **(1)** in **FIG. 3**). The edge router **11** then specifies a routing policy to be utilized in the routing domain **10** based on the recognized RTI and the DA. At this point in time, the edge router **11** inserts the RTI in the packet according to the default routing policy utilized in the routing domain **10** if the RTI is not inserted in the packet or value of the RTI is "0" ("1" is inserted as the value of RTI in **FIG. 3**).

[0062] Further, the edge router **11** forwards the packet to the next hop router (the route **13** in **FIG. 3**) by referring to the routing table, by which the specified routing policy has been generated.

[0063] The router **13** in the routing domain **10** similarly selects the routing table by referring the RTI of received packet (refer to **(2)** in **FIG. 3**) and transfers the packet to the next hop router (the border router **21** in the **FIG. 3**).

[0064] The border router **21** decides on a routing policy to be utilized in the routing domain **20** based on the RTI of the received packet, and if the routing policy in the routing domain **20** differs from the routing domain **10**, the border router **21** changes the value of the RTI (refer to **(3)** in **FIG. 3**). The border router **21** then transfers the packet to the next hop router (the router **22** in **FIG. 3**).

[0065] On the packet switching network **100**, the above described process is performed repeatedly and the packet is transferred via routes **(4)** through **(7)** shown in **FIG. 3**. In this embodiment, the edge router **33** may delete the RTI when the packet is transferred to the destination client terminal **2**.

[0066] As will be seen from the foregoing description, flexible and highly functional routing is achieved by the simultaneous use of the plural routing policies on the packet switching network. In other words, according to the invention, routing a specific packet to a specific router on the network when the routers receive a certain signal without the knowledge of such routing process of the client terminal, the dynamic use of the plural routing policies, the simultaneous use of more than one route for the same IP address, etc. are achieved and thus a routing control can be highly fictionalized.

[0067] Moreover, various applications are feasible by using the invention and the invention is able to cover all the routing control systems to which the invention is applied.

[0068] The invention has been described in detail by referring to the embodiments. It is obvious to those skilled in art that the invention is not restricted to the embodiments mentioned above. The invention may be carried out as a corrected or modified embodiment not departing from the gist and scope specified by the scope of the claims of a patent. Therefore, the description of this specification aims at the representation of examples but does not have any limitation on the present invention.

What is claimed is:

1. A packet switching system for transmitting and receiving a packet via a packet switching network that is configured by interconnecting a plurality of routing apparatuses, comprising:

a plurality of routing tables stored in the respective routing apparatuses, each of the routing tables being generated by a unique routing policy;

an identifier inserted in the packet, configured to specify the routing tables; and

an identifier changer configured to change a value of the identifier within the packet switching network, wherein

the routing apparatus is configured, to select a routing table in accordance with the value of the identifier inserted in the packet received, and to transfer the packet to a destination that is specified by the selected routing table.

2. A packet switching system according to claim 1, wherein the packet switching network is configured by interconnecting a plurality of routing domains formed in a prescribed area,

a plurality of routing tables, each of which has been generated by a unique routing policy, are utilized in each of the routing domains,

the routing apparatus is deployed at a border with an adjacent routing domain, at the origin or at the end of the routing domain, and

the identifier changer is configured to change the value of the identifier in view of a routing policy utilized in the routing domain to which the packet is to be transferred.

3. A packet switching system according to claim 1, wherein the identifier changer is configured to perform the same process to change the value of the identifier for a prescribed block of the packets in accordance with a type of packet.

4. A packet switching system according to claim 1, further comprising, a monitor configured to monitor a status of communication on the packet switching network, and to instruct the identifier changer to change the value of the identifier in accordance with variation in a status of communication.

5. A packet switching system according to claim 4, wherein the monitor is implemented independently from the routing apparatus.

6. A packet switching system according to claim 4, wherein the monitor is implemented in the routing apparatus.

7. A packet switching method for transmitting and receiving a packet via a packet switching network that is configured by interconnecting a plurality of routing appparatuses comprising the steps of:

(1) storing a plurality of routing tables, each of which has been generated by a unique routing policy, in the routing apparatuses;

(2) inserting an identifier in the packet to specify a routing table;

(3) transferring the packet to a destination that is specified by the routing table selected in accordance with a value of the identifier inserted in the packet that is received at the routing apparatus; and

(4) changing the value of the identifier within the packet switching network.

8. A packet switching method according to claim 7, wherein the packet switching network is configured by interconnecting a plurality of routing domains formed in a prescribed area,

a plurality of routing tables, each of which has been generated by a unique routing policy, are utilized in each of the routing domains,

the routing apparatus is deployed at a border with an adjacent routing domain, at the origin or at the end of the routing domain, and

at step (4), the value of the identifier is changed in view of a routing policy utilized in the routing domain to which the packet is to be transferred.

9. A packet switching method according to claim 7, wherein at step (4), the same process is performed to change the value of the identifier for a prescribed block of the packets in accordance with a type of packet.

10. A packet switching method according to claim 7, further comprising, the step of:

(5) instructing an applicable routing apparatus to change the value of the identifier in accordance with variation in a status of communication by monitoring the status of the packet switching network.

11. A packet switching method according to claim 10, where in step (5) is performed at a controlling apparatus which is independent from the routing apparatus.

12. A packet switching method according to claim 10, where in step (5) is performed in the routing apparatus.

13. A routing apparatus for configuring a packet switching network for transmitting and receiving a packet comprising:

a storing unit configured to store a plurality of routing tables, each of which has been generated by a unique routing policy;

a routing table searcher configured to select a routing table in accordance with a value of an identifier inserted in the packet for specifying a routing table;

a transferor configured to transfer the packet to a destination that is specified by the selected routing table; and

a identifier changer configured to change the value of the identifier.

14. A routing apparatus according to claim 13, wherein the packet switching network is configured by interconnecting a plurality of routing domains formed in a prescribed area,

a plurality of routing tables, each of which has been generated by a unique routing policy, are utilized in each of the routing domains, and

the identifier changer is configured to change the value of the identifier in view of a routing policy utilized in the routing domain to which the packet is to be transferred.

15. A routing apparatus according to claim 13, wherein the identifier changer is configured to perform the same process to change the value of the identifier for a prescribed block of the packets in accordance with a type of packet.

16. A routing apparatus according to claim 13, further comprising, a monitor configured to monitor the status of communication on the packet switching network, and to instruct the identifier changer to change the value of the identifier in accordance with variation in a status of communication.

17. A packet generating method for generating a packet that is transmitted and received on a packet switching network configured by interconnecting a plurality of routing apparatuses comprising the steps of:

(1) storing a plurality of routing tables, each of which has been generated by a unique routing policy, in the routing apparatuses; and

(2) inserting an identifier, which is able to be changed on the packet switching network, in the received packet to specify a routing table.

18. A packet generating method according to claim 17, wherein the packet switching network is configured by interconnecting a plurality of routing domains formed in a prescribed area,

a plurality of routing tables, each of which has been generated by a unique routing policy, are utilized in each of the routing domains,

the routing apparatus is deployed at a border with an adjacent routing domain, at the origin or at the end of the routing domain, and

a value of the identifier is able to be changed in view of a routing policy utilized in the routing domain to which the packet is to be transferred.

19. A packet generating method according to claim 17, wherein the identifier is inserted to allow performing the same process of changing the value of the identifier for a prescribed block of the packets in accordance with a type of packet.

20. A packet generating method according to claim 17, wherein the value of the identifier is able to be changed in accordance with variation in a status of communication by monitoring the status of the packet switching network.

21. A structure of packet transmitted and received on a packet switching network configured by interconnecting a plurality of routing apparatuses comprising an identifier, to specify a plurality of routing tables stored in the routing apparatuses, each of which has been generated by a unique routing policy, and is able to be changed on the packet switching network.

22. A structure of packet according to claim 21, wherein the packet switching network is configured by interconnecting a plurality of routing domains formed in a prescribed area,

a plurality of routing tables, each of which has been generated by a unique routing policy, are utilized in each of the routing domains,

the routing apparatus is deployed at a border with an adjacent routing domain, at the origin or at the end of the routing domain, and

a value of the identifier is able to be changed in view of a routing policy utilized in the routing domain to which the packet to be transferred.

23. A structure of packet according to claim 21, wherein the identifier is inserted to allow performing the same process of changing the value of the identifier for a prescribed block of the packets in accordance with a type of packet.

24. A structure of packet according to claim 21, wherein the value of the identifier is able to be changed in accordance with variation in a status of communication by monitoring the status of the packet switching network.

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