

EXHIBIT

1019



(12) **United States Patent**
Zhang et al.

(10) **Patent No.:** **US 6,396,833 B1**
(45) **Date of Patent:** **May 28, 2002**

(54) **PER USER AND NETWORK ROUTING TABLES**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

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(57) **ABSTRACT**

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A gateway is provided which routes a packet sent from a user to the connected network which would maximize the chances that the packet arrives at its destination in the quickest way possible. This is accomplished by extracting a source address from the packet; searching through one or more per-user routing tables to find a per-user routing table corresponding to the source address, the per-user routing table containing a list of currently accessible networks for the user and the range of network addresses corresponding to the currently accessible networks; extracting a destination address from the packet; traversing the entries of the matching per-user routing table, looking for a range of network addresses containing the destination address; routing the packet to a matching network if the destination address is contained within one of the ranges of network addresses for the currently accessible networks; and routing the packet to a default network if the destination address is not contained within one of the ranges of network addresses for the currently accessible networks. The gateway may also avoid the drawbacks of using hops in transporting packets to a destination by looking up the destination network in a table, each entry in the table having a router network address corresponding to each network currently accessible; establishing a tunneling session to the matching router network address; and forwarding the packet to the router network address through the tunneling session.

(22) Filed: **Dec. 2, 1998**

(51) **Int. Cl.**⁷ **H04L 12/56**

(52) **U.S. Cl.** **370/392; 370/401**

(58) **Field of Search** 370/229, 230, 370/235, 357, 359, 360, 378, 379, 382, 383, 392, 397, 393, 394, 400, 401, 432

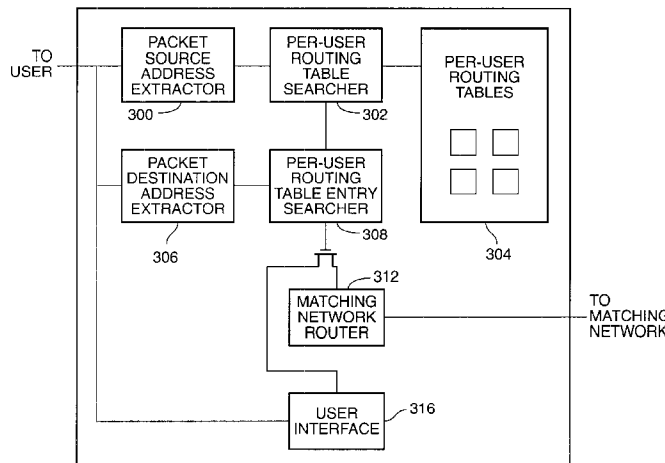
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38 Claims, 5 Drawing Sheets



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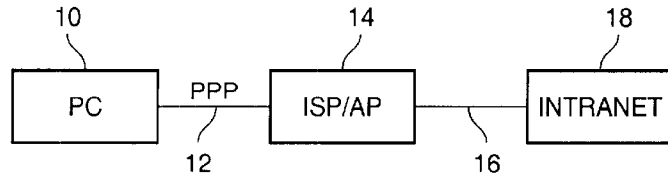


FIG. 1

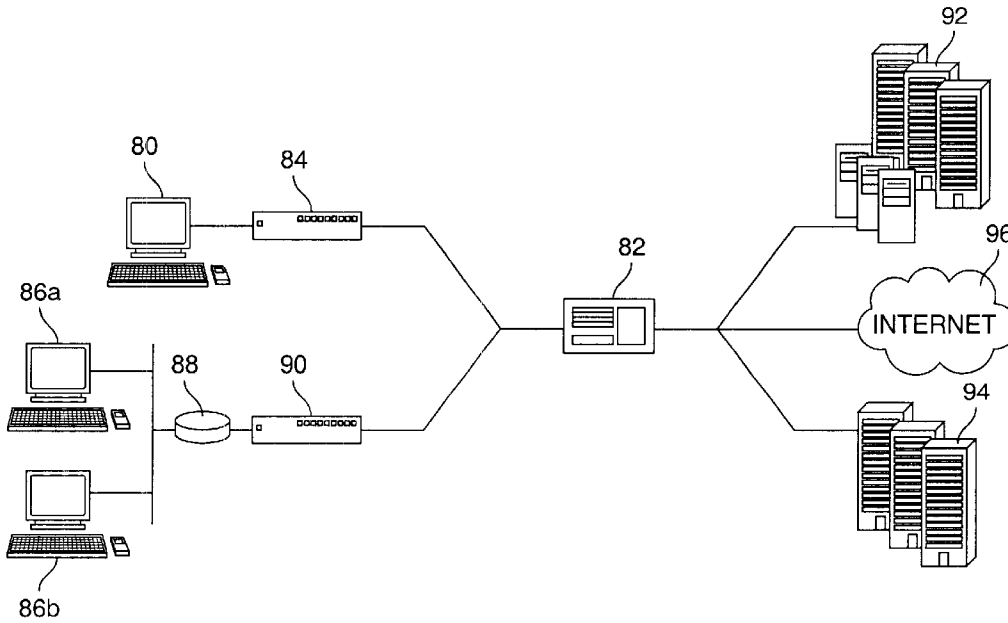


FIG. 2

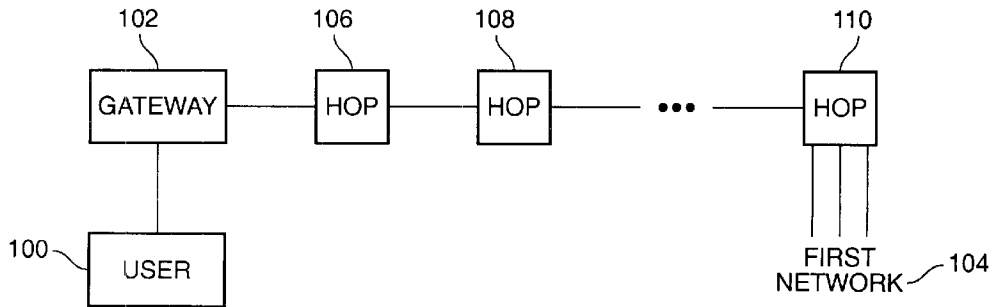


FIG. 3

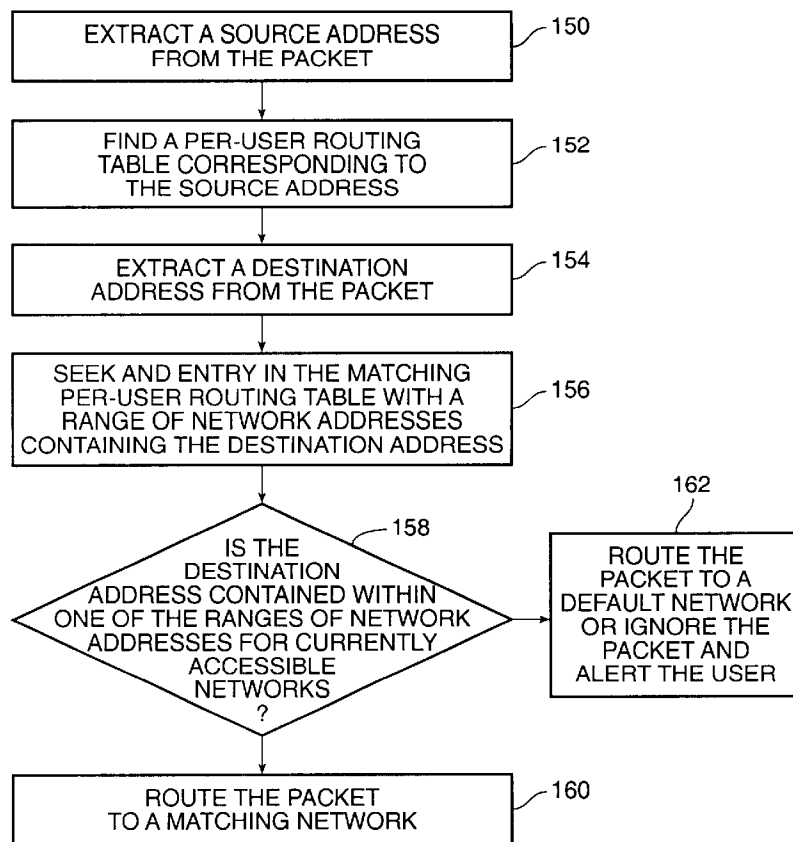


FIG. 4

VERSION	IHL	TYPE-OF-SERVICE	TOTAL LENGTH	
IDENTIFICATION			FLAGS	FRAGMENT OFFSET
TIME TO LIVE		PROTOCOL	HEADER CHECKSUM	
<u>202</u>		SOURCE ADDRESS		
<u>204</u>		DESTINATION ADDRESS		
OPTIONS (+PADDING)				
DATA				

200 IP PACKET

FIG. 5

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